ALAN M. ARAKAWA
Mayor
WILLIAM R. SPENCE
Director
MICHELE CHOUTEAU McLEAN
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

February 18, 2011

Mr. Gary Hooser, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Hooser:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE AUWAHI WIND FARM, LOCATED AT ULUPALAKUA RANCH, DISTRICTS OF HANA, KULA, AND KIHEI, ISLAND AND COUNTY OF MAUI, STATE OF HAWAII; TMK(S): (2) 1-9-001:006, (2) 2-1-002:001, (2) 2-1-002:002, (2) 2-1-003-050, (2) 2-1-003-054, (2) 2-1-003-999, (2) 2-1-004:006, (2) 2-1-004:016, (2) 2-1-004:017, (2) 2-1-004:018, (2) 2-1-004:049, (2) 2-1-004:071, (2) 2-1-004:106, (2) 2-1-004:999, (2) 2-1-005:023, (2) 2-1-005:030, (2) 2-1-005:045, (2) 2-1-005:055, (2) 2-1-005:057, (2) 2-1-005:077, (2) 2-1-005:095, (2) 2-1-005:100, (2) 2-1-005:108, (2) 2-1-008:001, (2) 2-1-008:131, (2) 2-1-008:999, (2) 2-1-009:001, AND (2) 2-1-009:999 (EIS 2011/0001)

In accordance with the provisions of Chapter 343, Hawaii Revised Statutes, and Title 11, Chapter 200-20 of the Administrative Rules of the State Department of Health, a Draft EIS has been prepared for the above-mentioned project. We respectfully request the publication of the Draft EIS in the March 8, 2011 issue of the Office of Environmental Quality Control (OEQC) Environmental Notice. Attached are the following items:

1. One (1) CD with a copy of the Draft EIS in PDF format, completed OEQC Publication Form, Draft EIS Distribution Cover Letter to Participants, and Draft EIS Distribution List;

2. One (1) hardcopy of the Draft EIS; and

3. Draft EIS Distribution List.

Thank you for your cooperation. Should you need further clarification, please contact Staff Planner Joseph Prutch at joseph.prutch@mauicounty.gov or at (808) 270-7512.

Sincerely,

CLAYTON I. YOSHIDA, AICP
Planning Program Administrator

for WILLIAM SPENCE
Planning Director

Attachments
xc: Joseph M. Prutch, Staff Planner
Michael Munekiyo, Munekiyo & Hiraga Inc.
Mitch Dmohowski, Auwahi Wind Energy, LLC
Project File
General File
WRS:CIY:JMP:vb
K:\WP_DOCS\PLANNING\EIS\2011\0001_AuwahiWindFarm\OEQC_DEIStrans.doc

Draft
Environmental Impact Statement
Auwahi Wind Farm
‘Ulupalakua Ranch
Maui, Hawai‘i

Volume I: Main Report

Prepared for
Maui Planning Commission

Prepared by
Tetra Tech EC, Inc.

On behalf of Auwahi Wind Energy LLC

February 2011

DRAFT

Environmental Impact Statement

Auwahi Wind Farm
'Ulupalakua Ranch
Maui, Hawai'i

This Draft Environmental Impact Statement and all ancillary documents were prepared under my direction or supervision and the information submitted, to the best of my knowledge, fully addresses document content requirements as set forth in section 11-200-17, Hawaii Administrative Rules.

02-14-2011

Mitch Dmohowski
Auwahi Wind Energy, LLC

Date

Prepared for:
Maui County Planning Commission

Prepared by:
Tetra Tech EC, Inc.

On behalf of:
Auwahi Wind Energy, LLC

February 2011

Project Summary

Project Name:	Auwahi Wind Farm Project
Applicant and Project Owner:	Auwahi Wind Energy LLC 101 Ash St, HQ 14 San Diego, California 92101
Summary of Proposed Activity:	**Auwahi Wind Energy LLC** is proposing to construct a wind farm with a generating capacity of approximately 21 megawatts (MW), augmented with an energy storage system. The proposed Project would also include a substation, operations and maintenance facility and related infrastructure, a 34.5-kilovolt (kV) generator-tie line, an interconnection substation, and a construction access route along existing public roadways and pastoral roads (pastoral roads are collectively referred to as Pāpaka Road).
Project Location:	‘Ulupalakua Ranch; Districts of Hāna, Kula, and Kihei; Maui, Hawai‘i
Land Ownership:	Private (‘Ulupalakua Ranch) State of Hawai‘i County of Maui Other Private (two parcels along Pāpaka Road)
Tax Map Keys (TMK):	Wind Farm Site—(2) 1-9-001:006 Generator-tie Line—(2) 1-9-001:006, (2) 2-1-009:001, (2) 2-1-009:999, (2) 2-1-008:001 Pāpaka Road and Construction Access—(2) 2-1-002:001, (2) 2-1-002:002, (2) 2-1-003-050, (2) 2-1-003-054, (2) 2-1-003-999, (2) 2-1-004:006, (2) 2-1-004:049, (2) 2-1-004:106, (2) 2-1-004:999, (2) 2-1-005:023, (2) 2-1-005:045, (2) 2-1-005:055, (2) 2-1-005:077, (2) 2-1-005:108, (2) 2-1-004:071, (2) 2-1-004:017, (2) 2-1-004:018, (2) 2-1-005:030, (2) 2-1-005:100, (2) 2-1-005:095, (2) 2-1-005:057, (2) 2-1-008:999, (2) 2-1-004:016, (2) 2-1-008:131
Project Size:	Footprint of Wind Farm Facilities—approximately 48.6 hectares (120 acres) Generator-tie Line—approximately 14.5 kilometers (9 miles) long Pāpaka Road—approximately 7.4 kilometers (4.6 miles) long

Hawaiʻi Revised Statutes Chapter 343 Trigger:	Use of state and county lands Use of state conservation district lands
Approving Agency:	County of Maui, Planning Commission 250 South High Street Wailuku, Maui, Hawaiʻi 96793 (808) 270-7512 Contact: Joe Prutch
Project Consultants:	Tetra Tech EC, Inc. 737 Bishop Street, Suite 3020 Honolulu, Hawaiʻi 96813 Contact: Anna Mallon (808) 394-4109 1750 SW Harbor Way, Suite 400 Portland, Oregon 97201 Contact: Alicia Oller (503) 727-8072

TABLE OF CONTENTS

Section Page

EXECUTIVE SUMMARY ES-1

1.0 INTRODUCTION 1-1

1.1 Background and History........ 1-1
1.1.1 Prior Proposal by Shell Wind Energy........ 1-2
1.1.2 Acquisition by Sempra Generation 1-2
1.1.3 Power Purchase Agreement with Maui Electric Company 1-3
1.1.4 Location of Proposed Project........ 1-3
1.1.5 Land Ownership........ 1-6
1.2 Purpose and Need 1-7
1.2.1 Project Need 1-7
1.2.2 Project Purpose........ 1-9
1.3 Project Objectives 1-9
1.4 Scope and Organization of the Document........ 1-10

2.0 PROPOSED PROJECT AND ALTERNATIVES........ 2-1

2.1 Proposed Project........ 2-1
2.1.1 Wind Farm Site 2-1
2.1.1.1 Wind Turbine Generators 2-1
2.1.1.2 Access Roads........ 2-6
2.1.1.3 Electrical Collection System 2-6
2.1.1.4 Collector Switchyard........ 2-9
2.1.1.5 Operations and Maintenance Building........ 2-10
2.1.1.6 Meteorological Monitoring Tower 2-12
2.1.1.7 Construction Staging and Equipment Laydown Area........ 2-12
2.1.2 Generator-tie Line Corridor........ 2-14
2.1.2.1 34.5-kV Generator-tie Line 2-14
2.1.2.2 69-kV Interconnection Substation........ 2-16
2.1.2.3 69-kV Interconnection Substation Access Road 2-17
2.1.3 Construction Access Route........ 2-18
2.1.3.1 Transportation Plan 2-18
2.1.3.2 Estimated Area to be Disturbed by Construction of Proposed Facilities........ 2-21
2.1.4 Best Management Practices, Design Features, and Project Plans........ 2-23
2.1.5 Site Cleanup........ 2-23
2.1.6 Future Expansion........ 2-23
2.1.7 Project Schedule and Estimated Construction Costs 2-27
2.1.8 Decommissioning and Restoration 2-27
2.2 Alternatives 2-28
2.2.1 Project Component Alternatives 2-28
2.2.1.1 No Action Alternative 2-28
2.2.2 Alternatives Eliminated From Further Consideration........ 2-28
2.2.2.1 Alternative Wind Farm Site within the Auwahi Parcel 2-28
2.2.2.2 Alternative Sites on Maui........ 2-29
2.2.2.3 Generator-tie Line Alternatives........ 2-29
2.2.2.4 Alternative Construction Access Routes 2-30
2.2.2.5 Alternative Alignment for Pāpaka Road........ 2-30
2.2.2.6 Alternative Project Size........ 2-31
2.2.2.7 Off-Shore Wind Farm Alternative 2-31
2.2.2.8 Pumped Storage Hydropower 2-31
2.2.2.9 Other Renewable Energy Sources 2-32

TABLE OF CONTENTS *(continued)*

Section Page

3.0 EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES 3-1

3.1 Climate 3-1
3.1.1 Definition of Resource 3-1
3.1.2 Existing Conditions 3-1
3.1.3 Potential Impacts and Mitigation Measures 3-2
3.1.3.1 Impact Methodology and Factors Considered for Impact Analysis 3-2
3.1.3.2 Construction Impacts 3-2
3.1.3.3 Operations and Maintenance Impacts 3-2
3.1.3.4 No Action Alternative 3-3
3.1.3.5 Avoidance, Minimization, and Mitigation Measures 3-3
3.1.3.6 Summary of Impacts 3-3
3.2 Geology and Topography 3-5
3.2.1 Definition of Resource 3-5
3.2.2 Existing Conditions 3-5
3.2.3 Potential Impacts and Mitigation Measures 3-7
3.2.3.1 Impact Methodology and Factors Considered for Impacts Analysis 3-7
3.2.3.2 Construction Impacts 3-7
3.2.3.3 Operations and Maintenance Impacts 3-8
3.2.3.4 No Action Alternative 3-9
3.2.3.5 Avoidance, Minimization, and Mitigation Measures 3-9
3.2.3.6 Summary of Impacts 3-9
3.3 Soils 3-11
3.3.1 Definition of Resource 3-11
3.3.2 Existing Conditions 3-11
3.3.2.1 NRCS Soil Survey 3-11
3.3.2.2 Land Study Bureau Detailed Land Classification 3-14
3.3.2.3 Agricultural Lands of Importance to the State of Hawai‘i 3-14
3.3.3 Potential Impacts and Mitigation Measures 3-16
3.3.3.1 Impact Methodology and Factors Considered for Impacts Analysis 3-16
3.3.3.2 Construction Impacts 3-16
3.3.3.3 Operations and Maintenance Impacts 3-18
3.3.3.4 No Action Alternative 3-19
3.3.3.5 Avoidance, Minimization, and Mitigation Measures 3-19
3.3.3.6 Summary of Impacts 3-19
3.4 Natural Hazards 3-21
3.4.1 Definition of Resource 3-21
3.4.2 Existing Conditions 3-21
3.4.2.1 Hurricanes and Tropical Storms 3-21
3.4.2.2 Tsunamis 3-22
3.4.2.3 Volcanic Eruptions 3-22
3.4.2.4 Earthquakes and Seismicity 3-23
3.4.2.5 Flooding 3-24
3.4.2.6 Lightning Strikes 3-26
3.4.2.7 Wildfire 3-26
3.4.3 Potential Impacts and Mitigation Measures 3-26
3.4.3.1 Impact Methodology and Factors Considered for Impacts Analysis 3-26
3.4.3.2 Construction Impacts 3-27

TABLE OF CONTENTS *(continued)*

Section | Page

3.4.3.3 Operations and Maintenance Impacts 3-28
3.4.3.4 No Action Alternative 3-30
3.4.3.5 Avoidance, Minimization, and Mitigation Measures 3-30
3.4.4 Summary of Impacts 3-30
3.5 Hydrology and Water Resources 3-31
3.5.1 Definition of Resource 3-31
3.5.2 Existing Conditions 3-31
3.5.2.1 Groundwater 3-31
3.5.2.2 Surface Water 3-32
3.5.3 Potential Impacts and Mitigation Measures 3-32
3.5.3.1 Impact Methodology and Factors Considered for Impacts Analysis 3-32
3.5.3.2 Construction Impacts 3-33
3.5.3.3 Operations and Maintenance Impacts 3-33
3.5.3.4 No Action Alternative 3-34
3.5.3.5 Avoidance, Minimization, and Mitigation Measures 3-34
3.5.3.6 Summary of Impacts 3-35
3.6 Vegetation 3-37
3.6.1 Definition of Resource 3-37
3.6.2 Existing Environment 3-37
3.6.2.1 Vegetation Communities 3-37
3.6.2.2 Special Status and Rare Plant Species 3-39
3.6.3 Potential Impacts and Mitigation Measures 3-42
3.6.3.1 Impact Methodology and Factors Considered for Impacts Analysis 3-42
3.6.3.2 Construction Impacts 3-44
3.6.3.3 Operations and Maintenance Impacts 3-47
3.6.3.4 No Action Alternative 3-49
3.6.3.5 Avoidance, Minimization, and Mitigation Measures 3-49
3.6.3.6 Summary of Impacts 3-50
3.7 Wildlife 3-51
3.7.1 Existing Environment 3-52
3.7.1.1 Non-listed Wildlife Species 3-52
3.7.1.2 Hawai‘i State Species of Concern 3-56
3.7.1.3 MBTA-protected Species 3-57
3.7.1.4 ESA-listed Species and Species under Consideration for Listing 3-57
3.7.2 Potential Impacts and Mitigation Measures 3-64
3.7.2.1 Impact Methodology and Factors Considered for Impacts Analysis 3-64
3.7.2.2 Construction Impacts—Non-listed Wildlife Species, Hawai‘i State Species of Concern, and MBTA-protected Species 3-65
3.7.2.3 Operations and Maintenance Impacts—Non-listed Wildlife Species, Hawai‘i State Species of Concern, and MBTA-protected Species 3-67
3.7.2.4 Construction and Operations and Maintenance Impacts—ESA-listed Species and Species under Consideration for Listing 3-69
3.7.2.5 No Action Alternative 3-80
3.7.2.6 Avoidance, Minimization, and Mitigation Measures 3-80
3.7.2.7 Summary of Impacts 3-86

TABLE OF CONTENTS *(continued)*

Section Page

3.8 Archaeological and Cultural Resources.......3-87
3.8.1 Definition of Resource.......3-87
3.8.1.1 Federal Regulatory Setting.......3-87
3.8.1.2 State Regulatory Setting.......3-88
3.8.2 Existing Conditions.......3-89
3.8.2.1 Environmental Setting.......3-89
3.8.2.2 Cultural Setting.......3-92
3.8.2.3 Cultural Resources of Hawaiian Cultural Value from Oral Histories.......3-95
3.8.3 Potential Impacts and Mitigation Measures.......3-96
3.8.3.1 Impact Methodology and Factors Considered for Impacts Analysis.......3-96
3.8.3.2 Construction Impacts.......3-96
3.8.3.3 Operations and Maintenance Impacts.......3-96
3.8.3.4 No Action Alternative.......3-97
3.8.3.5 Avoidance, Minimization, and Mitigation Measures.......3-97
3.8.3.6 Summary of Impacts.......3-106
3.9 Transportation and Traffic.......3-109
3.9.1 Definition of Resource.......3-109
3.9.2 Existing Conditions.......3-109
3.9.2.1 Harbors.......3-109
3.9.2.2 Airports.......3-109
3.9.2.3 Highways and Roadways.......3-109
3.9.2.4 Transit System.......3-110
3.9.2.5 Pedestrians and Bicyclists.......3-110
3.9.3 Potential Impacts and Mitigation Measures.......3-110
3.9.3.1 Impact Methodology and Factors Considered for Impacts Analysis.......3-110
3.9.3.2 Construction Impacts.......3-111
3.9.3.3 Operations and Maintenance Impacts.......3-123
3.9.3.4 No Action Alternative.......3-123
3.9.3.5 Avoidance, Minimization, and Mitigation Measures.......3-123
3.9.3.6 Summary of Impacts.......3-124
3.10 Hazardous and Regulated Materials and Wastes.......3-125
3.10.1 Definition of Resource.......3-125
3.10.2 Existing Conditions.......3-125
3.10.2.1 Wind Farm Site.......3-125
3.10.2.2 Other Project Areas.......3-125
3.10.3 Potential Impacts and Mitigation Measures.......3-126
3.10.3.1 Impact Methodology and Factors Considered for Impacts Analysis.......3-126
3.10.3.2 Construction Impacts.......3-126
3.10.3.3 Operations and Maintenance Impacts.......3-130
3.10.3.4 No Action Alternative.......3-132
3.10.3.5 Avoidance, Minimization, and Mitigation Measures.......3-132
3.10.3.6 Summary of Impacts.......3-132
3.11 Noise.......3-133
3.11.1 Definition of Resource.......3-133
3.11.1.1 Regulatory Framework.......3-133
3.11.2 Existing Conditions.......3-135
3.11.3 Potential Impacts and Mitigation Measures.......3-136

TABLE OF CONTENTS *(continued)*

Section Page

3.11.3.1 Impact Methodology and Factors Considered for Impacts Analysis....3-136
3.11.3.2 Construction Impacts....3-140
3.11.3.3 Operations and Maintenance Impacts....3-142
3.11.3.4 Underwater Noise Effects on Marine Life....3-147
3.11.3.5 No Action Alternative....3-147
3.11.3.6 Avoidance, Minimization, and Mitigation Measures....3-147
3.11.3.7 Summary of Impacts....3-147
3.12 Air Quality....3-149
3.12.1 Definition of Resource....3-149
3.12.2 Existing Conditions....3-149
3.12.3 Potential Impacts and Mitigation Measures....3-150
3.12.3.1 Impact Methodology and Factors Considered for Impacts Analysis....3-150
3.12.3.2 Construction Impacts....3-152
3.12.3.3 Operations and Maintenance Impacts....3-156
3.12.3.4 No Action Alternative....3-157
3.12.3.5 Avoidance, Minimization, and Mitigation Measures....3-157
3.12.3.6 Summary of Impacts....3-157
3.13 Visual Resources....3-159
3.13.1 Definition of Resource....3-159
3.13.2 Existing Conditions....3-159
3.13.2.1 Generator-tie Line Corridor....3-160
3.13.2.2 Construction Access Route....3-160
3.13.3 Potential Impacts and Mitigation Measures....3-160
3.13.3.1 Impact Methodology and Factors Considered for Impacts Analysis....3-160
3.13.3.2 Viewshed Analysis Methodology....3-161
3.13.3.3 Visual Quality Impact Evaluation Methodology....3-164
3.13.3.4 Construction Impacts....3-166
3.13.3.5 Operations and Maintenance Impacts....3-166
3.13.3.6 No Action Alternative....3-177
3.13.3.7 Avoidance, Minimization, and Mitigation Measures....3-177
3.13.3.8 Summary of Impacts....3-177
3.14 Surrounding Land Use and Agriculture....3-179
3.14.1 Definition of Resource....3-179
3.14.2 Existing Conditions....3-179
3.14.2.1 Land Ownership....3-179
3.14.3 Potential Impacts and Mitigation Measures....3-182
3.14.3.1 Impact Methods and Factors Considered for Impacts Analysis....3-182
3.14.3.2 Construction Impacts....3-182
3.14.3.3 Operations and Maintenance Impacts....3-182
3.14.3.4 No Action Alternative....3-183
3.14.3.5 Avoidance, Minimization, and Mitigation Measures....3-183
3.14.3.6 Summary of Impacts....3-183
3.15 Public and Construction Safety....3-185
3.15.1 Definition of Resource....3-185
3.15.2 Existing Conditions....3-185
3.15.2.1 Fire....3-185
3.15.2.2 Lightning Strikes....3-185
3.15.3 Potential Impacts and Mitigation Measures....3-185

TABLE OF CONTENTS *(continued)*

Section | Page

3.15.3.1 Impact Methodology and Factors Considered for Impacts Analysis....3-185
3.15.3.2 Construction Impacts....3-186
3.15.3.3 Operations and Maintenance Impacts....3-187
3.15.3.4 No Action Alternative....3-190
3.15.3.5 Avoidance, Minimization, and Mitigation Measures....3-190
3.15.3.6 Summary of Impacts....3-190
3.16 Socioeconomic Characteristics....3-191
3.16.1 Definition of Resource....3-191
3.16.2 Existing Conditions....3-191
3.16.2.1 Population....3-191
3.16.2.2 Economy....3-191
3.16.3 Potential Impacts and Mitigation Measures....3-193
3.16.3.1 Impact Methodology and Factors Considered for Impacts Analysis....3-193
3.16.3.2 Construction Impacts....3-193
3.16.3.3 Operations and Maintenance Impacts....3-195
3.16.3.4 No Action Alternative....3-195
3.16.3.5 Avoidance, Minimization, and Mitigation Measures....3-196
3.16.3.6 Summary of Impacts....3-196
3.17 Public Infrastructure and Services....3-197
3.17.1 Definition of Resource....3-197
3.17.2 Existing Conditions....3-197
3.17.2.1 Electric....3-197
3.17.2.2 Solid Waste....3-197
3.17.2.3 Water and Waste Water....3-197
3.17.2.4 Police and Fire Protection Services....3-198
3.17.2.5 Health Care Facilities and Emergency Medical Services....3-198
3.17.2.6 Education Facilities....3-198
3.17.2.7 Recreation Facilities....3-198
3.17.3 Potential Impacts and Mitigation Measures....3-198
3.17.3.1 Impact Methodology and Factors Considered for Impacts Analysis....3-198
3.17.3.2 Construction Impacts....3-199
3.17.3.3 Operations and Maintenance Impacts....3-201
3.17.3.4 No Action Alternative....3-203
3.17.3.5 Avoidance, Minimization, and Mitigation Measures....3-203
3.17.3.6 Summary of Impacts....3-203

4.0 CUMULATIVE IMPACTS....4-1

4.1 Climate....4-4
4.2 Geology and Topography....4-4
4.3 Soils....4-5
4.4 Natural Hazards....4-5
4.5 Hydrology and Water Resources....4-5
4.6 Vegetation....4-5
4.7 Wildlife....4-6
4.7.1 Non-listed Wildlife....4-6
4.7.2 MBTA Species....4-7
4.7.3 Hawaiian Species of Concern....4-7
4.7.4 ESA-listed Species and Species Under Consideration for Listing....4-7

4.8 Archaeological and Cultural Resources....4-7
4.9 Transportation and Traffic....4-8
4.10 Hazardous and Regulated Materials and Wastes....4-8
4.11 Noise....4-8
4.12 Air Quality....4-9
4.13 Visual Resources....4-9
4.14 Surrounding Land Use and Agriculture....4-10
4.15 Public and Construction Safety....4-10
4.16 Socioeconomic Characteristics....4-10
4.17 Public Infrastructure and Services....4-11

5.0 REGULATORY CONTEXT / CONSISTENCY WITH PLANS AND POLICIES....5-1

5.1 Federal Regulations....5-1
5.1.1 Endangered Species Act....5-1
5.1.2 National Environmental Policy Act....5-2
5.1.3 Migratory Bird Treaty Act....5-2
5.1.4 National Historic Preservation Act....5-3
5.1.5 Clean Water Act....5-3
5.1.6 Clean Air Act....5-3
5.1.7 Federal Aviation Regulations....5-4
5.2 State Regulations....5-4
5.2.1 Hawai‘i’s Environmental Impact Review Law (HRS Chapter 343)....5-4
5.2.2 Hawai‘i Coastal Zone Management Program (HRS § 205A)....5-4
5.2.3 State Land Use Law (HRS § 205)....5-9
5.2.4 State Conservation District Law (HRS § 183C)....5-10
5.2.5 State Endangered Species Act (HRS § 195D-4)....5-10
5.2.6 Hawai‘i State Plan (HRS § 226)....5-12
5.2.7 State Historic Preservation Functional Plan....5-13
5.3 Local Regulations....5-13
5.3.1 County Zoning....5-13
5.3.2 Special Management Area and Shoreline Setback Area....5-14
5.3.3 Maui General Plan....5-17
5.3.4 Countywide Policy Plan....5-18
5.3.4.1 Draft Maui Island Plan....5-20
5.3.5 Community Plans....5-23
5.3.5.1 Hāna Community Plan....5-23
5.3.5.2 Makawao-Pukalani-Kula Community Plan....5-28
5.3.5.3 Kihei-Mākena Community Plan....5-30
5.4 Required Permits for Project Development....5-31

6.0 OTHER HRS 343 REQUIREMENTS....6-1

6.1 Secondary and Cumulative Impacts....6-1
6.2 Relationship between Short-Term Uses and Long-Term Productivity....6-1
6.3 Irreversible and Irretrievable Commitment of Resources....6-2
6.3.1 Use of Non-Renewable Resources....6-2
6.3.2 Potential for Environmental Accidents....6-2
6.4 Environmental Effects Which Cannot be Avoided....6-2
6.5 Rationale for Proceeding....6-3
6.6 Unresolved Issues....6-3
6.6.1 Archaeological and Cultural Resources....6-3
6.6.2 Hydrology and Water Resources....6-3

TABLE OF CONTENTS *(continued)*

Section Page

6.6.3 Wildlife Resources 6-3

7.0 CONSULTED PARTIES 7-1

7.1 Consultation 7-1
7.2 EISPN/EA Distribution....................7-2
7.3 Comments Received on EISPN/EA 7-4
7.4 Other Outreach efforts 7-5

8.0 LIST OF PREPARERS 8-1

9.0 REFERENCES....................9-1

LIST OF FIGURES

Figure | Page

Figure 1-1. Project Vicinity Map ... 1-4
Figure 1-2. Project Map ... 1-5
Figure 1-3. Land Ownership ... 1-8
Figure 2-1. Wind Farm Site ... 2-2
Figure 2-2. Cut-Away View of a Wind Turbine Generator ... 2-3
Figure 2-3. Wind Farm Site Straightened Road Alignment ... 2-7
Figure 2-4. Example of a Prime Mover ... 2-8
Figure 2-5. Operations and Maintenance Building Floor Plan ... 2-11
Figure 2-6. Typical Met Tower Profile ... 2-13
Figure 2-7. Typical Gen-Tie Pole Structure ... 2-15
Figure 2-8. Construction Access Route ... 2-19
Figure 2-9. Piʻilani Highway Bumps ... 2-22
Figure 3.1-1. Wind Rose Auwahi Parcel ... 3-2
Figure 3.2-1. Topography ... 3-6
Figure 3.3-1. Soils ... 3-13
Figure 3.3-2. Land Study Bureau Agricultural Productivity Rating ... 3-15
Figure 3.3-3. Agricultural Lands of Importance ... 3-17
Figure 3.4-1. Hurricanes and Tropical Storms within 75 Miles of Hawaiʻi, 1949–2005 ... 3-22
Figure 3.4-2. Lava Flow Hazard Zones on East Maui ... 3-23
Figure 3.4-3. UBC Seismic Zones and G-Force ... 3-24
Figure 3.4-4. UBC Seismic Zones ... 3-24
Figure 3.4-5. Flood Zone Map ... 3-25
Figure 3.6-1. Vegetation ... 3-40
Figure 3.6-2. Critical Habitat and Protected Areas ... 3-43
Figure 3.7-1. Potential Mitigation Sites ... 3-84
Figure 3.9-1. Typical Detail for a General Electric Turbine Laydown Area ... 3-112
Figure 3.9-2. Kaheawa Pastures Tower and Blade Transport Ships ... 3-113
Figure 3.9-3. Typical Nacelle 13-Axle Combination Transport ... 3-114
Figure 3.9-4. Typical WTG Tower Transport ... 3-115
Figure 3.9-5. Typical Blade Transport ... 3-115
Figure 3.9-6. Pier #1 ... 3-117
Figure 3.9-7. Representative Two-lane Highway—Hāna Highway at Dairy Road ... 3-118
Figure 3.9-8. Representative Four-lane Highway—Piʻilani Highway ... 3-119
Figure 3.9-9. Representative Paved Local Road—Wailea Alanui Drive ... 3-119
Figure 3.9-10. Representative Unpaved Pastoral Road: Pāpaka Road, Eastern Portion ... 3-120
Figure 3.11-1. General Electric 1.5 xle Received Sound Levels: Wind Turbines at Maximum Rotation ... 3-143
Figure 3.11-2. Siemens SWT-2.3-101 Received Sound Levels: Wind Turbines at Maximum Rotation ... 3-144
Figure 3.11-3. Siemens SWT-3.0-101 Received Sound Levels: Wind Turbines at Maximum Rotation ... 3-145
Figure 3.13-1. Wind Turbine Zones of Visual Influence ... 3-162
Figure 3.13-2. Generator-tie Line Zones of Visual Influence ... 3-163
Figure 3.13-3. Visual Simulation Key Observation Points ... 3-165
Figure 3.13-4. KOP 1: Existing and Simulated Views from Upcountry Piʻilani Highway Travelling East ... 3-169
Figure 3.13-5. KOP 2: Existing and Simulated Views from Upcountry Piʻilani Highway Travelling West ... 3-171
Figure 3.13-6. KOP 3a: Existing and Simulated Views from Upcountry Piʻilani Highway Travelling North ... 3-173
Figure 3.13-7. KOP 3b: Existing and Simulated Views from Upcountry Piʻilani Highway Travelling North ... 3-175

LIST OF FIGURES

Figure Page

Figure 3.14-1. Maui Coastal Land Trust Conservation Easement 3-181
Figure 3.16-1. Crude Oil Prices 3-196
Figure 5-1. State Land Use Districts...5-11
Figure 5-2. Special Management Area..5-15
Figure 5-3. Community Plan Boundaries...5-24

LIST OF TABLES

Table Page

Table 1-1. Parcel Information for the Auwahi Wind Farm Project....1-6
Table 2-1. Range of Dimensions of the Wind Turbine Generators under Consideration....2-4
Table 2-2. Construction Access Route from Kahului Harbor to the Wind Farm Site....2-20
Table 2-3. Approximate Area to be Disturbed by Construction and Operations Activities....2-23
Table 2-4. Best Management Practices that Avoid, Minimize, or Mitigate Impacts to Project Environmental Resources....2-24
Table 2-5. Project Schedule....2-27
Table 2-6. Estimated Construction Costs....2-27
Table 3.1-1. Summary of Potential Climate Impacts....3-3
Table 3.2-1. Summary of Potential Geologic and Topographic Impacts....3-9
Table 3.3-1. Soil Types in the Proposed Project....3-11
Table 3.3-2. Summary of Potential Soils Impacts....3-19
Table 3.4-1. Summary of Potential Natural Hazards Impacts....3-30
Table 3.5-1. Characteristics of Watersheds in the Proposed Project....3-31
Table 3.5-2. Summary of Potential Water Resources Impacts....3-35
Table 3.6-1. Vegetation Communities Within the ROI....3-38
Table 3.6-2. Plant Species Documented by the Hawai‘i Biodiversity and Mapping Database as Potentially Occurring Within the ROI for the Auwahi Wind Farm Project....3-41
Table 3.6-3. Estimated Temporary and Total Construction Disturbance by Vegetation Community....3-45
Table 3.6-4. Estimated Permanent Disturbance by Vegetation Community....3-48
Table 3.6-5. Summary of Potential Vegetation Impacts....3-50
Table 3.7-1. Bird and Mammal Species Observed in the Proposed Project....3-52
Table 3.7-2. Invertebrate Species Documented within the Proposed Project and Surrounding Area (Montgomery 2008)....3-54
Table 3.7-3. Requested ITP/ITL Authorization for ESA-listed Species and Species under Consideration for Listing for the Auwahi Wind Project....3-70
Table 3.7-4. Annual Indirect Take Estimate for Hawaiian Hoary Bat....3-72
Table 3.7-5. Direct Take Estimates for Hawaiian Petrel....3-74
Table 3.7-6. Indirect Take Estimate for Hawaiian Petrel....3-76
Table 3.7-7. Total Take Estimate for Hawaiian Petrels....3-76
Table 3.7-8. Summary of Potential Wildlife Impacts....3-86
Table 3.9-1. Construction Access Route from Kahului Harbor to Proposed Project....3-110
Table 3.9-2. Kahului Harbor Vicinity Traffic Control....3-113
Table 3.9-3. Transport Route from Kahului Harbor to the Auwahi Wind Project....3-116
Table 3.9-4. Number of Vehicles Per Month During Construction Phase....3-121
Table 3.9-5. Summary of Potential Traffic Impacts....3-124
Table 3.10-1. Potential Pollutants and Control Measures....3-127
Table 3.10-2. Summary of Potential Hazardous Materials Impacts....3-132
Table 3.11-1. Sound Pressure Levels (L_P) and Relative Loudness of Typical Noise Sources and Acoustic Environments....3-134
Table 3.11-2. Hawai‘i Maximum Permissible Sound Levels by Zoning District....3-135
Table 3.11-3. Broadband Sound Power Levels (dBA) Reported in Accordance with IEC 61400-11....3-137
Table 3.11-4. Representative Octave Band 1/1 Center Frequencies....3-137
Table 3.11-5. Summary of WTG Acoustic Model Output by Turbine Type (dBA)....3-138
Table 3.11-6. Estimated L_{max} Sound Pressure Levels from Construction Equipment....3-140
Table 3.11-7. Summary of Potential Noise Impacts....3-147
Table 3.12-1. Summary of Criteria Pollutant Emissions from Project Construction....3-153
Table 3.12-2. Summary of Greenhouse Gas Emissions from Project Construction....3-155
Table 3.12-3. Summary of Greenhouse Gas Emission Rate for Maui Power Generation....3-157
Table 3.12-4. Summary of Potential Air Quality Impacts....3-157

LIST OF TABLES

Table Page

Table 3.13-1. Summary of Potential Impacts to Visual Resources....3-178
Table 3.14-1. Parcel Information for the Auwahi Wind Farm Project....3-180
Table 3.14-2. Summary of Potential Impacts to Land Use and Existing Activities....3-183
Table 3.15-1. Summary of Potential Public Safety Impacts....3-190
Table 3.16-1. Population Trends for Maui County....3-191
Table 3.16-2. Sector Employment for Maui County....3-192
Table 3.16-3. Allocation of Construction Costs (Hawai'i vs. Out of State)....3-194
Table 3.16-4. Project-Related Expenditure Impacts to Economic Output, Earnings, and Employment in Hawai'i....3-195
Table 3.16-5. Summary of Potential Socioeconomic Impacts....3-196
Table 3.17-1. Summary of Potential Public Infrastructure and Services Impacts....3-203
Table 4-1 Cumulative Projects....4-1
Table 5-1. County Special Use Permit Project Components....5-14
Table 5-2. Community Plan Region and Designation....5-25
Table 5-3. Permits and Approvals Required for the Auwahi Wind Farm Project....5-32
Table 7-1. Consulted Parties....7-1
Table 7-2. EISPN/EA Distribution List....7-3
Table 7-3. EISPN/EA Comments....7-4

APPENDICES

Appendix	Title
A	Fire Management Plan
B	Jurisdictional Waters Considerations
C	Preliminary Drainage Report
D	Biological Resources Survey
E	Archaeological Inventory Report
F	Cultural Impact Assessment
G	Traffic Data
H	Noise Assessment
I	Visual Assessment
J	EISPN/EA Comments and Responses

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List of Acronyms

Acronym or Abbreviation	Full Phrase
$\mu g/m^3$	microgram per cubic meter
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawaiʻi
APE	Area of Potential Effect
Applicant	Auwahi Wind LLC
ASL	above sea level
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
BESS	battery energy storage system
BMP	best management practice
C&D	construction and demolition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CAA	Clean Air Act
CadnaA	Computer-Aided Noise Abatement Program
CCAR	California Climate Action Registry
CFR	Code of Federal Regulations
CIA	Cultural Impact Assessment
CO_2e	carbon dioxide equivalents
CRM	Cultural Resources Management
CUP	County Special Use Permit
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
DBEDT	Hawaiʻi State Department of Business, Economic Development and Tourism
DHHL	Hawaiʻi State Department of Hawaiian Homelands
DLNR	Hawaiʻi State Department of Land and Natural Resources
DOE	U.S. Department of Energy
DOFAW	Hawaiʻi State Division of Forestry and Wildlife
DPW	Department of Public Works
EA	environmental assessment
EIS	environmental impact statement
EISPN	environmental impact statement preparation notice
EMF	electric and magnetic fields
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FMP	Fire Management Plan
GE	General Electric
GHG	greenhouse gas
HAAQS	Hawaiʻi ambient air quality standards

LIST OF ACRONYMS *(continued)*

Acronym or Abbreviation	Full Phrase
HAR	Hawai‘i Administrative Rule
HCP	Habitat Conservation Plan
HCZMP	Hawai‘i Coastal Zone Management Program
HDOH	Hawai‘i State Department of Health
HDOT	Hawai‘i State Department of Transportation
HDPE	high density polyethylene
HECO	Hawaiian Electric Company
HPUC	Hawai‘i Public Utilities Commission
HRHP	Hawai‘i Register of Historic Places
HRS	Hawai‘i Revised Statutes
Hz	hertz
HMWMP	Hazardous Materials and Waste Management Plan
IEC	International Electrotechnical Commission
I-O	Input-Output
IPCC	Intergovernmental Panel on Climate Change
ISO	Organization for International Standardization
ITL	Incidental Take License
ITP	Incidental Take Permit
kHz	kilohertz
KOP	key observation point
kph	kilometers per second
kV	kilovolt
kVA	kilovolt-ampere
kyr	kiloyear
LHWRP	Leeward Haleakalā Watershed Restoration Partnership
L_{max}	maximum sound level
L_p	sound pressure level
L_w	sound power level
MBTA	Migratory Bird Treaty Act
MECO	Maui Electric Company
met	meteorological
MGD	million gallons per day
mph	miles per hour
MW	megawatt
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standards
NAR	Natural Area Reserve
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSR	Noise Sensitive Receptor
OED	Oanapuka Series
OEQC	Office of Environmental Quality Control
O&M	operations and maintenance

LIST OF ACRONYMS *(continued)*

Acronym or Abbreviation	Full Phrase
OPGW	optical ground wire
OSHA	Occupational Safety and Health Administration
PM_{10}	inhalable particulate matter
$PM_{2.5}$	fine particulate matter
POI	point of interconnection
PPA	Power Purchase Agreement
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
rpm	rotation per minute
RPS	Renewable Portfolio Standards
rCl	Cinder Land
rLW	Lava Flows
rVS	Very Stony Land
SCADA	Supervisory Control and Data Acquisition
SHPD	Hawai‘i State Historic Preservation Division
SMA	Special Management Area
SPCC	Spill Control and Countermeasure
SWE	Shell Wind Energy Inc.
SWPPP	Storm Water Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
TMK	Tax Map Key
UBC	Uniform Building Code
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USGS	U.S. Geological Survey
V	voltage
WTG	wind turbine generator
ZVI	Zone of Visual Influence

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This Draft Environmental Impact Statement (EIS) for the Auwahi Wind Farm LLC (Auwahi Wind or Applicant) was prepared by the Applicant pursuant to the state of Hawai'i 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 purpose of this document is to inform the public and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed Auwahi Wind Farm Project (proposed Project) and its alternatives; and to recommend mitigation measures that will avoid or reduce a significant adverse impact to the maximum extent possible.

The purpose of the proposed Project is to provide clean, renewable wind energy for the island of Maui by December 2012. The proposed Project would provide economic benefits, by contributing to the local economy, generating new jobs, and providing a stable, long-term source of tax revenue for the state and county. The power generated by the wind farm would be sold to the Maui Electric Company (MECO) subsidiary of Hawaiian Electric Company (HECO) under a long-term, fixed base price contract with fixed annual escalation providing long-term price stability for consumers. The energy delivered by the proposed Project would help HECO meet its Renewable Portfolio Standard (RPS), established in HRS § 269-92 and the state of Hawai'i goal of increasing energy independence through the development of additional sources of renewable energy. To accomplish this purpose, the Applicant proposes to construct and operate a new wind farm site on the Auwahi parcel of 'Ulupalakua Ranch with a net generating capacity of 21 megawatts, augmented with a battery energy storage system. The proposed Project consists of an underground electrical collection system, an electric collector switchyard, an operations and maintenance (O&M) facility and related infrastructure, access roads, an approximately 14.5-kilometer (9-mile) 34.5-kilovolt generator-tie line, an interconnection substation, a microwave communication tower, and an approximately 43-kilometer (27-mile) construction access route from the Port of Kahului on Maui that includes approximately 4.6 miles of Pāpaka Road.

The EIS addresses alternatives to the proposed Project, including the No Action Alternative and nine alternatives that were eliminated from further consideration. The eliminated alternatives considered alternative wind farm locations in the Auwahi parcel; alternative wind farm sites in Maui, and alternative project components. Alternative project components included generator tie-line alternatives, alternative construction access routes, and alternative alignment for Pāpaka Road. This EIS also considered alternative means to meet the state's RPS and eliminated those alternatives, including alternative Project size, an off-shore wind farm alternative, a pumped storage hydropower alternative, and other alternative renewable energy sources. An alternative preliminarily identified as a viable alternative was subsequently dismissed if it was determined that the alternative would not meet the Project's Purpose and Need or the Project's objectives, listed in Section 1.2 and 1.3, respectively.

Under the No Action Alternative, the wind farm would not be constructed and the Project objectives listed in Section 1.3 would not be met. However, this alternative establishes a baseline against which the proposed Project can be compared.

BENEFICIAL AND ADVERSE IMPACTS

Auwahi Wind completed desktop and field-based analyses for biological, cultural, visual, air, and noise resources that could be affected by the proposed Project. Table ES-1 summarizes the types of impacts that could result from the proposed Project and the No Action Alternative and these are discussed in further detail in Chapter 3. In general, the analyses showed that impacts were small relative to the benefits that the proposed addition of renewable energy to MECO would provide. Where significant impacts were identified as likely or possible, Auwahi Wind developed appropriate measures to avoid, minimize, and mitigate impacts to the maximum extent practicable. In all resource areas evaluated, neither significant cumulative impacts nor secondary impacts would result from construction or operations of the proposed Project.

While the No Action Alternative would avoid the environmental impacts identified in this EIS, the objectives of the proposed Project would not be met. The No Action Alternative would neither contribute to Hawai‘i's RPS nor provide economic benefits to the local community through contributions into the local economy, generation of new jobs, and introduction of a stable, long-term source of tax revenue for the state and county. This alternative would also eliminate the long-term displacement of greenhouse gas (GHG) emissions from fossil-fueled electrical generation that this proposed Project would provide.

PROPOSED AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

In this EIS, Auwahi Wind evaluated potential impacts to sensitive environmental resources associated with the proposed Project. In many instances, impacts were deemed less than significant. In all cases where significant adverse impacts were identified, Auwahi Wind developed best management practices (BMPs) and mitigation measures that reduced the potential impact level to less than significant, thereby avoiding significant adverse impacts to sensitive environmental resources.

The means by which Auwahi Wind reduced impacts included proposed Project design features such as BMPs to control stormwater runoff and erosion, fugitive dust, and noxious vegetation; development of a Habitat Conservation Plan for protected fauna; and development of specific Project-related plans, such as a Fire Management Plan and a Traffic Control Plan. Impacts to sensitive flora and fauna would be avoided, reduced, or mitigated by implementing construction timing restrictions, pre-construction surveys, and, in the case of incidental take, compensatory mitigation. The Applicant also incorporated design modifications into its proposed Project that avoid impacts to ceremonial and burial sites and would implement an Archaeological Monitoring Plan and Burial Treatment Plan to protect other ceremonial and burial sites potentially affected by the proposed Project. Proposed mitigation measures are described in detail for each resource listed in Chapter 3 of this EIS. Auwahi Wind would implement the avoidance, minimization, and mitigation measures recommended in this EIS and associated desktop and field-based studies that support its conclusions.

CONSISTENCY WITH LAND USE POLICIES AND PLANS

This EIS takes into account the state and local land use policies and plans that apply to areas affected by the proposed Project. The State Land Use Law (HRS § 205-2) allows for wind-generated energy production for public, private, and commercial use. A Conservation District Use Permit would be sought for the small portion of the proposed Project, specifically along Pāpaka Road, that is located within the Conservation District. The proposed Project would also require a County Special Use Permit from the Maui County Planning Commission. The proposed Project is located in a Special Management Area (SMA), a subset of the coastal zone that is regulated to ensure that activities are consistent with the objectives and policies of the Coastal Zone Management Agency and SMA guidelines. An SMA Use permit would be obtained from the County of Maui for the development of the proposed wind farm and a portion of Pāpaka Road and improvements to Upcountry Pi‘ilani Highway.

The Maui County General Plan serves as long-term, comprehensive planning "blueprint" for physical, economic, environmental development and cultural identity of Maui County. Themes of the Maui General Plan, currently under revision, include making Maui County more self-sufficient by limiting the amount of non-renewable energy used. The proposed Project is consistent with the Maui General Plan goals, policies, and objectives.

Several community-based plans would also apply to the proposed Project, including the Hāna Community Plan, Makawao-Pukalani Community Plan, and Kihei-Mākena Community Plan. The wind farm site and much of the generator-tie line are within the boundaries of the Hāna Community Plan, which designates this area for agricultural use and preservation. In general, the proposed Project is consistent with these community plans. In some cases, temporary or permanent impacts to sensitive resources such as visual, cultural, and biological resources would result from construction or operations of the proposed Project; however, these impacts are either minimal or reduced to less than significant by the avoidance, minimization, and mitigation measures that the Applicant would implement. In other cases, the proposed Project would create a net benefit to the community, as recommended in the Hāna Community and Makawao-Pukalani-Kula Community Plans that call for alternative energy sources such as wind energy. Chapter 5 of this EIS evaluates the land use policies and plans that would be affected by the proposed Project.

OTHER CHAPTER 343 TOPICS

Wind energy is an abundant, infinitely renewable resource. Generation and integration of wind energy into the electric grid decreases fossil fuel consumption, thereby reducing GHG emissions, particulate-related health effects, and other forms of pollution associated with coal or diesel fuel electric generation. Power generated from the proposed Project would help to reduce price volatility associated with the cost of energy to the County of Maui. The proposed Project would demonstrate how renewable energy uses can coexist with agricultural and ranching uses in rural Maui. Furthermore, the proposed Project would provide economic benefits by contributing to the local economy, generating new jobs, and providing a stable, long-term source of tax revenue for the state and county. Objectives and policies of the Maui County General Plan, and the Hāna and Makawao-Pukalani-Kula Community Plans would also be accomplished.

Construction and operations of the proposed Project do not preclude other uses on the land. Once the proposed Project is developed, ‘Ulupalakua Ranch would continue to use the parcel for cattle pasture as it has done for decades. At the end of the approximately 20-year life of the proposed Project, there are several options that could be implemented, such as construction of new electric generation facilities and renegotiating the Power Purchase Agreement, or removal and decommissioning of the existing facilities and returning the land to its original condition to the extent possible.

Construction of the proposed Project would require the use of non-renewable resources used in the manufacturing of Project components, construction materials, and fuel consumed during construction and O&M of the proposed Project. However, to the extent feasible, waste generated during construction as well as O&M would be recycled.

The potential for an environmental accident is low. To further reduce the likelihood of adverse impacts associated with an environmental accident, Auwahi Wind would implement a Hazardous Materials and Waste Management Plan that details use, storage, disposal, and emergency response procedures; a Spill Prevention, Containment, and Countermeasures Plan that outlines prevention, response, containment, reporting, and cleanup procedures as well as worker training, inspection, and emergency response procedures; best management practices; and a Site Safety Handbook to retain onsite. Implementation of these plans and procedures would reduce the likelihood of an environmental accident and minimize the impact of any such accident.

There is a potential for adverse impacts to archaeological and cultural resources that cannot be avoided, although proposed Project design changes have greatly reduced these impacts. Per HRS § 6E (Historic Preservation), consultation with the State Historic Preservation District, Maui Island Burial Council, and other interested parties is ongoing. In addition, there is a potential for adverse impacts to threatened and endangered fauna species. Measures are being taken to reduce these impacts and applicable consultations are underway with the Division of Forestry and Wildlife and U.S. Fish and Wildlife Service.

RATIONALE FOR PROCEEDING

The addition of this wind-generated energy Project would further 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. In addition, the specific location of the proposed Project would provide further geographic diversity to Maui's power supply and thereby improve the overall reliability of the system.

PARTIES CONSULTED

Early coordination meetings with agencies, 'Ulupalakua Ranch management, and neighboring communities began in 2007 when this Project was first proposed. Stakeholders consulted before and during the development of the environmental impact statement preparation notice/environmental assessment (EISPN/EA) and Draft EIS are listed in Chapter 7. The EISPN/EA was distributed to federal, state, and local agencies; federal and state legislators; businesses and community organizations; libraries; and other interested parties for review between March 23 and April 22, 2010. A media advisory notice was published in advance of the two public meetings held during the EISPN/EA comment period. Comments from 37 stakeholders were received during the comment period. Other outreach activities conducted by Auwahi Wind include a Project web page and development of an informational brochure to provide to interested parties at stakeholder meetings as well as at larger community events.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
		CONSTRUCTION IMPACTS		
3.1	Climate	Construction activities would have no impact on temperature, rainfall, humidity, or aspects of the wind regime.	No measures are proposed.	Climate characteristics would remain unchanged.
3.2	Geology and Topography	Construction activities would not be impacted by geologic hazards and would not result in increased exposure of people or structures to geologic hazards. Construction activities would have a temporary effect on landscape function through ground excavation, filling or leveling.	Use best management practices (BMPs) to minimize potential effects of ground disturbance on landscape function. Following construction, ground surfaces, other than those required for O&M will be restored and revegetated.	There would be no ground-disturbing activities; therefore, there would be no potential to alter the landscape or increase exposure to geologic hazards.
3.3	Soils	Ground-disturbing activities could increase the potential for soil erosion.	Use standard stormwater BMPs to reduce the risk of erosion.	There would be no ground-disturbing activities; therefore there would be no potential to disturb soils or increase erosion.
3.4	Natural Hazards	Construction could be adversely affected by a natural hazard such as a hurricane or earthquake. There is a very low risk of wildfires related to the use of vehicles and electrical equipment and increased human presence during construction. The Project is in an area of a lava-flow hazard rated as zone 2, and there is the possibility that Haleakalā could erupt even though it is not currently active.	Implementation of a Fire Management Plan to reduce the wildfire risk. Safety procedures in the Site Safety Handbook will be implemented in a natural hazard event.	No impacts related to natural hazards would occur under the No Action Alternative because conditions would remain unchanged.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.5	Hydrology and Water Resources	During construction, 25,000 gallons per day of water would be required for dust and emergency fire suppression. This water may come from an onsite well that taps into the Lualailua aquifer or would be trucked in from an offsite source. The use of hazardous materials such as fuels, lubricants, cleaning solvents, and paints during construction could pose a hazard to groundwater quality. Ground disturbance during construction would increase the potential for sediment and other pollutants to be transported in stormwater runoff into receiving surface waters.	The Applicant will prepare a Project Spill Prevention, Containment, and Countermeasures (SPCC) Plan, which will reduce potential impacts to groundwater. The Applicant will also prepare a Project Storm Water Pollution Prevention Plan (SWPPP), which will include BMPs to reduce impacts to hydrology, drainage, and surface waters.	There would be no ground-disturbing activities; therefore, there would not be any potential to disturb drainage patterns and groundwater recharge in the area.
3.6	Vegetation	Construction would result in vegetation clearing for installation of Project facilities. Construction would not significantly affect botanical resources, given the general degradation of the habitat and minimal distribution of rare intact native communities within the Region of Influence (ROI). Ground disturbance and vehicular traffic have the potential to result in an increase in noxious plant species distribution. One species of concern was documented adjacent to the construction access route. One endangered plant species and one candidate plant species were documented within the generator-tie line corridor.	Areas temporarily disturbed during construction will be revegetated using native plants or approved weed-free seed mixes. Invasive plant species distribution will be minimized through the implementation of standard BMPs. Implementation of a Fire Management Plan will reduce the risk of fire. Listed plant species will be flagged, fenced, and avoided during construction. Rare native plants will be avoided to the extent possible.	Under the No Action Alternative the Project would not be constructed; therefore, there would be no adverse effect on vegetation or special status and rare plant species. Vegetation communities would not have the beneficial effect of habitat restoration associated with wildlife mitigation.
3.7	Wildlife	The Project has been sited to avoid restoration and conservation activities on the ʻUlupalakua Ranch (Auwahi Forest Restoration Project), areas of native vegetation, and the dryland forests within the Kanaio Natural Area Reserve (NAR). Collisions with construction equipment may result	Implementation of BMPs for weed control and revegetation of disturbed areas with native species or pastureland vegetation will minimize the introduction or spread of weeds. Auwahi Wind is developing a Habitat	The No Action Alternative would have no new adverse direct or indirect effects on any wildlife species. However, under the No Action Alternative

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
		in injury or mortality of avian, bat, and invertebrate species. Increased onsite noise and human presence during construction may disturb wildlife. Project construction would result in very small reductions of habitat potentially used by the Hawaiian short-eared owl and Pacific golden plover. There are five state and federally listed wildlife species (Hawaiian petrel, Hawaiian hoary bat, Newell's shearwater, Blackburn's sphinx moth, and nēnē) with the potential to be incidentally affected by the Project. The yellow-faced bee, currently under consideration for federal listing, may also have the potential to be affected by construction of the Project.	Conservation Plan (HCP) for an Incidental Take Permit (ITP)/Incidental Take License (ITL) issued by the U.S. Fish and Wildlife Service (USFWS) and Division of Forestry and Wildlife (DOFAW), respectively. The proposed Project avoids and minimizes impacts to wildlife by adhering, where reasonably possible, to the voluntary Wind Turbine Guidelines Advisory Committee's March 2010 recommendations for site development and BMPs. Species-appropriate mitigation measures will be implemented to compensate and provide a net conservation benefit for impacts to listed species. For the Hawaiian petrel, Hawaiian hoary bat, Blackburn's sphinx moth, and yellow-faced bee, mitigation measures will include protection, restoration, or management of suitable habitat or contributions to agency-recommended monitoring or research programs. Auwahi Wind will contribute funding to an appropriate management/research program to mitigate potential impacts to Newell's shearwater and nēnē. Pre-construction surveys and relocation of Blackburn's sphinx moths, construction restrictions to avoid impacts to seabirds, and avoidance of disturbance of bat roosting trees also will avoid and minimize impacts to wildlife.	there would be no contribution to habitat restoration and management efforts, which would result in continued degradation of wildlife habitats over time.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.8	Archaeological and Cultural Resources	Construction could have direct adverse impacts to 12 historic properties in the Area of Potential Effect (APE).	The Applicant will develop mitigation plans for review by the lead agency, State Historic Preservation District, and consulting parties and will ensure that approved mitigation plans are implemented prior to construction. Auwahi Wind's contractor will implement an approved Historic Properties Treatment Plan, an Archaeological Monitoring Plan, and a Burial Treatment Plan to protect identified burial and ceremonial sites.	The No Action Alternative would have no adverse effect on historic properties or other archaeological and cultural resources.
3.9	Transportation and Traffic	Construction would require increased use of the harbor, highways, and roadways along the construction access route. Modifications of overhead transmission lines or traffic lights could be necessary along the construction access route. Road improvements would be necessary to accommodate the transport of oversized and heavy equipment. Damage to roads or infrastructure may occur as a result of equipment or material deliveries. Short-term congestion could result from transport of the superloads. The transport, staging, and storage of the wind turbine generator (WTG) components have the potential to impact Honolulu and Kahului harbor facilities and operations in the short term.	A traffic management plan will be implemented to minimize traffic and transportation infrastructure impacts. Superload deliveries will be scheduled during off-peak times and coordinated with the Hawai'i Department of Transportation (HDOT) and County of Maui Department of Public Works (DPW) to minimize inconvenience to the passenger vehicles and buses. Continued coordination with HDOT Harbors Division-Honolulu and Maui District offices will avoid or minimize traffic congestion and delays in the harbor.	No impacts to transportation and traffic are expected under the No Action Alternative because traffic conditions would remain unchanged.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.10	Hazardous and Regulated Materials and Wastes	Construction of the Project would involve the routine transport, use, storage, and disposal of hazardous materials. There is a very low risk of vandalism at the site.	The Applicant will prepare and implement a Hazardous Materials and Waste Management Plan (HMWMP) for hazardous materials management. The Applicant will comply with regulatory requirements and implement BMPs for handling hazardous materials. The Applicant will prepare and implement a SPCC Plan to address accidental releases and spills. Compliance with the Site Safety Handbook will minimize risks of exposure. Site security is sufficient to prevent vandalism.	Under the No Action Alternative, no hazardous materials would be transported, stored, used, or disposed of at the site; therefore, there would be no impacts.
3.11	Noise	Project construction may cause short-term but unavoidable noise impacts depending on the activity, type and condition of equipment, and distance to receiver. Blasting may be required. Construction would generate traffic on public roadway that would have potential noise effects.	Auwahi Wind will notify the surrounding community in advance of the construction schedule and resolve any complaints or concerns from construction noise. Noisy construction activities will be conducted between 7:00 a.m. and 10:00 p.m., unless further restricted by a Hawai‘i Department of Health (HDOH) noise permit. The Applicant will coordinate with individual landowners regarding the operation of construction-related vehicles on private site access roadways.	Under the No Action Alternative, no construction-related noise would be generated.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.12	Air Quality	Project construction would require the operation of heavy equipment and construction vehicles as well as vehicle traffic to and from the Project associated with construction worker commutes and heavy trucks delivering construction materials and facility components. Construction equipment and construction-related vehicle traffic would be a source of greenhouse gas (GHG) emissions. Construction truck traffic and 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 Applicant's contractor will implement a dust control program throughout the construction period. The Project will be in compliance with state and federal ambient air quality standards.	The No Action Alternative would avoid all air quality and GHG emissions associated with construction activities. The No Action Alternative would not have the beneficial long-term effect of displacing GHG emissions associated with fossil fuels.
3.13	Visual Resources	The Project is in a low-density rural area. Visual impacts during construction are expected to be minor and short-term. Dust could be temporarily generated during site clearing and grading activities and the movement of heavy vehicles and equipment along local roads.	The Applicant's contractor will keep construction time to a minimum, implement active dust suppression measures, remove construction debris, locate construction staging and storage areas away from local roads, revegetate temporarily disturbed areas, and comply with all required setbacks from roads and residences to minimize visibility.	Under the No Action Alternative, there would be no impacts to visual resources associated with construction activities.
3.14	Surrounding Land Use and Agriculture	Impacts to land use during the construction phase of the Project would include short-term disruption to ranching and cattle grazing within the site. See Section 3.3 regarding impacts to agricultural lands.	No measures are proposed.	No impacts to land use are expected under the No Action Alternative because conditions and activities would remain unchanged.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.15	Public and Construction Safety	Potential safety issues during construction are associated with public access to the Project and accidents or injuries of construction workers. Workers and the general public could be injured from the movement of construction vehicles, equipment and materials.	A Site Safety Handbook and Fire Management Plan, implemented prior to the start of construction, will include construction safety measures and identify requirements for temporary fencing around staging areas, storage yards, and excavations to control and restrict public access to the construction area. Standard construction BMPs will be implemented to reduce the potential for accidents or injuries. See Section 3.10 regarding hazardous materials handling.	Under the No Action Alternative, conditions affecting public safety would remain as they are under existing conditions.
3.16	Socioeconomic Characteristics	The Project does not conflict with any general or community plan goals intended to account for population growth. The Project would have a short-term beneficial impact by generating approximately 50 short-term construction jobs and contributing approximately $62.25 million of construction expenditures to the local economy. For every direct dollar spent, $1.27 in indirect impact economic impact is expected.	No measures are proposed.	The economic gains from the construction of the Project would not occur under the No Action Alternative. This would be a minor negative impact on the local economy.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.17	Public Infrastructure and Services	The electricity required to operate the modular office space onsite would be minimal. Waste from constructing the Project would not cause significant impacts to the existing waste disposal facilities or exceed the capacity of the facilities. During construction the wastewater from portable toilets would be minimal, and the existing treatment and disposal facilities have adequate capacity to accommodate the temporary increase in sanitary wastewater. Fire, police, and emergency services are all available, and construction of the proposed Project is not expected to significantly impact the current service levels. Existing health care and emergency services are expected to be adequate to accommodate illness or injuries from construction-related incidents.	No measures are proposed.	Under the No Action Alternative, conditions affecting public infrastructure and services would remain as they are currently.
		OPERATIONS IMPACTS		
3.1	Climate	The Project would have a beneficial impact on the climate by replacing energy generated by the combustion of fossil fuels, thereby reducing emissions of GHGs.	No measures are proposed.	Under the No Action Alternative, climate characteristics would remain unchanged. The potential for reduction in GHGs would not occur.
3.2	Geology and Topography	During operations, the proposed Project would be maintained by grading and compacting to minimize erosion. After construction, 33 percent of the proposed Project would be retained permanently for operations and maintenance (O&M).	No measures are proposed.	Under the No Action Alternative, there would be no ground-disturbing activities; therefore, there would be no impact on geology and topography resources.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.3	Soils	Features to control stormwater and minimize erosion are included in the Project site design and engineering. During operations, the proposed Project would be maintained in good condition to prevent adverse effects on soil resources. In the event of a major component replacement, heavy equipment would be used that could result in soil disturbance and erosion.	No specific mitigation measures are proposed; however, BMPs similar to those used during construction will be followed, reducing soil impacts to less than significant.	Under the No Action Alternative, there would be no ground-disturbing activities; therefore, there would be no impact on soils or potential to increase erosion.
3.4	Natural Hazards	In rare events, a WTG collapse or dropped/thrown rotor blade during a natural hazard such as hurricanes or tropical storms may occur. No portion of the proposed Project is within the Civil Defense Tsunami Evacuation Zone. The Project is in an area of a lava-flow hazard rated as zone 2, and there is the possibility that Haleakalā could erupt even though it is not currently active. Maui is designated as seismic zone 2B. Most of the Project is in Flood Zone X, which is assigned to those areas that are determined to be outside the 1 percent annual chance floodplain. A small portion of the wind farm site is in Flood Zone A, meaning no Base Flood Elevations have been determined.	WTGs that would be installed for this Project are designed to operate in winds up to 89 kilometers per hour (55 miles per hour) and stop at wind speeds in excess of 89 kilometers per hour (55 miles per hour). The wind farm is designed to withstand earthquakes per the appliance building codes for Maui's seismic zone 2B and the Design Site Class B under the International Building Code (2006 Edition). WTGs are designed with lightning receptors and are grounded to mitigate the effects of a lightning strike. Implementation of a Fire Management Plan will reduce the wildfire risk. A flood development permit would be obtained prior to construction if necessary for the portion of the Project in Flood Zone A.	No impacts related to natural hazards would occur under the No Action Alternative because conditions would remain unchanged.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.5	Hydrology and Water Resources	The Project would result in a small increase in the amount of new impervious (concrete) (2.4 hectares [6 acres]) and semi-impervious (aggregate) (31 hectares [77 acres]) surfaces in the ROI. If water for the O&M building is sourced from an onsite well, the Project would result in a very minor increase in demand but would not measurably reduce the quantity of available ground water.	Because very little impermeable surface would be added, the Project would not substantially increase the volume of stormwater runoff that reaches established watercourses. Implementation of the Project SPCC Plan will reduce potential impacts to groundwater. The Project SWPPP will include BMPs to reduce impacts to hydrology, drainage, and surface waters.	There would be no ground-disturbing activities; therefore, there would not be any potential to disturb drainage patterns and groundwater recharge in the area.
3.6	Vegetation	During operations, vegetation would be permanently removed for Project facilities. Routine maintenance activities would have minimal impacts to vegetation. In the event of a major component replacement, heavy equipment and the use of access roads, crane pads, and staging areas would be necessary, with resulting potential disturbance to vegetation. Operations activities could result in the introduction and spread of invasive species or a very minor increased risk of fire. Routine maintenance activities could potentially disturb special status or rare plant species.	Invasive plant species distribution will be minimized through the implementation of standard BMPs. Implementation of a Fire Management Plan will reduce the risk of fire and any potential indirect effects on special status or rare plants.	Under the No Action Alternative the Project would not be built; therefore, there would be no effect on vegetation or special status and rare plant species.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.7	Wildlife	The Project would result in a permanent loss of primarily degraded wildlife habitat where vegetation removal is associated with permanent structure placements. Non-listed avian species, including those protected by the Migratory Bird Treaty Act (MBTA), have the potential to collide with operating WTGs or other Project structures such as the generator-tie line. Because they fly low over the ground, there is a potential for Hawaiian short-eared owls to collide with maintenance vehicles while foraging. It is possible that Pacific golden plovers could collide with the WTGs during flights during periods of poor visibility. Potential direct impacts to Hawaiian petrels include collision with WTGs or other Project facilities when flying to and from the colony. There is potential for Hawaiian hoary bats to collide with WTGs or succumb to barotrauma while foraging.	Collisions with Project components will be avoided and minimized by burying onsite collection lines, installing bird flight diverters on the generator-tie line and met tower guy wires, and flagging met tower guy wires. Onsite lighting at the O&M building, collector switchyard, and interconnection substation will be minimized; a Federal Aviation Administration (FAA) endorsement of a minimal WTG lighting plan to reduce the likelihood of attracting or disorienting seabirds will be requested. To minimize impacts to the Hawaiian hoary bat, suitable roosting trees will not be removed or trimmed between May 15 and August 15 or disturbed during the bat breeding season. Standard BMPs will be implemented to minimize the spread of invasive, non-native plants, and disturbed areas will be replanted with native or naturalized plant species to minimize reductions in native habitat of Blackburn's sphinx moth and yellow-faced bees.	The No Action Alternative would have no new adverse direct or indirect effects on any wildlife species. However, under the No Action Alternative there would be no contribution to conservation, management, or restoration efforts, which would result in continued degradation of wildlife habitats over time.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.7 (cont.)	Wildlife		Auwahi Wind is developing an HCP for an ITP/ITL to be issued by the USFWS and DOFAW. The Applicant will provide mitigation that will provide a net conservation benefit for the affected species such as funding measures associated with protection, management, and/or restoration of habitat for or research/monitoring associated with these species.	
3.8	Archaeological and Cultural Resources	The access roads for O&M of Project facilities could have an indirect adverse effect on archaeological and cultural resources by providing access to resources that were previously difficult to reach. This could allow increasing vandalism and theft of eligible resources.	Measures to minimize theft and vandalism at recorded historic properties would include fencing of sites, development of a Worker Environmental Awareness Program for Project O&M team workers, and regularly schedule monitoring and patrolling of significant resources.	The No Action Alternative would have no adverse effect on historic properties or other archaeological and cultural resources.
3.9	Transportation and Traffic	There would be long-term beneficial impacts to the transportation system because the Project would improve some roads and provide improved access to private properties along Pāpaka Road.	No mitigation measures are proposed.	No impacts to transportation and traffic are expected under the No Action Alternative because traffic conditions would remain unchanged.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.10	Hazardous and Regulated Materials and Wastes	Hazardous materials would be stored in the O&M building and used at each WTG and at the collector switchyard. Each of the 15 WTG sites would have a gear box with 64 gallons of hydraulic and lubricating oils and a transformer with 522 gallons of mineral oil. The new collector switchyard would have three breakers that collectively contain approximately 4,000 gallons of mineral oil. There is potential for worker exposure to chemicals exceeding Occupational Safety and Health Administration limits.	The Project O&M phase will comply with all applicable federal, state, and local laws, ordinances, regulations, and permits. The HMWMP will be updated with information about hazardous materials pertaining to the O&M phase. Auwahi Wind will implement BMPs for managing hazardous materials, and provide appropriate maintenance or control measures to avoid or manage leaks and spills. Auwahi Wind will update the SPCC Plan with information pertaining to the O&M phase and implement BMPs for spill prevention, response, containment, and reporting. Site Safety Handbook will be periodically updated for O&M activities and detail proper waste storage and disposal procedures.	Under the No Action Alternative, no hazardous materials would be transported, stored, used, or disposed of at the site; therefore, there would be no impacts.
3.11	Noise	Acoustic modeling demonstrates that the Project has been adequately designed to meet the Hawai'i Community Noise Standards at all existing Noise Sensitive Receptors.	No measures are proposed.	Under the No Action Alternative, no noise would be generated.
3.12	Air Quality	The Project would have the beneficial impact of displacing GHG emissions produced by fossil fuel power sources. Also, the Project would offset all of the GHG emissions generated from Project construction.	No measures are proposed.	The No Action Alternative would not have the beneficial long-term effect of displacing GHG emissions associated with fossil fuels.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.13	Visual Resources	Existing views from various locations near the Project would be altered to varying degrees by installation of the WTGs and generator-tie line. The WTGs would be visible mainly from areas south of the ‘Ahihi-Kina‘u NAR to the Haleakalā National Park ridgeline, and immediately around the Project. Other likely areas of high visibility for the WTGs are limited to the South Maui coastline to the west of the site and along the Hoapili Trail to the south of the site. Areas of high visibility for the generator-tie line are scattered throughout the southwestern portion of the island of Maui. The primary sensitive viewer groups with visibility of the WTGs and generator-tie line would be travelers on Upcountry Pi‘ilani Highway.	The Project occurs in a low-density rural area and avoids significant aesthetic impacts requiring mitigation. The Project complies with all required setbacks from roads and residences; and will use WTGs with uniform design, speed, color, height, and rotor diameter; WTGs will be aligned in strings for uniformity; much of the electrical collection system will be underground; a low-reflectivity finish for substation equipment will be used to minimize its visibility; dull gray porcelain insulators will be used to reduce insulator visibility; and WTGs that must be equipped with lights will be kept to the minimum for FAA safety.	Under the No Action Alternative, there would be no impacts to visual resources associated with operations of the Project. The existing visual landscape would persist in the current state subject to future land use changes and development.
3.14	Surrounding Land Use and Agriculture	Because the Project would be compatible with ongoing ranching activities and is consistent with the state and county regulations, plans and objectives, once a County Special Use Permit is obtained, it is expected to have a less than significant impact on land use.	No measures are proposed.	No impacts to land use are expected under the No Action Alternative because conditions and activities would remain unchanged.
3.15	Public and Construction Safety	WTG safety hazards include tower collapse and blade throw. The threat of fire associated with the operation of WTGs could result from the electrical collection system and generator-tie lines, the storage and use of flammable materials and equipment, and malfunction of the WTGs.	Implementing the measures in the Site Safety Handbook and designing the WTGs per industry specifications and standards will minimize the potential for tower collapse and blade throw. Auwahi Wind has developed an FMP to mitigate the already low risk of fire. See Section 3.10 regarding the SPCC Plan.	Under the No Action Alternative, conditions affecting public safety would remain as they are under existing conditions.

Table ES-1.
Construction and Operations Impacts

EIS Section	Impact Topic	Preferred Alternative	Measures to Reduce Adverse Impacts	No Action Alternative
3.16	Socioeconomic Characteristics	The Project would result in beneficial impacts related to employment and electricity rates. There would be approximately five full-time jobs for skilled operators to operate the wind farm and maintain the WTGs and generator-tie lines. Energy generated from the wind farm would be provided to rate payers at a fixed price through a Power Purchase Agreement.	No measures are proposed.	Under the No Action Alternative, existing conditions would not change; however, the economic gains from the development of the Project would not occur. Therefore, there would be minor, negative effects on the local economy.
3.17	Public Infrastructure and Services	The O&M building and met tower would require electrical service. The O&M building would generate municipal waste. The O&M building would require water and generate wastewater. These impacts would be minor and would be facilitated by existing public infrastructure or private onsite systems.	No measures are proposed.	Under the No Action Alternative, conditions affecting public infrastructure and services would remain as they are currently.

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1.0 INTRODUCTION

1.0 INTRODUCTION

Auwahi Wind Energy LLC (Auwahi Wind or Applicant), a subsidiary of Sempra Generation, proposes to construct and operate a wind farm (proposed Project) with a net generating capacity of 21 megawatts (MW), augmented with a battery energy storage system (BESS), on the island of Maui. In addition to the wind turbine generators (WTGs) and the BESS, the proposed Project would include an electrical collection system, an electric collector switchyard, an operations and maintenance (O&M) facility and related infrastructure, an approximately 14.5-kilometer (9-mile) 34.5-kilovolt (kV) generator-tie line[1], an interconnection substation, and a 43-kilometer (27-mile) construction access route from the Port of Kahului to the wind farm site (Figures 1-1 and 1-2). The proposed Project is expected to be operational in December 2012. This Draft Environmental Impact Statement (EIS) was prepared pursuant to the state of Hawaiʻi environmental review process, as defined and required by Chapter 343 of the Hawaiʻi Revised Statutes (HRS) and Title 11, Chapter 200 of the Hawaiʻi Administrative Rules (HAR).

The proposed Project would require the use of State of Hawaiʻi and County of Maui lands (a portion of the generator-tie line, interconnection substation, and microwave communication tower) and a small portion of the State Conservation District (small portion of Pāpaka Road and Upcountry Piʻilani Highway road improvements), which triggers the requirement for compliance with HRS Chapter 343. Project components that will require the use of these lands are the generator-tie line and the construction access route. It was anticipated that the proposed Project may have a significant impact to the human and natural environment (specifically cultural, archaeological, and biological resources); therefore, an EIS was planned from the proposed Project's inception to fully disclose any potential impacts on the environment and proposed best management practices (BMPs), project-specific design features, and mitigation measures to reduce these potential impacts. This Draft EIS provides a detailed description of the Applicant's proposed Project. It also presents the existing environmental setting for the full range of potentially affected resources and the analysis of potential impacts to those resources.

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 Hawaiʻi Wind Working Group was formed in 2002 under the U.S. Department of Energy (DOE) Wind Powering America program to identify specific concerns, barriers, and obstacles to wind development in Hawaiʻi. The working group is a collaboration of government agencies, nonprofit organizations, businesses, and industries interested in wind development. This collaboration includes the Hawaiian Electric Company (HECO); Maui Electric Company (MECO); Hawaiʻi Department of Business, Economic Development & Tourism (DBEDT); and DOE National Renewable Energy Laboratory.

Based on high-resolution wind resource maps developed by the Hawaiʻi Wind Working Group (Hawaiʻi Wind Working Group 2004), the Auwahi parcel of ʻUlupalakua Ranch was identified as a suitable location for a wind farm project because it has a consistent wind power density regime (i.e.,

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[1] A "generator-tie line" is a sole-use facility constructed by a private electric generator to interconnect and transmit its power to the electric grid. Although this approximately 14.5-kilometer (9-mile) electrical line proposed by Auwahi Wind has been referred to as a "transmission line" in previous documents, the correct term is generator-tie line. A "transmission line" is an electrical line constructed by a traditional public utility, which must provide open access to that line to any party that requests it.

consistently high winds suitable for a wind farm). The Auwahi parcel is also located in a remote and undeveloped portion of the island on the slopes of Mt. Haleakalā. The Auwahi parcel is zoned for agriculture, within which wind farms are considered a compatible use, further contributing to its suitability for development as a wind farm project.

1.1.1 Prior Proposal by Shell Wind Energy

Shell Wind Energy, Inc. (SWE) was the original proponent of the proposed Project and creator of Auwahi Wind LLC. SWE signed a 25-year property lease agreement with ʻUlupalakua Ranch in 2006, securing the Auwahi parcel for construction and operations of the proposed Project. Within the Auwahi parcel, two potential project sites were identified: (1) an area just north of Upcountry Piʻilani Highway and (2) an area just south of the highway. A separate parcel on ʻUlupalakua Ranch was identified as a suitable location for a potential pumped hydro storage facility that could store power from the WTGs during off-peak periods to be used to help meet peak demand. This pumped hydro storage facility was eliminated from further consideration for the proposed Project due to commercial feasibility and potential environmental impact issues. In 2006, three 50-meter-high meteorological towers (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 done for the two potential project sites. Although the assessment results showed commercially viable wind regimes at both sites, it was determined that the south site would have a higher estimated net annual energy production. Thus, the northern site within the Auwahi parcel would be less likely than the southern site to meet the proposed Project objectives of increasing Hawaiʻi's energy independence and providing a renewable energy source to assist the people of Hawaiʻi in meeting or exceeding their Renewable Portfolio Standard (RPS). Therefore, the development site north of Upcountry Piʻilani Highway was eliminated from consideration.

Using the results of the energy assessment and an initial site evaluation, a preliminary site layout was developed to identify the approximate location and configuration of the WTGs and assess the site capacity under full build-out conditions. The preliminary layout indicated that the proposed wind farm site could accommodate 39 WTGs, with a maximum generating capacity of up to 117 MW depending on the size of the WTGs. For the first phase of the Project, SWE 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. However, pumped hydro storage was determined to be economically unfeasible. To provide an economical energy storage solution for the first phase of the Project, battery storage technology was incorporated into the proposed Project design to smooth sudden increases or decreases of the energy output and potentially time-shift some of the off-peak demand production to the on-peak demand 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 planned for Maui. MECO initiated a structured negotiation process as the basis for the selection of a project for which they would enter into negotiations for a Power Purchase Agreement (PPA). The proposed Project was selected but was downsized to a generating capacity of 21 MW to meet the MECO requirements regarding the maximum allowable wind energy-to-grid capacity.

1.1.2 Acquisition by Sempra Generation

Sempra Generation purchased Auwahi Wind LLC and an assignment of the Auwahi parcel lease from SWE in October 2009. Sempra Generation is a subsidiary of Sempra Energy, a Fortune 500 energy services holding company based in San Diego, California. Sempra Generation acquires and develops power plants and renewable energy projects that generate electricity for the competitive market. Sempra Generation has more than 2,700 MW of generating capacity in operation including natural gas, wind, and solar photovoltaic projects.

Environmental surveys and engineering studies developed under the direction of SWE and additional studies commissioned by Sempra Generation form the basis of the EIS Preparation Notice/Environmental Assessment (EISPN/EA) prepared for the Project pursuant to HRS § 343-5 as a mechanism for public comment and scoping for the Draft EIS. The EISPN provided a detailed description of the proposed Project and presented the environmental setting for the full range of potentially affected resources. Much of the information in the Existing Environment section of this Draft EIS is based on the work of a previous SWE-retained environmental consultant (CH2M Hill) and numerous subconsultants. Sempra Energy has retained Tetra Tech to complete the environmental review and HRS Chapter 343 process for the proposed Project. Tetra Tech has updated and revised the earlier documentation to reflect the proposed Project's current design and level of information necessary for an EIS by conducting additional research and field work.

1.1.3 Power Purchase Agreement with Maui Electric Company

Auwahi Wind intends to sell 100 percent of its energy production under a 20-year PPA with MECO, a wholly owned subsidiary of HECO. The energy delivered by Auwahi Wind would help HECO meet its RPS requirements. The PPA is on schedule to be finalized, executed, and submitted to the Hawai‘i Public Utilities Commission (HPUC) for approval in early 2011. HPUC approval of the PPA is expected by July 2011.

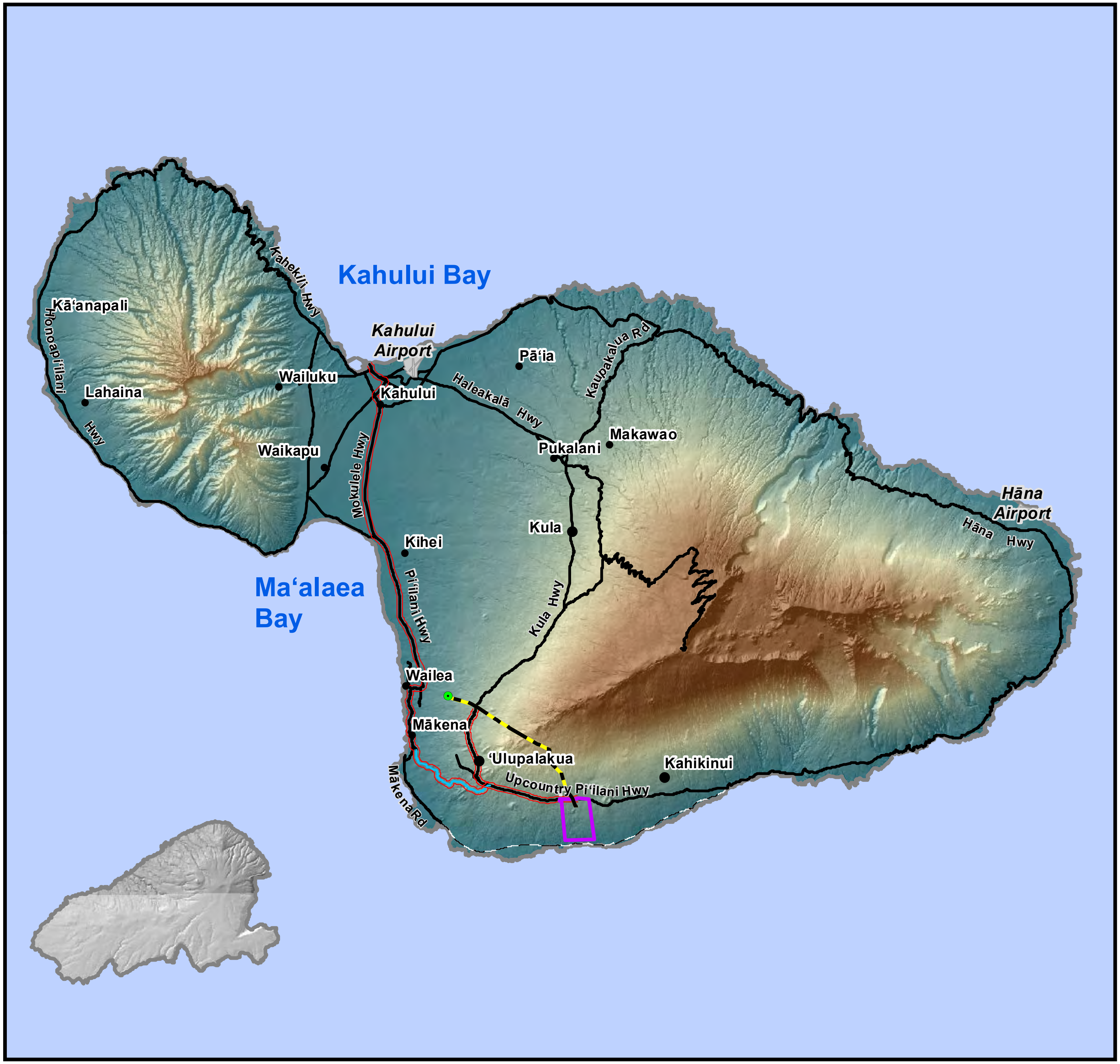
1.1.4 Location of Proposed Project

The proposed Project is located almost entirely on ‘Ulupalakua Ranch, approximately 16 kilometers (10 miles) south of Kula, in the Hāna, Kula, and Kihei Districts of Maui. It consists of three major components: the wind farm site, a generator-tie line corridor and interconnection substation, and a construction access route. The location of each of these components is shown on Figure 1-1.

The wind farm site (approximately 5.9 square kilometers [1,466 acres]) is on the Auwahi parcel of ‘Ulupalakua Ranch that is bordered by the Pacific Ocean to the south and Upcountry Pi‘ilani Highway to north; state-owned undeveloped lands are adjacent to the west and east of the site. As shown in Figure 1-2, the proposed wind farm site would be located within the southern portion of the parcel, with the northern edge of the site defined by Upcountry Pi‘ilani Highway and the southern edge located more than 305 meters (1,000 feet) from the shoreline. The primary construction access route to the wind farm site consists primarily of existing state and county highways as well as approximately 7.4 kilometers (4.6 miles) of pastoral roads between Mākena Alanui Road and Upcountry Pi‘ilani Highway. These pastoral roads are collectively referred to as Pāpaka Road and are located on ‘Ulupalakua Ranch and several other private and publicly owned parcels.

FIGURE 1-1

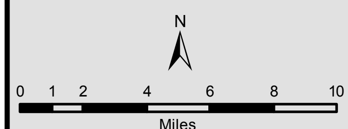
AUWAHI WIND PROJECT
PROJECT VICINITY MAP



- Wind Farm Site
- Airport
- City/Town
- Interconnection Substation
- Generator-Tie Line
- Construction Access Route
- Pāpaka Road
- Road
- Hoapili Trail

DATA SOURCES:

Project Infrastructure:
Sempra Generation Energy
Airport/City/Road:
ESRI Streetmap 2007



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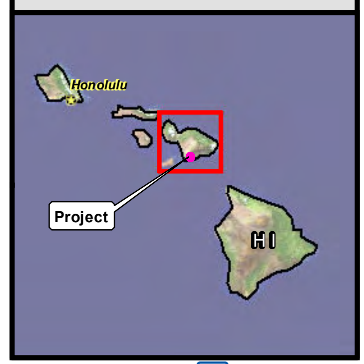

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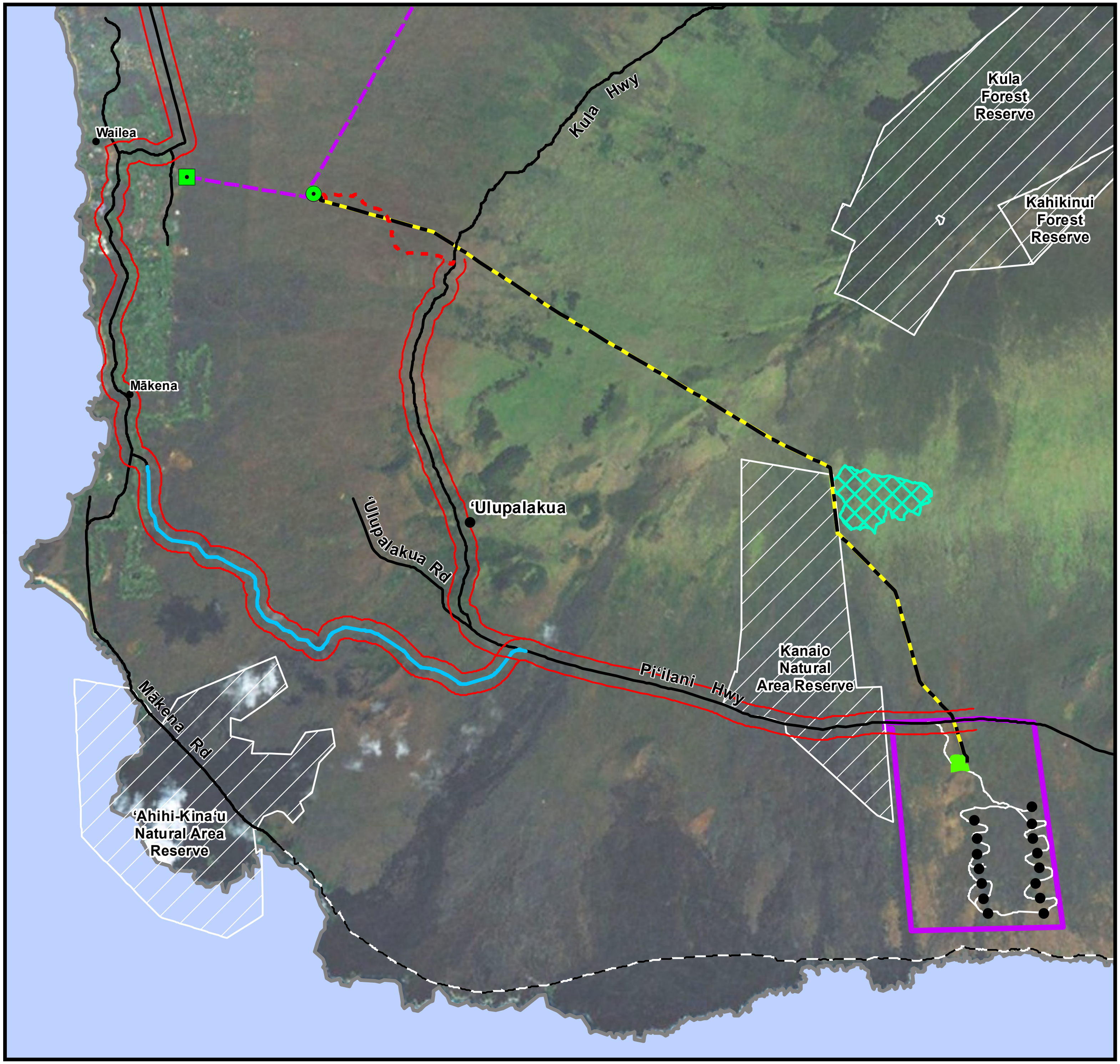
FIGURE 1-2

AUWAHI WIND PROJECT

PROJECT MAP



- Wind Farm Site
- Collector Switchyard/ Laydown Area
- WTG
- Interconnection Substation
- Wailea Substation
- Generator-Tie Line
- City/Town
- Interconnection Substation Access
- Existing MECO Transmission Line
- Construction Access Route
- Pāpaka Road
- Road
- Site Access Road
- Hoapili Trail
- Auwahi Forest Restoration Project
- Natural Area Reserve

DATA SOURCES:

Auwahi Restoration Reserve:
Leeward Haleakala- Watershed Restoration Partnership
Natural Area Reserve:
Sempra Generation Energy
Project Infrastructure:
Sempra Generation Energy
City/Road:
ESRI Streetmap 2007

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NAD 1983 UTM 4 JANUARY 25, 2011

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The electrical power generated by the wind farm would be transmitted to MECO's existing electrical grid through a new 34.5-kV generator-tie line. The generator-tie line would originate within the wind farm site and extend approximately 14.5 kilometers (9 miles) north and west on 'Ulupalakua Ranch property, crossing both Upcountry Pi'ilani Highway and Kula Highway. The generator-tie line would be mounted on approximately 18-meter-high (60-foot-high) poles made of wood, steel, or similar materials, comparable to other transmission lines in the area. The generator-tie line would connect to the existing MECO Wailea-Kealahou 69-kV transmission line at the proposed point of interconnection (POI) located approximately 1.6 kilometers (1 mile) east of MECO's Wailea substation (Figure 1-2). An interconnection substation would be constructed to step up the electricity from 34.5 kV to 69 kV. The BESS building and microwave communication tower would be located at the interconnection substation.

The construction access route would be used to transport equipment from Kahului Harbor to the proposed wind farm site (Figure 1-1). From Kahului Harbor, the route follows Mokulele Highway, goes through Kihei via Pi'ilani Highway, Wailea, and Mākena to Pāpaka Road, then extends along Upcountry Pi'ilani Highway to the wind farm site. Pāpaka Road would require some modifications and improvements. In addition, several segments of new road would have to be constructed to tie into the existing Pāpaka Road to keep the proposed Project on 'Ulupalakua Ranch property. The road would be used during construction and infrequently during operations for major maintenance activities. Both ends of the road would be gated to limit access on private land. Sections of Upcountry Pi'ilani Highway would also require some improvements to remove excessive bumps and possibly increase curve radii. Details of the construction access routes are discussed in Section 3.9 – Transportation and Traffic.

1.1.5 Land Ownership

A total of 28 parcels are crossed by the Project. The wind farm site is located entirely on land owned by 'Ulupalakua Ranch. The generator-tie line is also on 'Ulupalakua Ranch property, although it spans Upcountry Pi'ilani Highway, which is in a county easement, and Kula Highway, which is owned by the state. The Pāpaka Road portion of the construction access route crosses 19 parcels, most of which are owned by 'Ulupalakua Ranch. As shown in Table 1-1, 9 parcels are owned by the state, 3 of which are leased by 'Ulupalakua Ranch and 2 of which are co-owned by the County of Maui; 1 parcel is jointly owned by 'Ulupalakua Ranch and another private party (Piltz); 3 parcels are owned by the County of Maui; and 1 parcel is owned entirely by ATC Makena Holdings, LLC. Land ownerships crossed by the proposed Project are illustrated in Figure 1-3.

Table 1-1.
Parcel Information for the Auwahi Wind Farm Project

Project Component	Tax Map Key (TMK)	Landowner(s)
Wind Farm Site	(2) 1-9-001:006 (por.)	'Ulupalakua Ranch
Generator-tie Line Corridor, Interconnect Substation	(2) 1-9-001:006 (por.)	'Ulupalakua Ranch
	(2) 2-1-009:001 (por.)	'Ulupalakua Ranch
	(2) 2-1-009:999 (por.)	State of Hawai'i/County of Maui
	(2) 2-1-008:001 (por.)	'Ulupalakua Ranch
Pāpaka Road/Construction Access Route	(2) 2-1-002:001 (por.)	State of Hawai'i
	(2) 2-1-002:002 (por.)	State of Hawai'i
	(2) 2-1-003-050 (por.)	State of Hawai'i
	(2) 2-1-003-054 (por.)	State of Hawai'i

Table 1-1.
Parcel Information for the Auwahi Wind Farm Project

Project Component	Tax Map Key (TMK)	Landowner(s)
Pāpaka Road/Construction Access Route (continued)	(2) 2-1-003-999 (por.)	County of Maui
	(2) 2-1-004:006 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:016 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:017 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:018 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:049 (por.)	State of Hawaiʻi; leased by ʻUlupalakua Ranch
	(2) 2-1-004:071 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:106 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:999 (por.)	County of Maui
	(2) 2-1-005:023 (por.)	ʻUlupalakua Ranch Private Party (Piltz)
	(2) 2-1-005:030 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:045 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:055 (por.)	State of Hawaiʻi; leased by ʻUlupalakua Ranch
	(2) 2-1-005:057 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:077 (por.)	State of Hawaiʻi; leased by ʻUlupalakua Ranch
	(2) 2-1-005:095 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:100 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:108 (por.)	ATC Makena Holdings, LLC
	(2) 2-1-008:131 (por.)	County of Maui
	(2) 2-1-008:999 (por.)	State of Hawaiʻi/County of Maui

(por.) = only a portion of the TMK is crossed by the proposed Project.

1.2 PURPOSE AND NEED

1.2.1 Project Need

Of the 50 states, Hawaiʻi is the most dependent on imported energy. Hawaiʻi is one of the world's most remote island chains and has no fossil fuel resources of its own. In 2005, approximately 95 percent of Hawaiʻi's primary energy was derived from imported fossil fuels such as petroleum and coal (Global Energy Concepts 2006). Consequently, Hawaiʻi'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, Hawaiʻi established RPS (HRS § 269-92) that require HECO and its affiliates, Hawaiʻi Electric Light Company and MECO, 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. The Global Warming Solutions Act of 2007 requires that Hawaiʻi's greenhouse gas (GHG) emissions be reduced to levels at or less than 1990 levels by January 2020. On January 28, 2008, Hawaiʻi also signed a Memorandum of Understanding with the DOE that established the Hawaiʻi Clean Energy Initiative, under which at least 70 percent of Hawaiʻi's energy needs would be supplied by renewable resources by the year 2030.

FIGURE 1-3

AUWAHI WIND PROJECT

LAND OWNERSHIP

'Ulupalakua Ranch

1) 219001006
4) 221004006
5) 221004016
6) 221004017
7) 221004018
9) 221004071
10) 221004106
13) 221005030
14) 221005045
16) 221005057
18) 221005095
19) 221005100
21) 221008001
24) 221009001

Govt. State

2) 221002001
8) 221004049 *
15) 221005055 *
17) 221005077 *
23) 221008999 ***
25) 221009999 ***
26) 221003054
27) 221002002
28) 221003050

Private

12) 221005023 **

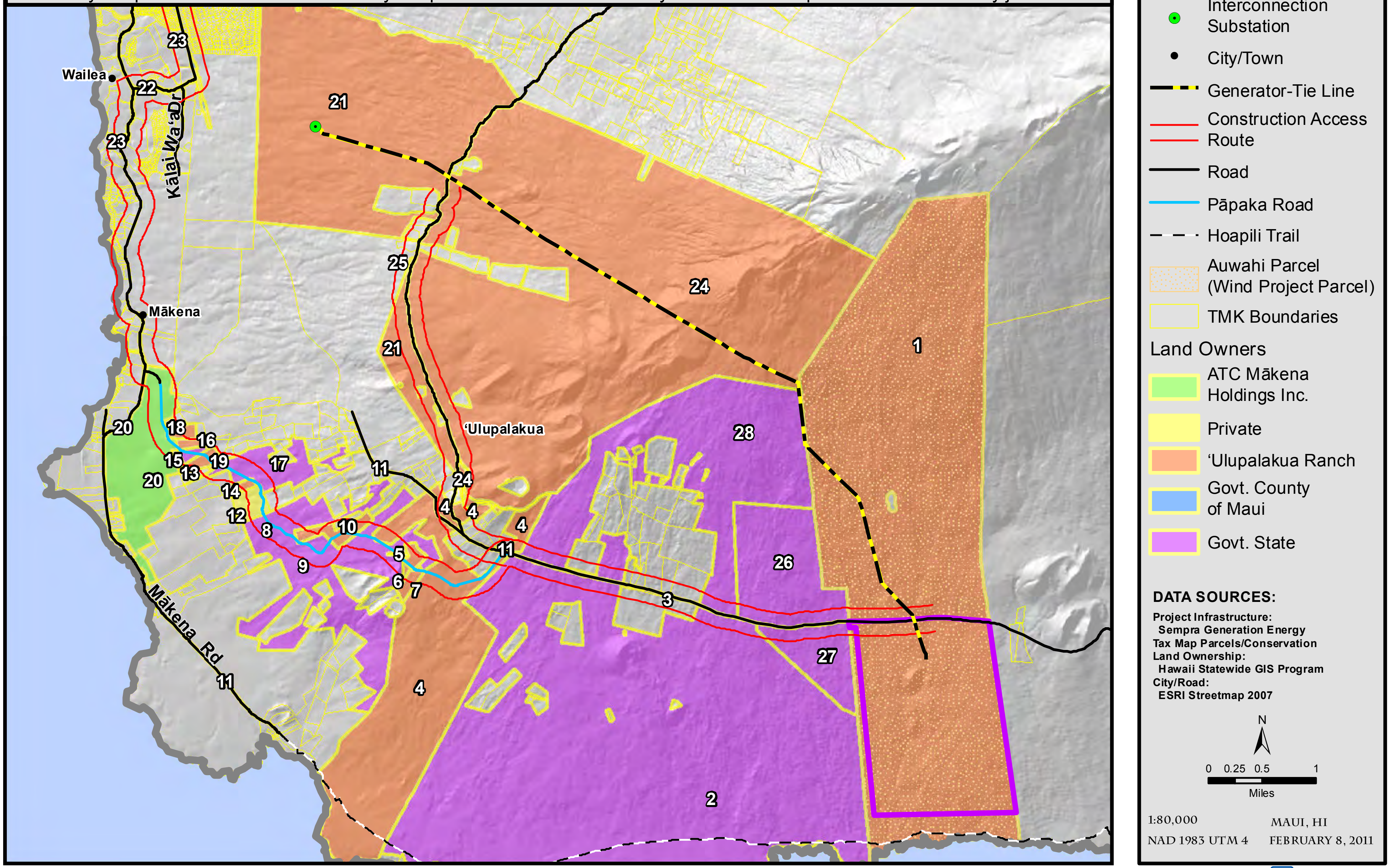
Govt. County of Maui

22) 221008131
3) 221003999
11) 221004999

ATC Mākena Holdings LLC.

20) 221005108

*leased by 'Ulupalakua Ranch **co-owned by 'Ulupalakua Ranch ***owned by the State and a portion is under County jurisdiction



DATA SOURCES:
Project Infrastructure: Sempra Generation Energy
Tax Map Parcels/Conservation Land Ownership: Hawaii Statewide GIS Program
City/Road: ESRI Streetmap 2007

1:80,000
NAD 1983 UTM 4

MAUI, HI
FEBRUARY 8, 2011

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P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXDs\EIS\Sempra_Auwahi_EIS_Fig1-3_Ownership_85111i_020711 - Last Accessed: 2/8/2011 - Map Scale correct at: ANSI A (11" x 8.5")

These regulations and initiatives reflect Hawai'i's commitment to move away from petroleum-based energy generation and to 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.

As of December 2009, 23.7 percent of MECO's sales were from renewable energy sources (HECO 2010). As proposed, the Project could provide 78,500 megawatt-hours per year (MWh/year) of electricity to MECO's grid, enough to provide electricity to approximately 6,600 households.

1.2.2 Project Purpose

The purpose of the proposed Project is to provide clean, renewable wind energy for the island of Maui. For MECO to meet its RPS requirements within a reasonable time, MECO has required, as a key term in the PPA, that the Auwahi Wind Project begin operation by December 2012. Implementation of the proposed Project would contribute to the state's portfolio of renewable energy projects and provide environmental and economic benefits to the state and the local community. The proposed Project would demonstrate that renewable energy uses can coexist with agricultural and ranching uses in rural Maui. Once the proposed Project has been developed, 'Ulupalakua Ranch would continue to use the parcel for cattle pasture as it has done for decades.

Wind energy is an abundant, infinitely renewable resource. Generation and integration of wind energy into the electric grid decreases fossil fuel consumption, thereby reducing GHG emissions, particulate-related health effects, and other forms of pollution associated with coal or diesel fuel generation. The proposed Project would generate approximately 21 MW of energy, enough to power as many as 6,600 households, based on the average statistics reported by the American Wind Energy Association (AWEA 2010). 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 provide economic benefits by contributing to the local economy, generating new jobs, and providing a stable, long-term source of tax revenue for the state and county. The power generated by the wind farm would be sold to MECO under a long-term, fixed-price contract with fixed annual escalation providing long-term price stability for consumers.

1.3 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 infrastructure (existing electrical grid) constraints on Maui, the Applicant established the following objectives for the proposed Project, pursuant to HAR § 11-200-17(e)(2):

- Construct and operate a wind farm on Maui in an area with adequate wind resources to provide dependable, efficient, and economically feasible renewable energy;
- Increase Hawai'i's energy independence through the development of an additional source of renewable energy;
- Provide a renewable energy source to assist the people of Hawai'i in meeting or exceeding their RPS, established in HRS § 269-92;

- 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 determined by MECO;
- Locate the project in an area where the wind farm would be compatible with existing land use and would have a minimal visual and sound impacts; and
- Minimize the biological and cultural impacts of the project by designing the infrastructure around known resources.

These objectives were used to develop the suite of alternatives considered, evaluate and eliminate those alternatives that were not practicable, and identify and refine the proposed Project, as discussed in Chapter 2.

1.4 SCOPE AND ORGANIZATION OF THE DOCUMENT

Alternatives considered and eliminated through screening criteria are discussed in Chapter 2. This Draft EIS identifies, evaluates, and documents the environmental impacts of the proposed Project and the No Action Alternative. The proposed Project is described in Section 2.1.

Existing conditions of each environmental resource area are described in Chapter 3. Along with information presented for the No Action Alternative, these conditions constitute the baseline for analyzing potential effects of the proposed Project. The environmental impacts from implementing the proposed Project are also described in Chapter 3. The analyses address direct impacts (those directly caused by a specific action and occurring at the same time and place) and indirect impacts (those caused by an action but occurring later or that are physically disconnected but within a reasonably foreseeable time or geographic area). Seventeen resource areas are evaluated in Chapter 3 as follows:

3.1 – Climate
3.2 – Geology and Topography
3.3 – Soils
3.4 – Natural Hazards
3.5 – Hydrology and Water Resources
3.6 – Vegetation
3.7 – Wildlife
3.8 – Archaeological and Cultural Resources
3.9 – Transportation and Traffic
3.10 –Hazardous and Regulated Materials and Wastes
3.11 – Noise
3.12 – Air Quality
3.13 – Visual Resources
3.14 – Surrounding Land Use and Agriculture
3.15 – Public Safety

3.16 – Socioeconomic Characteristics

3.17 – Public Infrastructure and Services

Cumulative impacts of the proposed Project are described in Chapter 4. This Draft EIS evaluates the cumulative impacts when considered in the context of other past, present, and reasonably foreseeable future actions. Actions and measures that could mitigate impacts are identified where appropriate.

Chapter 5 describes the regulatory context and consistency with plans and policies, and discusses the regulatory framework in which the proposed Project is set.

Chapter 6 describes other HRS 343 requirements, such as the relationship between local short-term uses and long-term productivity; irreversible and irretrievable commitment of resources; environmental effects that cannot be avoided; and unresolved issues.

Chapter 7 lists consulted parties contains consulted throughout the planning stages of the Project.

Chapter 8 contains a list of preparers and Chapter 9 provides references for documents cited in the Draft EIS.

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2.0 PROPOSED PROJECT AND ALTERNATIVES

2.0 PROPOSED PROJECT AND ALTERNATIVES

2.1 PROPOSED PROJECT

The proposed Project is the development of an approximately 21-MW wind farm on the Auwahi parcel of ‘Ulupalakua Ranch. This chapter provides a detailed description of the proposed Project including construction and O&M activities and a general project schedule and anticipated costs. This chapter also describes the No Action Alternative and alternatives that were eliminated from further consideration. The proposed Project is composed of three major components: the wind farm site, a generator-tie line corridor, and a construction access route.

2.1.1 Wind Farm Site

The wind farm site would have the following facilities: access roads and WTG pads, construction staging and equipment laydown area, WTGs, underground and overhead electrical collection systems, a collector switchyard, an O&M building, and one permanent met tower (Figure 2-1). Civil and electrical infrastructure is necessary to support these facilities.

Civil and electrical infrastructure would be constructed as part of the wind farm site and would include some underground components such as WTG foundations, collector switchyard foundations, and electrical collector cables. Several methods may be used to excavate openings to install these infrastructure components including standard excavators, bulldozers, and hydraulic hammers. Where in situ rock engineering properties do not allow for efficient ripping and/or other bulk removal methods, blasting may be required. The blasting would be conducted by drilling pilot holes at or slightly below the required excavation depths and charging the holes with explosives. After the charges are set, the blast area would be covered with mats to control airborne material and the charge would be ignited. Following the blasting, the material would be excavated with the standard excavator to the required depth. These blasting activities would be conducted pursuant to the required permits.

General fill would be needed for grading of the wind farm infrastructure such as WTG pads, access roads, and laydown areas. Available sources of this fill include (1) material excavated as part of grading onsite, and (2) imported fill from a local borrow source located offsite, if needed. The goal for grading is to balance the onsite cut/fill quantities to the extent economically practical and avoid exporting excavated material. To maximize the use of excavated material, a mobile crusher would be used for crushing cut material for fill in most areas of the Project site. Two general types of rocky material exist in most cut locations:

- Hard basaltic rock (aka blue rock), and
- Vesicular basaltic rock (basalt with air many air pockets and “a’a” materials across the site surface, as well as light pumice material around the cinder cone).

Either of these materials can be used for structural/general fill.

2.1.1.1 Wind Turbine Generators

General Information for Wind Turbine Generators

The WTGs consist of four basic parts: a foundation, a tower, rotor, and nacelle. The tower elevates the rotor and nacelle above the ground. In general, wind speeds typically increase with height, so taller towers and larger rotors can allow more energy to be captured. The rotor includes the hub and

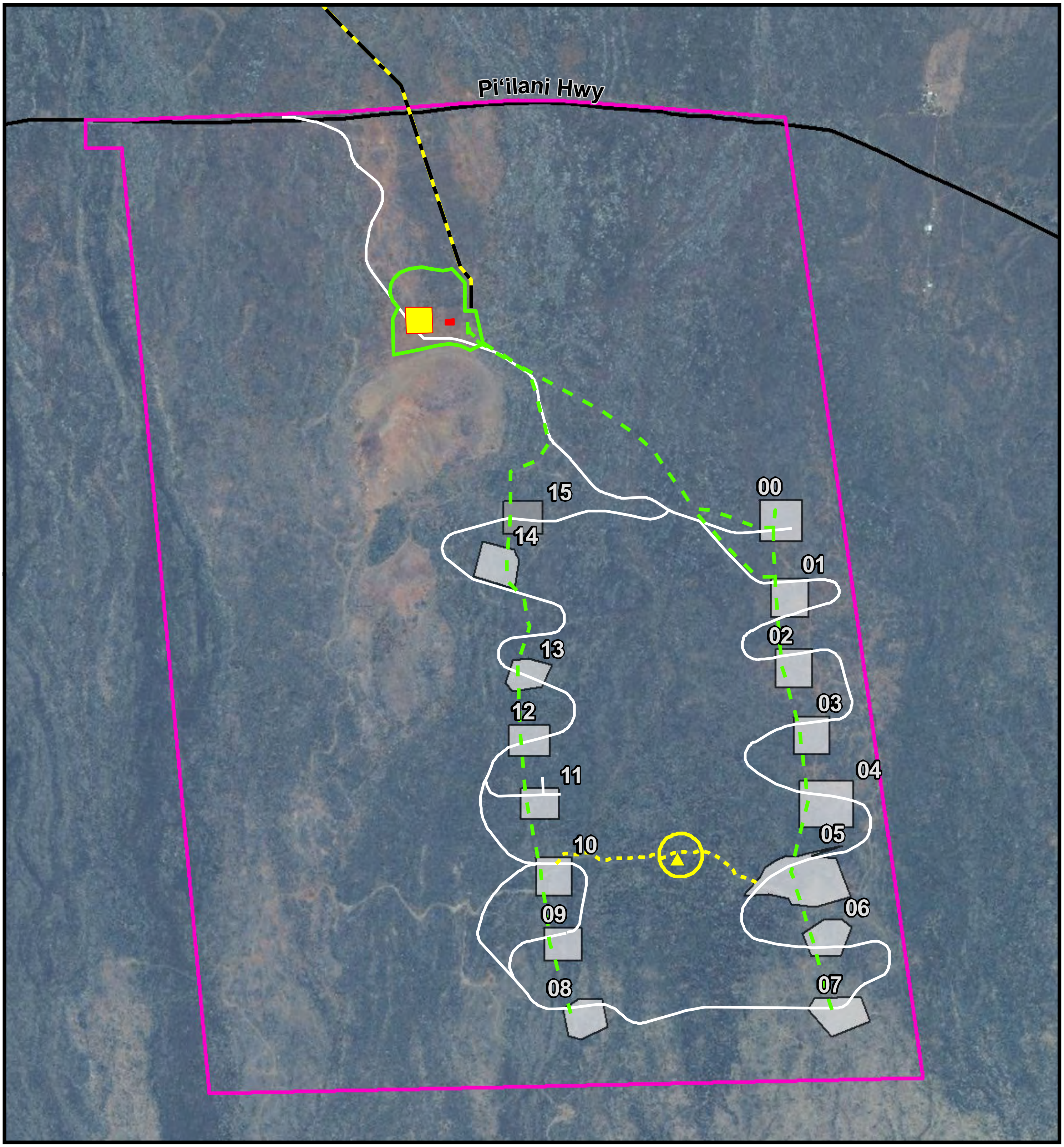

FIGURE 2-1

AUWAHI WIND PROJECT

WIND FARM SITE

N

0 250 500 1,000
Feet

1:16,000
NAD 1983 UTM 4

MAUI, HI
FEBRUARY 11, 2011

Wind Farm Site
Operations and Maintenance
Storage and Parking
Collector Switchyard/ Laydown Area
WTG Pad
Alternate WTG Pad
MET Tower
MET Tower Access Road
Generator-Tie Line
Site Access Road
Electrical Collection
Road

DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Road:
ESRI Streetmap 2007

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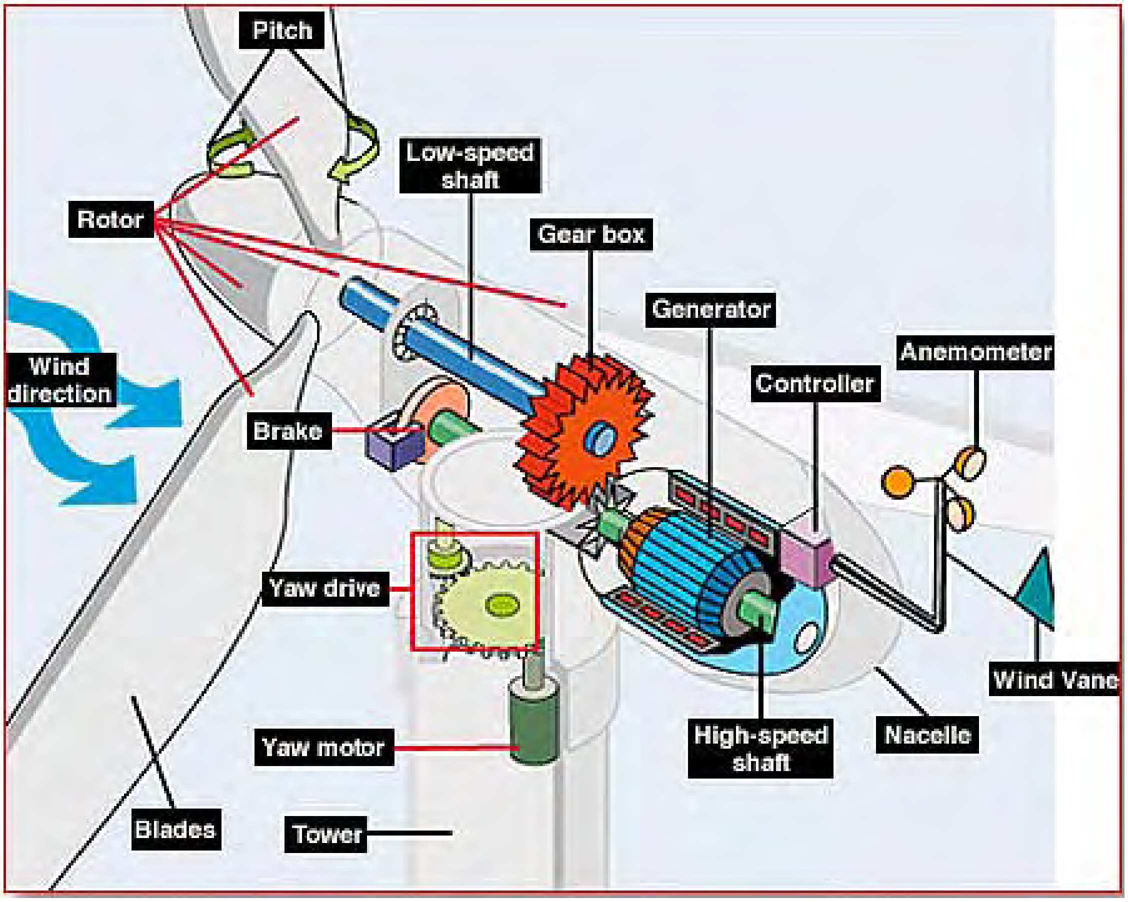
blades and is typically attached by a low-speed shaft to the nacelle, which houses mechanical and electrical components including the gear box, generator, and controller (Figure 2-2). One of the WTG models under consideration is a "gearless" unit in which the rotor connects directly to the generator, thereby eliminating one shaft and the gear box.

Figure 2-2. Cut-Away View of a Wind Turbine Generator



Source: DOE (2006)

When the wind passes across the blades, the rotor turns the low-speed shaft. The gear box connects the low-speed shaft to a high-speed shaft that increases the rotational speed of the rotor from 6 to 20 rotations per minute (rpm) (depending on the WTG model, blade length, and wind conditions) to about 1,000 to 1,800 rpm, which is the rotational speed required by the generators to produce electricity. Each WTG is equipped with a controller that determines when the turbine can be operational, generally activating the system when wind speeds reach approximately 13 kilometers per hour [kph] (8 miles per hour [mph]) and shutting down when winds exceed 90 kph (55 mph). High wind speeds can damage the equipment.

Specific Information for Wind Turbine Generators

As currently designed, the wind farm site would include up to 16 WTG pad locations along an access road. All 16 potential WTG pad locations were included in the site surveys. Only 15 of the 16 WTG pads would be built. The 16th WTG pad allows for flexibility if one of the WTG pad locations becomes unfeasible for constructability reasons. The Applicant is currently evaluating three different turbine models for constructability, reliability, performance, and availability: the 1.5-MW General Electric (GE), the 2.3-MW Siemens, or the 3.0-MW Siemens. Because of the dynamic nature of the turbine market (e.g., ongoing changes in supply, demand, and pricing), the final turbine model would likely not be selected until the permitting process is well underway. Depending on the turbine model, the proposed Project would require between 8 and 15 WTGs. The proposed Project would require either fifteen 1.5-MW GE WTGs, ten 2.3-MW Siemens WTGs, or eight 3.0-MW Siemens WTGs. Depending on the WTG model selected, fewer WTG pads may be required.

The layout and configuration of the site would vary depending on the WTG selected. The dimensions of each turbine are unique, with tower heights of 80 meters (262 feet) and blade lengths ranging between 41.3 to 50.5 meters (135.3 and 166 feet) (Table 2-1). Total height from ground level to the tip of the blade would range from 121.3 meters (398 feet) to 130.5 meters (428 feet). The dimensions of the two Siemens WTGs are the same, although the 3.0-MW Siemens WTG is a gearless direct-drive machine that is more efficient than the 2.3-MW Siemens WTG, which has a gear-box. A typical WTG pad would require a cleared area of approximately 0.6 hectare (1.5 acres).

Table 2-1.
Range of Dimensions of the Wind Turbine Generators under Consideration

Turbine Manufacturer	**GE**	**Siemens**	**Siemens**
Wind turbine generator (WTG) model	GE 1.5 xleWE	SWT 2.3-101	SWT 3.0-101
WTG MW	1.5	2.3	3.0
Height to top of blade (m)	121.3	130.5	130.5
Lowest rotor swept height (hub height – rotor radius) (m)	38.75	29.5	29.5
Rotor height (Zone of Risk) (m)	45–121	30–131	30–131
Rotor RPM	9–20	6–16	6–16
Cut in wind speed (m/s)	3.5	4	4
Cut out wind speed (m/s)	25	25	25
Rotor Radius (blade length) (m)	41.3	50.5	50.5
Blade Width at Hub (m)	1.9	2.4	2.4
Blade Width at Widest Point (Chord Root) (m)	3.2	3.5	3.5
Radius at Widest Point on Rotor (m)	8	16	16
Blade Width at Tip (Chord Tip) (m)	1	1	1
Number of Rotor Blades	3	3	3
Monopole Diameter at Ground Level (m)	4.3	4.2	4.2
Monopole Diameter at Widest Point (m)	4.3	4.2	4.2
Elevation at Widest Point on Monopole (m)	0	0	0
Monopole Diameter at Hub (m)	2.6	2.4	2.4
Elevation at Hub (m)	80	80	80
Nacelle Height (m)	4	3.8	3.8
Nacelle Width (m)	3.6	3.5	3.5
Auwahi Wind Total Number of Turbines	15	10	8
Auwahi Wind Total Gross MW Capacity	22.5	23.0	24.0
Auwahi Wind Total Net MW Capacity	21.0	21.0	21.0

Notes:
m = meter (1 meter is equal to 3.28 feet)
m/s = meters per second
MW = megawatt
RPM = revolutions per minute

Within the cleared area, approximately 0.4 hectare (1 acre) would be graded flat to offload, assemble, and erect WTG components. The graded slope within the leveled area would be no greater than 1 percent. Within the leveled area, approximately 0.16 hectare (0.4 acre) would be graveled and compacted to support delivery vehicles and erection equipment. As shown in Figure 2-2, the WTG pads may vary in shape and in size.

To allow for flexibility in the turbine selection process while still adequately assessing the Project-related impacts, the Draft EIS considers the number and dimensions of the specific turbine models. Table 2-1 summarizes the dimensions for the three WTG models currently being considered. The impact analyses are based on the turbine model (GE 1.5 MW) that would require the greatest amount of ground disturbance and therefore represent the maximum potential Project impacts. Therefore, the actual impacts of the Project would fall within the envelope of impacts presented in this Draft EIS.

Construction Activities

At the WTG locations, an average area of approximately 0.6 hectare (1.5 acres) would be required for a crane pad and for off-loading, storage, and assembly 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 utilizing a combination of forklifts, medium-size cranes (90 to 130 tons) and a main erection crane (as large as 600 tons), located on a compacted gravel crane pad. Medium-size cranes (130 tons) will also be utilized for off-loading and erection or setting of the various tower and WTG generation components. Construction equipment requiring access to these areas would include both wheeled and tracked vehicles.

Based on the surface exposure of rock found at the proposed Project site during the preliminary geotechnical investigations (Black & Veatch 2008), the most likely foundation type for the WTGs would be a spread-type footing approximately 18.3 meters (60 feet) wide by 2.4 meters (8 feet) deep with rock dowels. Prior to construction, detailed geotechnical studies would be done to ensure that no voids, lava tubes, or unsuitable soils were beneath each of the proposed turbine locations. Each WTG foundation would consist of approximately 306 cubic meters (400 cubic yards) of concrete (which may vary depending on the WTG model selected), reinforcing bars, and anchor bolts. Concrete is usually poured continuously and would require approximately 50 or more concrete trucks per foundation.

Each WTG would require multiple deliveries (at least 10 separate loads) of equipment and materials to its pad. Towers are generally delivered in three or four sections, but each blade would be delivered separately, as would the nacelles and rotors and down-tower components (e.g., switchgear, controllers, ladders and platforms, pad-mount transformers, and pad-mount transformer vaults).

Operations and Maintenance Activities

During the O&M phase of the Project, preventative maintenance and troubleshooting activities would be routinely performed on each WTG. This would typically include 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 service vehicle access. However, if a major component needed to be replaced (e.g., blades, gearboxes, or generators), heavy equipment similar to that used during construction, would be required. If a major component replacement were necessary, the access road, crane pad, and staging area would be used in a similar manner as for the original assembly area, with similar disturbance and mitigation.

2.1.1.2 Access Roads

Construction Activities

A series of internal access roads would be constructed within the wind farm site to accommodate construction and O&M activities. The internal access roads would be approximately 6 meters (20 feet) wide with 3-meter-wide (9-foot-wide) shoulders on each side (12 meters [38 feet] total width) and approximately 11 kilometers (7 miles) long. Shoulders may be expanded to 5 meters (16 feet) wide in certain areas to allow for adequate passage for the crawler crane and transport trucks, and would include turn-around areas at certain WTG pad locations. All access roads would have a gravel surface, stormwater erosion and control features, and would be maintained throughout construction and operations of the proposed Project.

The proposed WTG access road layout includes several switchbacks to reduce the overall gradient of the existing slopes. It is also designed to have less than a 2 percent crown or cross-slope. Ditches and culverts would be installed to collect and convey stormwater runoff, as required. Depending on which WTG model is selected and the grading analysis to be conducted during the final design, the site roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (Figure 2-3). If this alignment is chosen, the length of the WTG access roads would be 8.1 kilometers (5.1 miles). The width of the access roads would be the same for either the existing proposed WTG access roads or straightened road alignment. For either alignment, a "prime mover" would transport some or all of the WTG components. A prime mover is a heavy truck capable of pushing or pulling large loads on steep grades (Figure 2-4).

In some locations, the wind farm site access roads may cross over lava tubes. Where archaeological resources are known to be present in the lava tubes, bridges will be constructed over the lava tubes to avoid potential impacts. In locations where no archaeological resources are present, the lava tubes may be filled with structural materials (e.g., rock, gravel, or concrete).

Operations and Maintenance Activities

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

2.1.1.3 Electrical Collection System

Construction Activities

Power generated by each of the WTGs would be collected by a series of underground power cables (collection circuits). The underground circuits would be converted to above ground, pole-mounted circuits at the northernmost WTG locations (pads 15 and 00) and would then be carried to the collector switchyard. Low-voltage (690-volt [V]) cables would pass from the generator in each

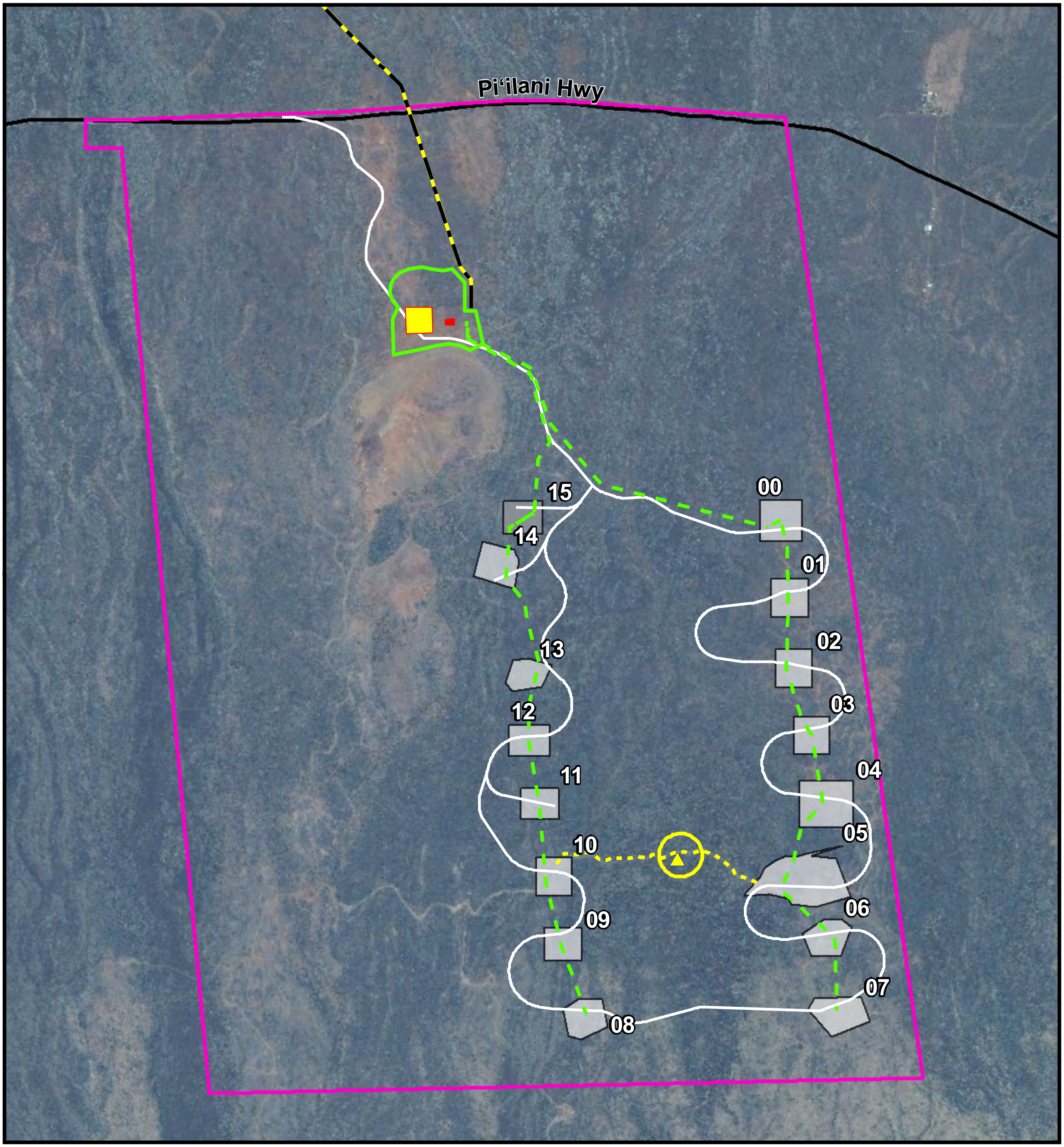


FIGURE 2-3

AUWAHI WIND PROJECT

WIND FARM SITE
STRAIGHTENED ROAD
ALIGNMENT

N

0 250 500 1,000
Feet

1:16,000
NAD 1983 UTM 4

MAUI, HI
JANUARY 17, 2011

- Wind Farm Site
- Operations and Maintenance
- Storage and Parking
- Collector Switchyard/ Laydown Area
- WTG Pad
- Pad 15
- MET Tower
- MET Tower Access Road
- Generator-Tie Line
- Road
- Straightened Road Alignment
- Straightened Road Electrical Collection

DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Road:
ESRI Streetmap 2007

TETRA TECH EC,INC

FIGURE 2-4

AUWAHI WIND PROJECT

EXAMPLE OF A
PRIME MOVER

DATA SOURCES:
Prime Mover Pictured:
Sempra Generation Energy

JANUARY 10, 2011

nacelle through the foundation to a pad-mounted transformer located adjacent to each WTG foundation. The transformer would step up the low-voltage power from 690 V to medium voltage power at 34.5 kV. The medium voltage power cables would "daisy-chain" between each pad-mount transformer. The cables would be directly buried in trenches and would terminate at riser structures located adjacent to the northernmost WTG pad locations and transition to an overhead line to the collector switchyard. The electrical collection system would consist of up to two separate 34.5-kV feeder circuits, depending on the WTG model selected. The trenches for the underground cables would be excavated by rubber tire or tracked equipment to the required burial depth, typically 91 centimeters (36 inches). Each trench would contain three power cables (one for each phase), plus a ground wire and a fiber optic communication cable for the SCADA system (to transmit data from the WTG controllers to the collector switchyard). The cable trench would 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 and applicable electrical codes. It is estimated that approximately 7.28 hectares (18 acres) of ground disturbance would be necessary to construct the underground electrical collection system. The typical burial depth of the underground collection system is approximately 91 centimeters (36 inches). Following construction, the collection system trenches would be marked to avoid inadvertent excavation and the surface would be restored and replanted with natural vegetation.

Operations and Maintenance Activities

Using small trucks, qualified personnel would routinely monitor, inspect, and maintain the communication and electrical collector cables throughout the O&M phase of the Project. Heavy construction or excavation equipment would only be required if any underground cables were determined to have failed.

2.1.1.4 Collector Switchyard

Construction Activities

The energy generated by the WTGs would be delivered to the collector switchyard through a series of underground and overhead electrical collection circuits as described above. The collector switchyard would be located within the area designated as the construction staging and laydown area. It would be the central collection point for the one or two underground feeder circuits connecting the WTGs to the 34.5-kV generator-tie line. The designated area for the collector switchyard is 27 meters by 27 meters (90 feet by 90 feet). The area would be cleared and graded to control stormwater runoff and drainage. The collector switchyard base would be compacted with well graded material. Foundations would be installed for the breakers, 34.5-kV buswork supports, and control building. Below-grade conduit would be installed for power and communication cables and ground grid would be installed in the sub-grade. Following installation of all equipment, a final layer of crushed rock surfacing would be placed and a perimeter fence would be erected and grounded. Collector switchyard testing and commissioning would be done before energizing the facility.

As currently anticipated, the collector switchyard would include the following major components: three 34.5-kV SF6 circuit breakers, open-rack steel structure design, rigid aluminum buswork, 34.5-kV metering, and protective relaying. Depending on the WTG model selected, the number of feeder circuits could be reduced to one and the collector switchyard arrangement significantly reduced. The protective relaying and control and communications equipment would be housed in a weatherproof climate-controlled building with approximate dimensions of 4 meters by 9 meters (12 feet by 30 feet). The wind farm collection circuits would enter the southern side of the collector switchyard on overhead poles and drop to a dead-end pole or structure located on the same rack as the 34.5-kV breakers. The aboveground generator-tie line would exit the collector switchyard from a wood or steel dead-end structure also connected to the 34.5-kV bus on the north side of the collector switchyard. The communication cables from the WTGs would enter the collector switchyard alongside the power cables from the south and connect to the main SCADA system in the control building enclosure. The communication cables would exit the collector switchyard on an overhead optical ground wire (OPGW) installed on the overhead 34.5-kV generator-tie line that would run toward the interconnection substation.

Operations and Maintenance Activities

Qualified personnel would manage the collector switchyard during the O&M period. 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 switchyard would not typically require heavy construction equipment. However, if a major component failure occurred (e.g., failure of a 34.5-kV breaker), appropriate construction equipment would be required to replace the component.

2.1.1.5 Operations and Maintenance Building

Construction Activities

The proposed wind farm would include an O&M building located within the proposed laydown area, adjacent to the collector switchyard. The building footprint and concrete slab would be approximately 15 meters by 24 meters (50 feet by 80 feet), an area of 0.04 hectare (0.1 acre). With parking and outdoor storage, a typical area of permanent disturbance would be approximately 0.6 hectare (1.5 acres). Associated temporary impacts such as utilities installation would disturb less than 0.4 hectare (1 acre). 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 (Figure 2-5).

In addition to the interior facilities, there would be parking and permanent outdoor storage for major components such as replacement WTG blades adjacent to the O&M building. The approximately 0.61-hectare (1.5-acre) parking and outdoor storage area would be constructed with compacted gravel.

Utilities for the O&M building would include a septic system, an onsite well or water storage tank, electricity, and communication services. A septic system would be designed based on the results of the percolation test to be completed during future geotechnical studies. This septic system and all utilities would be designed in compliance with all applicable state and county regulations and requirements. The area of temporary impacts associated with these utilities would likely be less than 0.4 hectare (1 acre). The O&M area, including the parking and permanent storage area, would likely be enclosed by a 2-meter (7-foot)-high chain-link fence topped by three strands of barbed wire, with posts set in concrete.

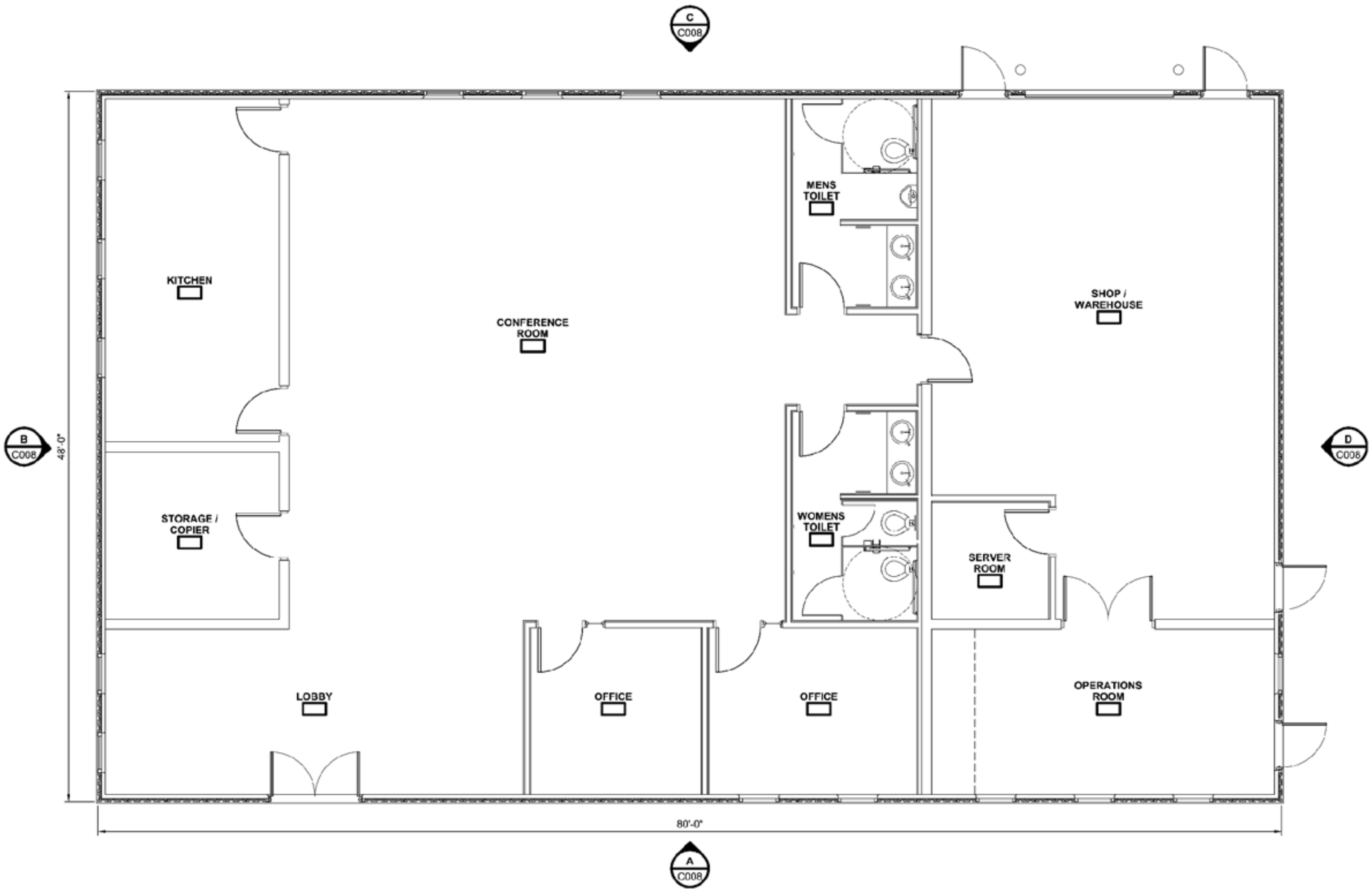
Operations and Maintenance Activities

Activities associated with the O&M building would include basic maintenance and upkeep of the facility. Permanent infrastructure would include water and wastewater systems, potentially an onsite well, and a septic system.

FIGURE 2-5

AUWAHI WIND PROJECT

OPERATIONS AND MAINTENANCE BUILDING TYPICAL FLOOR PLAN



DATA SOURCES:

Operations and Maintenance Pictured: Sempra Generation Energy

JANUARY 10, 2011

TETRA TECH EC,INC

2.1.1.6 Meteorological Monitoring Tower

Construction Activities

One permanent met tower would be installed within the wind farm to measure and record weather data to track the performance of the WTGs. Meteorological data include wind speed and direction, barometric pressure, humidity, and ambient temperature.

This equipment would be used by the wind farm operator to monitor and actively assess Project performance. Either a lattice tower or a monopole tower would be installed. The key dimensions and parameters are:

- Height: 80 meters (262 feet)
- Guy radius: 63 meters (208 feet)
- Tower rating: 129 kph (80 mph) wind speed

A typical met tower is shown in Figure 2-6. For determining impacts, a conservative approach for the permanent guyed met tower (fitted with bird diverters and white 2.5-centimeter [1-inch] poly tape) would be to assume a circular area with a 63-meter (208-foot) horizontal radius (guy radius). This would be a maximum total impact area of approximately 1.3 hectares (3.2 acres). Construction of the met tower would require site preparation (e.g., clearing and grubbing), grading, and installation of an anchor foundation, underground electrical and communication lines, and onsite assembly of the tower.

Operations and Maintenance Activities

Met towers require routine monitoring and maintenance during their operations but do not typically require heavy equipment for servicing.

2.1.1.7 Construction Staging and Equipment Laydown Area

Construction Activities

A construction staging and equipment laydown area would be built and used during construction for temporary storage of plant equipment, construction materials and equipment, vehicle parking and refueling, water storage, waste disposal and collection receptacles, sanitary facilities, and temporary modular office space. Refueling of construction vehicles would take place onsite using a vendor-supplied fuel truck or skid-mounted tanks on pick-up trucks. Fuel stored onsite would be provided with secondary containment. Ultimately, the permanent O&M building would be constructed in the construction staging and equipment laydown area.

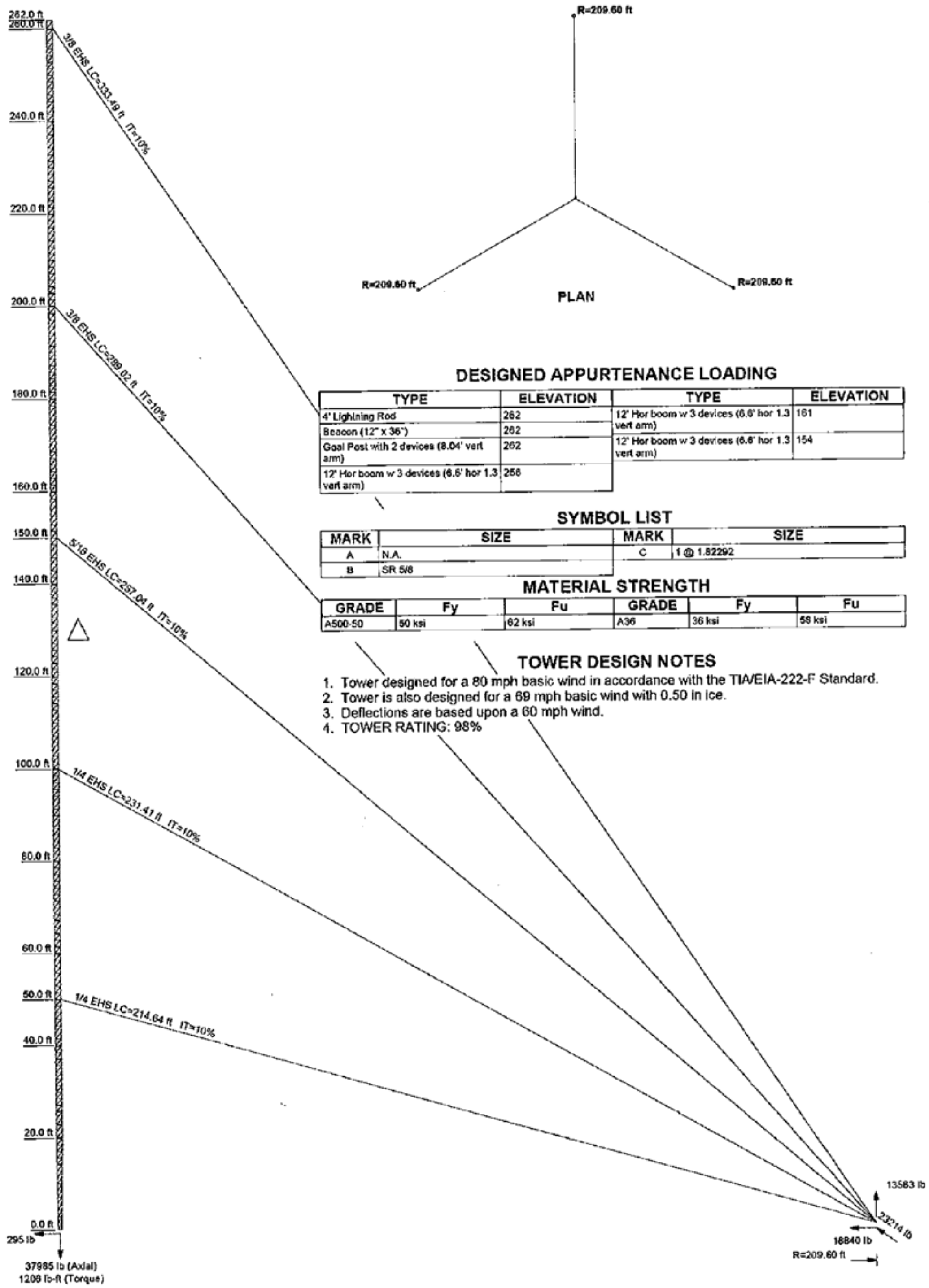
The construction staging and equipment laydown area would consist of an approximately 4.05-hectare (10-acre) compacted gravel pad constructed adjacent to the proposed collector switchyard. The permanent disturbance area would be approximately 0.73 hectare (1.8 acres). Construction activities consist of clearing and grubbing, topsoil stripping, grading to control stormwater runoff and drainage, compaction, utility trenching, and placement of aggregate surfacing.

The proposed Project would require approximately 5,000 cubic meters (175,000 cubic feet) of concrete for construction of foundations for the WTGs, met tower, collector switchyard, the O&M building, interconnection substation, and other equipment pads. Concrete typically needs to be poured within 90 minutes of being mixed with water. Currently, it is anticipated that existing batch plants on Maui would be able to supply all of the proposed Project's concrete requirements.

FIGURE 2-6

AUWAHI WIND PROJECT

TYPICAL MET TOWER PROFILE



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
4' Lightning Rod	262	12' Hor boom w 3 devices (6.6' hor 1.3 vert arm)	161
Beacon (12" x 36")	262	12' Hor boom w 3 devices (6.6' hor 1.3 vert arm)	154
Goal Post with 2 devices (8.04' vert arm)	262		
12' Hor boom w 3 devices (6.6' hor 1.3 vert arm)	256		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	N.A.	C	1 @ 1.82292
B	SR 5/8		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 60 mph wind.
4. TOWER RATING: 98%

DATA SOURCES:

Meteorological Tower Pictured:
Sempra Generation Energy

JANUARY 4, 2011

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Operations and Maintenance Activities

Following construction, gravel would be removed from the temporary construction staging and laydown area and the area would be restored with natural vegetation. A permanent 0.4-hectare (1-acre) storage area would be maintained during O&M to store spare WTG components such as blades. The permanent O&M building providing offices for the plant O&M staff and vehicle parking for plant operations would be in this area. The graveled areas for parking and storing spare parts would be maintained by the operations staff to minimize erosion and control stormwater runoff and drainage.

2.1.2 Generator-tie Line Corridor

The generator-tie line corridor would connect the proposed collector switchyard to MECO's existing grid system at the POI. The collector switchyard would be located on the wind farm site and the proposed POI would be located on the existing Wailea-Kealahou 69-kV generator-tie line, approximately 1.6 kilometers (1 mile) east of the Wailea substation (see Figure 1-2). The generator-tie line corridor would include the 34.5-kV generator-tie line, the 69-kV interconnection substation, and the microwave communication tower. Following is a description of each facility and the associated proposed construction and O&M activities.

2.1.2.1 34.5-kV Generator-tie Line

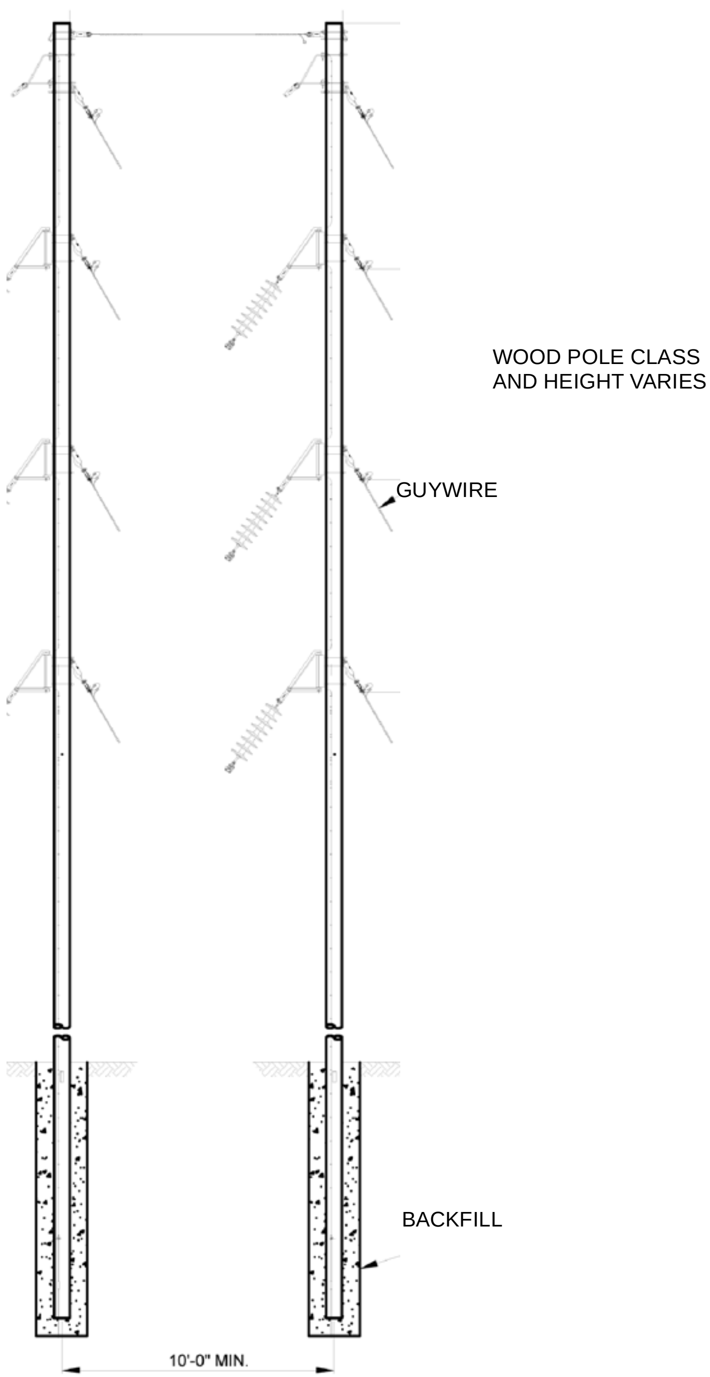
Construction Activities

The 34.5-kV generator-tie line would connect the collector switchyard on the wind farm site with the 69-kV interconnection substation at the POI. The generator-tie line facilities would be constructed using wood or steel poles or similar suitable materials (Figure 2-7). The poles would support the three-phase 34.5-kV generator-tie line (i.e., three conductors), associated insulators and accessories, and an OPGW. All the required poles would be within the established corridor, approximately 40 meters (130 feet) wide and 14.5 kilometers (9 miles) long. The poles are anticipated to be approximately 18 meters (60 feet) tall, similar to the existing wood poles supporting MECO's Wailea-Kealahou transmission line. Taller poles may be required along a small section of the generator-tie line (less than 1,000 feet in length) if it is necessary to span a Fresnel (beam) zone along the alignment. These structure heights could approach approximately 100 feet in height. Final structure heights will be determined as part of detailed engineering and design. Poles with guy wires would only be used at inflection points along the generator-tie line and are expected to be less than 10 percent of the overall poles. The exact location of each pole would be determined based on detailed engineering that would take into consideration a variety of factors, including existing access roads, terrain, environmental constraints, and cost.

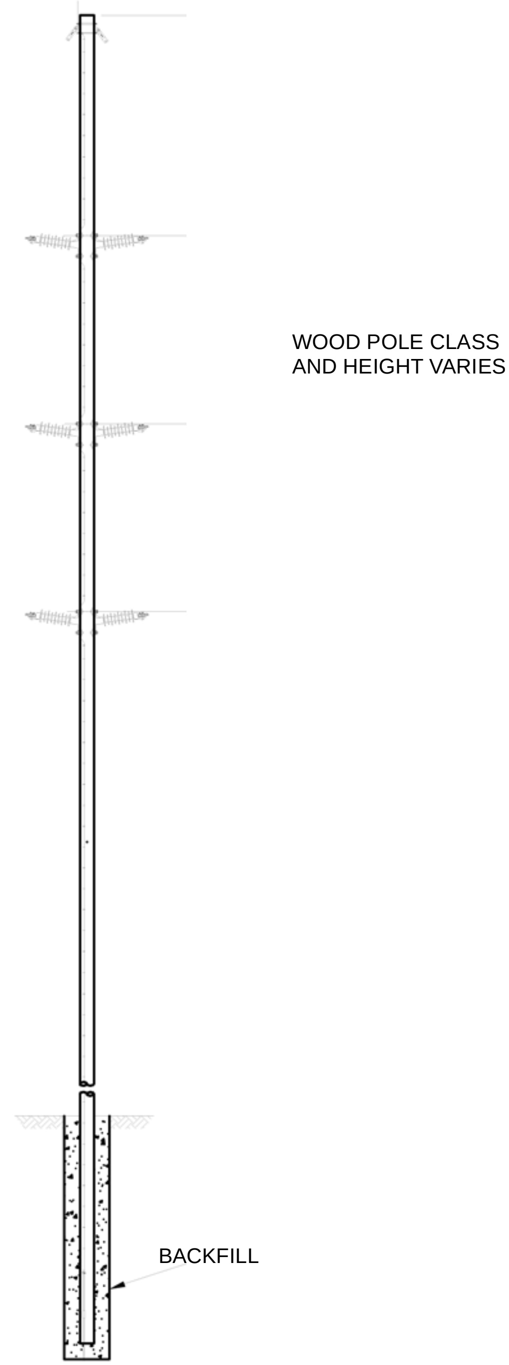
Generator-tie line construction would use standard industry procedures including surveying, corridor preparation, material hauling, pull sites, staging areas, structure assembly and erection, ground wire, conductor stringing, cleanup, and revegetation. Specific methods of access have not been determined but they would maximize use of existing ranch roads or areas suited for off-road driving to the extent possible to minimize impacts.

Operations and Maintenance Activities

Qualified personnel would routinely monitor, inspect, and maintain the generator-tie line facilities throughout the O&M phase. These maintenance activities would be accomplished with the use of off-road vehicles and light trucks. Heavy construction equipment would only be required if overhead facilities need to be repaired or replaced.



Conceptual 34.5kV Medium Angle Double Circuit



Conceptual 34.5kV Wood Double Circuit Tangent

FIGURE 2-7

AUWAHI WIND PROJECT

TYPICAL GEN-TIE POLE STRUCTURE

DATA SOURCES:
Pole Structures Pictured:
RMT

JANUARY 4, 2011

TETRA TECH EC,INC

P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXDs\EIS\Sempra_Auwahi_EIS_Fig2-7_GenTieDrawings_85i11i_010411 - Last Accessed: 1/4/2011 - Map Scale correct at: ANSI A (11" x 8.5")

2.1.2.2 69-kV Interconnection Substation

Construction Activities

The proposed 69-kV interconnection substation would be constructed at the POI located adjacent to MECO's existing Wailea-Kealahou 69-kV transmission line, approximately 1.6 kilometers (1 mile) east of the existing Wailea substation. The fenced dimension of the interconnection substation would be approximately 80 meters by 80 meters (264 feet by 264 feet), for a footprint of approximately 0.6 hectare (1.6 acres). Approximately 1.62 hectares (4 acres) would be disturbed during construction. The substation would be shared by Auwahi Wind and MECO; a fence would demarcate the change of ownership at the 69-kV disconnect switches on the high-voltage side of the main step-up transformer.

The substation area would be cleared and graded to control stormwater runoff and the substation pad would be compacted with well-graded material. Foundations would be installed for the buildings and components. Below-grade raceway (e.g., the conduit, ductbank, and trench) and ground grid would be installed in the sub-grade. Vehicle access would be provided on the east and north sides of the substation, with a fence line separating the Auwahi Wind and MECO facilities. Following installation of all equipment, a final layer of crushed rock surfacing would be placed and a perimeter fence would be erected and grounded. Substation testing and commissioning would be done before energizing the facility.

The Auwahi Wind side of the substation would include the following major equipment:

- A BESS building to house a series of utility-scale batteries to provide smoothing and regulating capability for power generated from the wind farm. It is anticipated that the BESS building would be a metal pre-fabricated structure on a concrete slab. Although the BESS building has not yet been designed, it is anticipated that a building 27 meters by 27 meters (88 feet by 88 feet) is necessary to house the batteries and associated equipment. Five 480-V 34.5-kV step-up transformers for the battery storage system would be located adjacent to the BESS building.
- Four 34.5-kV SF6 circuit breakers and associated disconnect switches;
- An open-rack, steel structure, rigid aluminum buswork;
- A 34.5-kV capacitor bank;
- Metering and protective relaying;
- A 34.5-kV to 69-kV main step-up transformer and associated disconnect switches;
- Underground conduit and control cabling;
- A 4-meter by 9-meter (12-foot by 30-foot), weatherproof, climate-controlled building enclosure containing protective relays, control, and communications systems and equipment; and
- A 6-meter (20-foot)-wide access road (driveway) and a 1.8-meter (6-foot)-high chain link fence with barbed wire and gates.

The 34.5-kV overhead generator-tie line and OPGW would enter the Auwahi Wind side of the interconnection substation from the south and terminate at a dead-end structure. The fiber optic communication cables would connect to the main SCADA system located in Auwahi Wind's control building.

The MECO side of the substation would include the following major equipment:

- A four-position (including one-spare position) 69-kV ring bus with three 69-kV SF6 circuit breakers and associated disconnect switches, open-rack steel structure design, rigid aluminum buswork, 69-kV metering and protective relaying, and underground conduit and control cabling;
- Space on the ring bus for a future circuit;
- A 4-meter by 9-meter (12-foot by 30-foot), weatherproof, climate-controlled building containing MECO protective relaying as well as control and communications systems and equipment; and
- A microwave communication tower that would be located at the interconnection substation site to provide network communications from the interconnection substation to the Ma'alaea Power Plant. The microwave communication tower would be approximately 20 feet high, located near radio communication gear, capable of supporting a minimum 1-meter (3-foot) microwave antenna, and include a self-standing, lattice-style tower (no guide wires or alternate support structures).

The 69-kV overhead transmission line and communications cables would exit the MECO side of the interconnection substation from steel dead-end structures located on the north and west sides.

<u>Operations and Maintenance Activities</u>

Qualified personnel would operate and maintain the interconnection substation. 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 interconnection substation would not typically require heavy construction equipment. However, if a major component failure occurred (e.g., a failure of a main transformer) then appropriate construction equipment would be required to replace the component.

2.1.2.3 69-kV Interconnection Substation Access Road

<u>Construction Activities</u>

The proposed interconnection substation site is located approximately 2.6 kilometers (1.6 miles) below Kula Highway. To the maximum extent possible, the access road to the interconnection substation would follow the route of existing ranch roads. The existing ranch roads and proposed newly constructed portions would be 6.1 meters (20 feet) wide with a maximum grade of 15 percent and a minimum turning radius of 30.5 meters (100 feet) so that a truck similar to a WB-62 carrying transformers could access the site. The road would have an all-weather graveled surface with adequate compaction to accommodate the specialized transportation equipment. The road would be designed to adequately collect stormwater runoff and minimize erosion. Drainage measures could include ditches and culverts to collect and convey stormwater. Following construction, any deteriorated roadway surfaces would be repaired and restored.

Operations and Maintenance Activities

Following construction, the access road to the 69-kV interconnection substation would be used for routine O&M activities but it would be closed to the public. The access roads would be maintained in good working order by grading and compacting to minimize naturally occurring erosion.

2.1.3 Construction Access Route

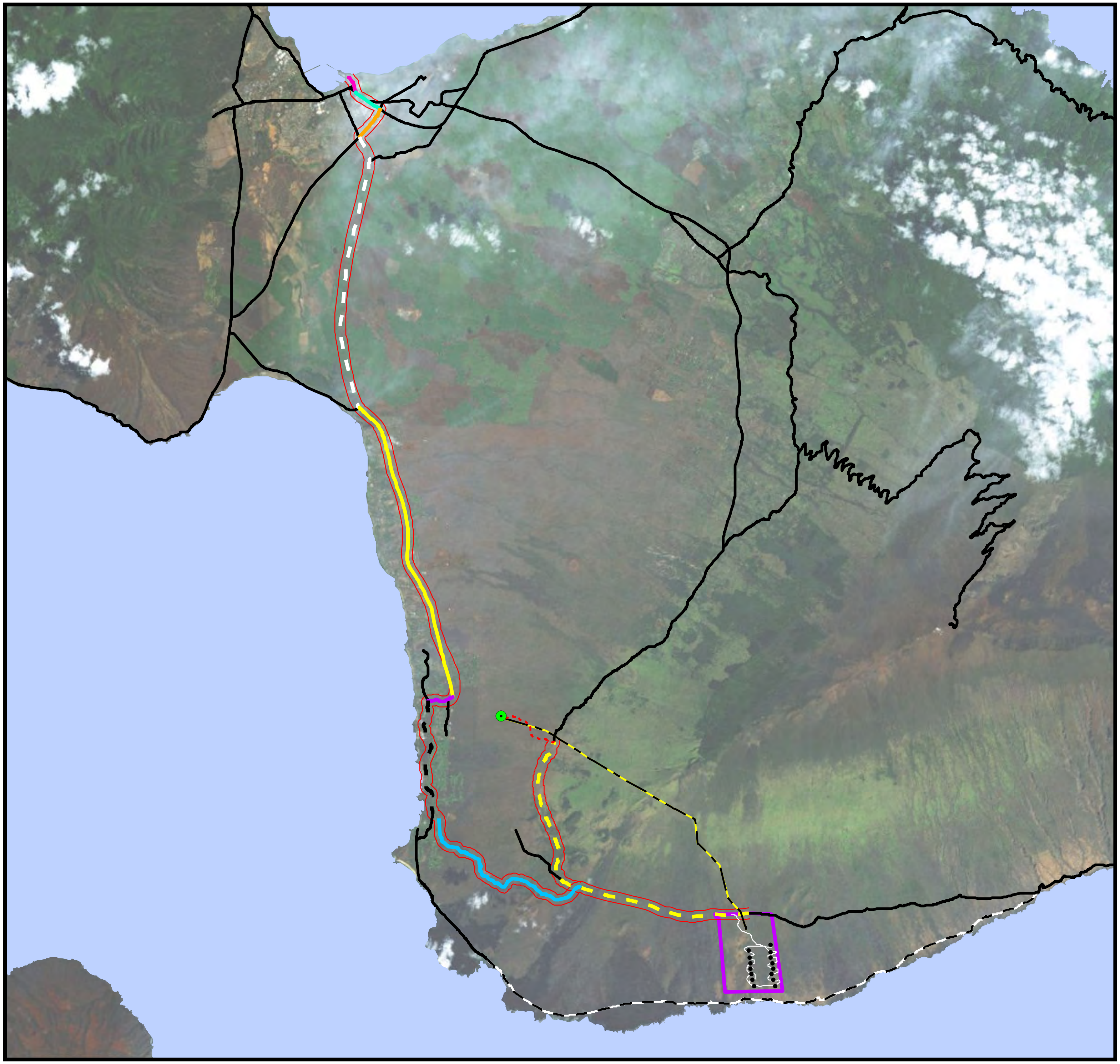
2.1.3.1 Transportation Plan

Most of the materials and equipment required for the proposed Project, including the turbine components and construction materials and equipment, would be imported to Maui through Kahului Harbor, the island's only commercial port, and then transported to the proposed Project site. Because most of the major turbine components are considered "superloads," special transportation equipment (e.g., multi-axle transport trailers, Schnabel trailers with hydraulic lifts, and steerable blade-trailers) would be required. 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. There are several road segments on a portion of Kula Highway (referred to as Upcountry Piʻilani Highway), between Pāpaka Road and the wind farm site entrance, that would need to be leveled to accommodate the superloads. Approximately nine bumps with a rise greater than 50.9 centimeters (20 inches) over a 30.5-meter (100-foot) length may require modification and possibly two S-curves would need to be widened. The level of modification would depend on a number of factors including selection of the WTG equipment, selection of the transportation provider (by the construction contractor), and availability of specialized transportation equipment. For example, if it were determined that the removal of a bump was required, the construction contractor could either (1) re-contour the road profile by removing the bump, or (2) temporarily fill in the areas approaching and exiting the bump (i.e., provide a more gradual transition). The affected zones of construction could be 61 to 122 meters (200 to 400 feet) long, and would typically be limited to the existing width of the road including the shoulders. Curve widening may be required in one or two locations. If required, the construction contractor would excavate the inside shoulder of the curve to provide a smoother, horizontal transition into and away from the curve. The affected zones of construction could be 61 to 122 meters (200 to 400 feet) long and may extend 12 to 15 meters (40 to 50 feet) onto the inside shoulder of the curve. Any temporary or permanent road modifications proposed by the construction contractor would be coordinated with the County of Maui.

Based on the results of the transportation route assessment, it was determined that a direct route from Kahului Harbor to the wind farm site using Haleakalā and Kula Highways would not be practicable, as there are several portions of Kula Highway (between Pukalani and ʻUlupalakua Ranch) where the turn radii and slopes are not adequate for the size of transport truck required to haul the turbine components. The most practicable route was determined to be along a designated route, from Kahului to the Mokulele Highway, through Kihei, Wailea, and Mākena to Pāpaka Road, and along Upcountry Piʻilani Highway to the wind farm site (Figure 2-8). As described below, Pāpaka Road would require modifications to accommodate specialized transport equipment. For analysis, the construction access route has been separated into nine segments, as listed in Table 2-2. Additional details on the construction access route are included in Section 3.9 – Traffic and Transportation. The following discussion focuses on construction and O&M activities along Segments 5, 6, 7, 8 and 9, which would require some modification for the Project.

FIGURE 2-8

AUWAHI WIND PROJECT CONSTRUCTION ACCESS ROUTE



- Wind Farm Site
- WTG
- Interconnection Substation
- Generator-Tie Line
- Construction Access Route
- Local Road
- Site Access Road
- Interconnection Substation Access
- Hoapili Trail
- 1) Hobron Avenue
- 2) Hāna Highway
- 3) Dairy Road
- 4) Pu‘unēnē Avenue / Mokulele Highway (311)
- 5) Pi‘ilani Highway
- 6) Wailea Ike Drive
- 7) Wailea Alanui Drive / Mākena Alanui Road
- 8) Pāpaka Road
- 9) Upcountry Pi‘ilani Highway / Kula Highway

DATA SOURCES:

Project Infrastructure:
Sempra Generation Energy

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Table 2-2.
Construction Access Route from Kahului Harbor to the Wind Farm Site

Segment Number	Route	Ownership/ Jurisdiction	Approximate Distance (miles)
1	Ala Luina Street and Hobron Avenue	County of Maui DPW	0.6 km (0.4 mile)
2	Hāna Highway	HDOT	1.1 km (0.7 mile)
3	Dairy Road (Highway 380)	HDOT	1.3 km (0.8 mile)
4	Puʻunēnē Avenue and Mokulele Highway (Highway 311)	HDOT	10.3 km (6.4 miles)
5	Piʻilani Highway	HDOT	11.6 km (7.2 miles)
6	Wailea Ike Drive	County of Maui DPW	1 km (0.6 mile)
7	Wailea Alanui Drive / Mākena Alanui Drive/Mākena Golf Road	County of Maui DPW	4.5 km (2.8 miles)
8	Pāpaka Road (series of privately owned pastoral roads)	Private (privately owned)	7.6 km (4.7 miles)
9	Upcountry Piʻilani Highway (east of Pāpaka Road entrance)	HDOT / County of Maui DPW	6.4 km (4.0 miles)
	Total Distance		**44.4 km (27.6 miles)**

DPW = Department of Public Works
HDOT = Hawaiʻi State Department of Transportation
km = kilometer

<u>Intersections of Piʻilani Highway and Wailea Ike Drive, Wailea Ike Drive and Wailea Alanui Drive, and Mākena Alanui Road and Mākena Golf Road (Segments 5, 6, and 7)</u>

Construction Activities

Temporary road improvements would be necessary at the intersections of Piʻilani Highway and Wailea Ike Drive, Wailea Ike Drive and Wailea Alanui Drive, and Mākena Alanui Road and Mākena Golf Road. These improvements will be better defined once a final transportation route assessment is completed but may include temporary widening and removal of medians.

Operations and Maintenance Activities

This route would not serve as the primary access route to the proposed Project site following construction. It would only be used to transport replacement parts for the WTGs. The primary access route to the proposed Project site during O&M would be from Kula Highway/Upcountry Piʻilani Highway.

<u>Pāpaka Road (Segment 8)</u>

Construction Activities

Pāpaka Road would be used for transporting equipment during construction and for future transportation of replacement equipment. Currently, both ends of the Pāpaka Road are gated and locked. During construction, it is anticipated that guards would be placed at either end to only allow the passage of construction vehicles.

The western portion of the existing road is approximately 7 meters (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, Pāpaka Road would be widened to approximately 9 meters (30 feet) (including shoulders), and several segments of new road would be constructed to keep the roadway alignment on ʻUlupalakua Ranch property and facilitate civil engineering and design. Pāpaka Road would be designed (e.g., horizontal and vertical curves, and gradients) to accommodate the superload transportation vehicles. The road would be all-weather (gravel surfaces) except where currently paved and would have adequate compaction to accommodate the specialized transportation equipment. The road would include drainage features such as ditches and culverts and would be designed to adequately collect and convey stormwater runoff and minimize erosion. Following construction, any deteriorated roadway surfaces would be repaired.

Operations and Maintenance Activities

Pāpaka Road would neither be used for routine O&M activities nor would it serve as the primary access route to the proposed wind farm site following construction. Pāpaka Road would only be used to transport replacement parts for the WTGs. It is anticipated that both ends of the road would remain gated and locked. ʻUlupalakua Ranch employees and private landowners of adjacent parcels would use the road during and after construction. In the event of an emergency, Pāpaka Road may be opened for public use to assist in an evacuation.

<u>Upcountry Piʻilani Highway (Segment 9)</u>

Construction Activities

The portion of the Upcountry Piʻilani Highway (commonly referred to as Kula Highway in this area) between Pāpaka Road and the wind farm site (approximately 6.4 kilometers [4 miles]) would also be used for transporting equipment during construction and for future transportation of replacement equipment. Based on surveys conducted by a specialized transportation consultant, approximately nine bumps with a rise greater than 50 centimeters (20 inches) over a 30.5-meter (100-foot) length may require modification and possibly two S-curves would have to be widened (Figure 2-9). Details on these modifications are in Section 3.9 – Transportation and Traffic. The proposed road modifications would comply with the County of Maui design criteria including requirements for road base, compaction, pavement thickness, shoulder width, stormwater collection, and drainage.

Operations and Maintenance Activities

Following construction, the portion of the Upcountry Piʻilani Highway between Pāpaka Road and the wind farm would continue to be used for normal public traffic and routine O&M activities for the wind farm. It would continue to be maintained under its present jurisdiction. A turnout along Upcountry Piʻilani Highway with educational signage is proposed, although the specific site has yet to be determined. The signage would provide the public with general information about the area as well as specific information related to wind generation and the proposed Project.

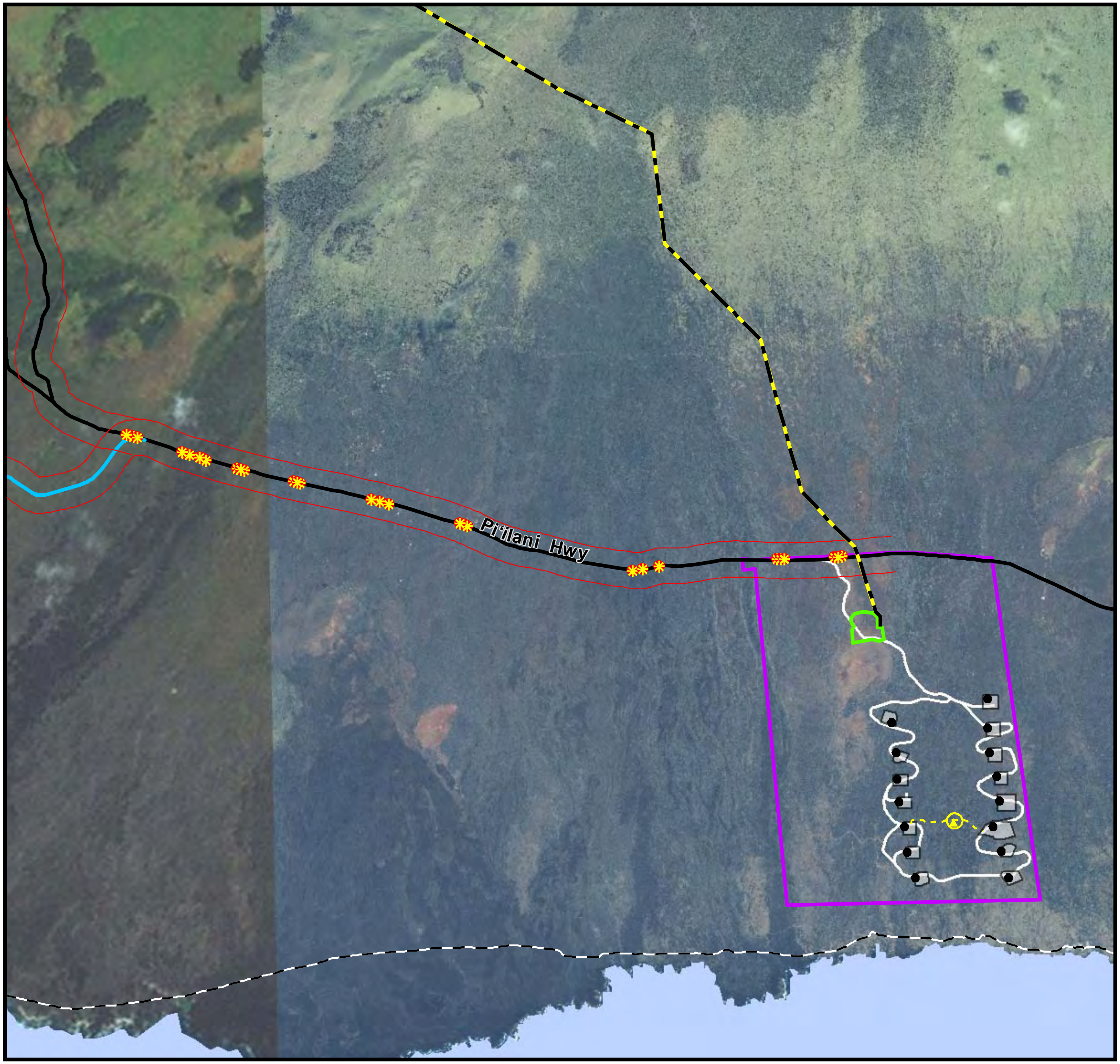
2.1.3.2 Estimated Area to be Disturbed by Construction of Proposed Facilities

Approximately 99 hectares (244 acres) would be disturbed during construction of the proposed Project. Table 2-3 has an estimation of disturbed areas by Project component.

FIGURE 2-9

AUWAHI WIND PROJECT

PI'ILANI HIGHWAY BUMPS



- Wind farm site
- Collector Switchyard/ Laydown Area
- WTG
- MET Tower
- Piilani Highway Bumps To Be Modified
- Generator-Tie Line
- MET Tower Access Road
- Site Access Road
- Construction Access Route
- Pāpaka Road
- Road
- Hoapili Trail
- WTG Pad

DATA SOURCES:

Project Infrastructure:
Sempra Generation Energy
City/Road:
ESRI Streetmap 2007

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Miles

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MAUI, HI
JANUARY 10, 2011

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Table 2-3.
Approximate Area to be Disturbed by Construction and Operations Activities

Project Component	Approximate Area to be Temporarily Disturbed during Construction (acres)1/	Approximate Area to be Permanently Disturbed (acres)	Total Disturbance (acres)1/
WTG Access Roads (Proposed Alignment)	42.9	29.1	72.0
WTG Access Roads (Straightened Road Alignment)2/	36.8	25.2	62.0
WTG Pads	10.5	4.6	15.1
Underground Electrical Collection System	11.4	0.0	11.4
Meteorological Tower (including access road)	3.7	1.1	4.7
Construction Staging and Equipment Laydown Area (includes O&M building, storage, parking, and collector switchyard)	7.6	1.8	9.4
Generator-tie Line Corridor	38.6	19.4	58.0
Interconnection Substation	1.8	1.3	3.1
Interconnection Substation Access Roads	11.3	3.8	15.1
Construction Access Route, Pāpaka Road	38.8	16.6	55.4
TOTAL	**166.5**	**77.6**	**244.1**

1/ Totals do not add up exactly due to rounding. (1 acre = 0.4 hectare).
2/ The straightened road alignment is not included in the total because if constructed it would replace the currently proposed WTG access road alignment. Should this alignment be selected, construction would impact a total of 232.9 acres, of which 160.5 aces would be temporarily impacted.

2.1.4 Best Management Practices, Design Features, and Project Plans

Table 2-4 lists industry standard BMPs, project-specific design features, and Project plans that the Applicant has committed to incorporating into the proposed Project to reduce potential impacts. Additional avoidance and minimization measures specific to each resource area are discussed in Chapter 3.

2.1.5 Site Cleanup

All portions of the proposed Project would be maintained in an orderly and clean manner throughout construction. At the completion of the construction phase, a final cleanup of all components of the proposed Project would be done. All construction-related waste would be properly handled in accordance with county, state, and federal policies and permit requirements and removed from the area for disposal or recycling as appropriate. Areas with disturbed soil that would not be used during operations would be stabilized and returned to cattle grazing.

2.1.6 Future Expansion

The wind farm site has the capability to be expanded to accommodate up to 39 WTGs to meet Maui's future energy needs. Expansion opportunities would depend on 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 neither the Project permits nor the EIS address any future expansion. If an expansion is deemed practical at a future date, the appropriate due diligence activities and environmental permitting would be done at that time.

Table 2-4.
Best Management Practices that Avoid, Minimize, or Mitigate Impacts to Project Environmental Resources

Best Management Practice (BMP)	Geology and Topography	Soils	Natural Hazards	Hydrology and Water Resources	Vegetation	Wildlife	Archeological and Cultural Resources	Traffic and Transportation	Hazardous and Regulated Materials and Wastes	Noise	Air Quality	Visual Resources	Surrounding Land Use and Agriculture	Public and Construction Safety
A Temporary Erosion and Sediment Control (TESC) Plan will be prepared that would be implemented by the construction contractor. The TESC Plan will include standard stormwater BMPs such as building during the summer months when rainfall potential is low, using silt fences or hay bales to prevent eroded soil from being transported offsite, and contouring to stop drainage from entering the site and to prevent runoff from entering surface waters.	X	X		X	X	X	X							
To minimize the potential for erosion and impacts to site drainage patterns, Project access roads will be sited to follow natural contours and minimize side hill cuts to the extent possible.	X	X		X			X							
Ditches and culverts and other erosion controls will be implemented to capture and convey stormwater in areas of temporary disturbance.	X	X		X			X							
Blasting would be conducted such that it would minimize the creation of excessive slopes.	X	X	X											
During construction, wind erosion will be minimized by using common dust suppression techniques, such as regularly watering exposed soils, stockpiling soils, and stabilizing soils.		X									X			
With the exception of areas where permanent surface recontouring is required, disturbed areas will be restored to pre-existing grades and revegetated.	X	X	X	X	X	X	X					X	X	
Permanent stormwater control structures will be installed to prevent erosion where access roads, buildings, storage areas, and parking areas are constructed.		X	X	X										
To minimize the introduction and spread of invasive plant species, potential offsite sources of materials (gravel, fill, etc.) will be inspected, and the import of materials from sites that are known or likely to contain seeds or propagules of invasive species will be prohibited.					X									

Table 2-4.
Best Management Practices that Avoid, Minimize, or Mitigate Impacts to Project Environmental Resources

Best Management Practice (BMP)	Geology and Topography	Soils	Natural Hazards	Hydrology and Water Resources	Vegetation	Wildlife	Archeological and Cultural Resources	Traffic and Transportation	Hazardous and Regulated Materials and Wastes	Noise	Air Quality	Visual Resources	Surrounding Land Use and Agriculture	Public and Construction Safety
Vehicle operators transporting materials to the proposed Project site from offsite will be required to follow protocols for removing soils and plant material from vehicles and equipment prior to entry onto the site.					X	X							X	
The Hawai'i Department of Agriculture and Maui Invasive Species Commission will be consulted to establish protocols and training orientation methods for screening invasive species introductions during construction.					X	X							X	
Noisy construction activities (including blasting, if required) will be conducted between 7:00 a.m. and 10:00 p.m., unless further restricted by HDOH noise permits, to reduce the potential impact of construction noise during sensitive nighttime hours.										X				
Equipment and vehicles will be maintained in good working order and will employ adequate mufflers and engine enclosures to reduce equipment noise.									X	X				
Contractors and Project staff will implement proper O&M procedures as recommended by product manufacturers.										X	X		X	X
A Fire Management Plan (FMP; see Appendix A) will be implemented during construction and operations.			X		X	X	X				X	X	X	X
A Spill Prevention, Containment, and Countermeasures (SPCC) Plan will be prepared that would be implemented by the construction contractor and operations staff. The SPCC will include measures for the safe transport, handling, and storage of hazardous materials and will address security, safety, training, inspections, and spill response.				X					X					

Table 2-4.
Best Management Practices that Avoid, Minimize, or Mitigate Impacts to Project Environmental Resources

Best Management Practice (BMP)	Geology and Topography	Soils	Natural Hazards	Hydrology and Water Resources	Vegetation	Wildlife	Archeological and Cultural Resources	Traffic and Transportation	Hazardous and Regulated Materials and Wastes	Noise	Air Quality	Visual Resources	Surrounding Land Use and Agriculture	Public and Construction Safety
A site-specific Storm Water Pollution Prevention Plan (SWPPP) will be prepared that would be implemented by the construction contractor to reduce impacts to hydrology, drainage, and surface waters. The SWPPP will contain a description of the characteristics of the site such as nearby surface water, topography, and stormwater runoff patterns; identification of potential pollutants such as sediment from disturbed areas, and stored wastes or fuels; and identify BMPs that will be used to minimize or eliminate the potential for these pollutants to reach surface waters through storm water runoff .	X	X		X			X		X					
A Burial Treatment Plan will be prepared and implemented to reduce potential impacts to human burial sites that have the potential to be found at the wind farm site.							X							
To reduce the risk of earthquake damage, all structural elements of the proposed Project will meet or exceed current building code requirements for the seismic risk on Maui. The current design standard is defined by the 2006 Uniform Building Code.			X											X
A Traffic Management Plan will be prepared and implemented reduce potential impacts to traffic during construction.								X						
A Hazardous Materials and Wastes Management Plan (HMWMP) will be prepared and implemented that details proper procedures for storing and using hazardous materials and storing and disposing of hazardous waste. The plan will contain sufficient detail to address the purpose of the plan and to readily translate into the actions necessary to comply with relevant regulations. The plan would include information about site activities, site contacts, worker training procedures, and a hazardous materials inventory in accordance with Article 80 of the Uniform Fire Code.									X					
A Site Safety Handbook will be prepared for construction and operations and maintenance			X										X	X

2.1.7 Project Schedule and Estimated Construction Costs

Table 2-5 is a general estimate of the construction timeline for the proposed Project, and Table 2-6 summarizes preliminary construction cost estimates. The proposed Project schedule is under time constraints as required by the PPA with MECO.

Table 2-5.
Project Schedule

Project Activity	Estimated Start Date	Estimated Completion Date
Permitting Process	Summer 2010	Spring 2012
Construction	Spring 2012	Summer 2012
Wind Turbine Generator Installation	Summer 2012	Winter 2012
Commence Commercial Operations	Winter 2012	

Table 2-6.
Estimated Construction Costs

Item	Order of Magnitude Cost (2010 dollar value in millions)
Onsite Roads, WTG Pads, Collection System, Other Site Development	$32.2
Offsite Roads	$2.0
WTG Equipment and Battery System	$55.7
Turbine Installation and Commissioning	$11.9
Transportation and Logistics	$13.0
Collector Switchyard, Interconnection Substation, Generator-tie Line	$24.5
Operations and Maintenance Facility	$0.7
TOTAL	**$140.0**

2.1.8 Decommissioning and Restoration

The proposed Project would have an estimated 20-year life based on the projected useful life of the WTGs. After that time, the Applicant would evaluate whether to continue operations of the Project or decommission it. Should the Project be extended, the facility would be upgraded and repowered with renegotiated leases. If the Project was decommissioned, the goal of decommissioning would be to remove the power generation equipment and return the site to a condition as close to its pre-construction state as possible. All decommissioning- and restoration-related waste would be properly handled in accordance with county, state, and federal policies and permit requirements and removed from the area for disposal or recycling as appropriate. Major activities required for decommissioning would typically occur in reverse order to those of construction and are listed below:

- WTG foundation and met tower removal. Concrete and steel would be hauled offsite. Foundations would be filled with native weed-free aggregate and soils.
- Electrical collection system removal for above-ground structures and decommissioning in place for below-ground cables.

- Collector switchyard removal. Fencing and fence posts would be removed. Non-native aggregate would be removed. Native aggregate would be scattered onsite.
- Sale or demolition of the O&M building. The on-site septic system would be abandoned consistent with state and local requirements, unless needed for a future use of the site.
- Generator-tie line removal. Foundation holes would be filled with native weed-free soil.
- Road removal (as required by permit and/or site control agreements by landowners). Road disturbances would be re-graded to original contours where cut and fill made recontouring feasible. Any roads left in place would become the responsibility of the landowner.
- Grading disturbed areas to preconstruction contours where feasible.
- Revegetation with native or pasture grass species to ensure establishment of vegetation. Where applicable, restored areas would be stabilized and returned to cattle grazing.
- Recycling and disposal of materials, WTG components, and any hazardous and regulated materials and wastes would be conducted per applicable local, state, and federal regulations.

Decommissioning would restore the visual and ecological character of the landscape and also remove effects to other environmental and public resources that may have occurred as a result of Project operations.

2.2 ALTERNATIVES

This section discusses potential alternatives to the proposed Project and alternatives that have been eliminated from further consideration.

2.2.1 Project Component Alternatives

2.2.1.1 No Action Alternative

Pursuant to HAR § 11-200-17(f)(1), the No Action Alternative is included in this Draft EIS. Under the No Action Alternative, the wind farm would not be constructed. Individual resource area impact discussions in Chapter 3 identify any potential impacts associated with the No Action Alternative.

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 eliminated. Alternatives were eliminated if it was determined that they would not meet the proposed Project's Purpose and Need or objectives as described in Section 1.3. These alternatives and the rationale for dismissal are discussed in the Sections 2.2.2.1 through 2.2.2.9.

2.2.2.1 Alternative Wind Farm Site within the Auwahi Parcel

Two potential project sites were identified within the Auwahi parcel: (1) the area just north of Upcountry 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 northern and southern portions of the Auwahi parcel. Using the data collected from these three towers, a site energy assessment was conducted for the two potential project sites. Although the assessment results showed commercially viable wind regimes at both the northern and southern portions of the Auwahi parcel, it was determined that the southern portion would have a higher estimated net annual energy production. Thus, the northern site within the Auwahi parcel would be less likely than the southern site to meet the proposed Project objectives of increasing Hawai'i's energy independence and providing a renewable energy source to assist the people of Hawai'i in meeting or exceeding their RPS. Consequently, the Applicant decided to pursue development of the wind farm on the southern portion of the parcel.

2.2.2.2 Alternative Sites on Maui

As discussed in Section 1.1, the Auwahi parcel of 'Ulupalakua Ranch was identified as a suitable location for a wind farm project because it has a consistent wind power density regime (i.e., consistently high winds suitable for a wind farm). Three years of wind data were collected and analyzed to ensure that the Auwahi parcel was an optimum site selection. The Auwahi parcel is located in a remote and undeveloped portion of Maui that 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. In addition, the proposed Project falls almost entirely within the boundaries of 'Ulupalakua Ranch, which further simplified the development process. The Applicant determined that other sites on Maui would not be considered for further evaluation.

2.2.2.3 Generator-tie Line Alternatives

Roadside Alignment

During the early stages of Project development, the Applicant identified a potential generator-tie line corridor between the wind farm site and the existing Wailea substation along the edge of Upcountry Pi'ilani Highway and Kula Highway. The generator-tie line would be an overhead alignment located within the roadway easement. However, it was determined that this alignment would cross through the Kanaio Natural Area Reserve (NAR) and consequently was eliminated from further consideration. It was determined that the roadside alignment would have a much larger impact on the NAR than the proposed alignment. It is important to avoid any development in the NAR area if possible to avoid impacts to sensitive resources. The proposed generator-tie line alignment does not cross into this sensitive area and is owned entirely by 'Ulupalakua Ranch, so only a single easement would be required. The easement process for approval of the roadside alignment with multiple land owners could potentially far exceed the available window of time to complete the planning and approval stages of the proposed Project. The proposed Project has specific time frames that must be met in accordance with the PPA with MECO. For these reasons, a roadside alternative was eliminated from further consideration and evaluation.

Direct Route Alignment Across 'Ulupalakua Ranch Property

A direct route alignment (i.e., one with a minimal number of turns) within the mauka (inland) portions of the 'Ulupalakua Ranch property was considered for the proposed generator-tie line corridor. However, it was determined that this alignment would traverse the Auwahi Forest Restoration Project, which is located on the northern edge of the Auwahi parcel, and as such this route was eliminated from further consideration.

Underground Generator-tie Line

An underground alternative would require substantially more excavation and ground disturbance than an overhead line, resulting in potentially higher impacts to sensitive biological and archaeological resources. The roadside alignment alternative would cross through the Kanaio NAR, and constructing an underground generator-tie line corridor would require completely excavating a large portion of this critically sensitive area. In addition, constructing an underground line along the existing roadside or along the currently proposed generator-tie line could result in higher construction costs, which in turn would reduce the economic feasibility of the proposed Project. For these reasons, an underground alternative was eliminated from further consideration and evaluation.

Power Line Extension to Communities Adjacent to Wind Farm Site

The feasibility of bringing power to the communities adjacent to the proposed Project is limited because power generated at the wind farm site needs to be transmitted to a substation and stepped down and leveled prior to distributing it to the grid. More importantly, infrastructure is not in place in these communities to receive power at this time, and it is the purpose of the proposed Project to create power for distribution within the existing MECO infrastructure. To provide power to adjacent communities, a substation and distribution system to these homes would need to be constructed, operated, and maintained. Given lack of existing infrastructure, bringing power to these communities at this time would be prohibitively expensive and therefore not feasible.

2.2.2.4 Alternative Construction Access Routes

Direct Route via Haleakalā Highway and Kula Highway

Based on a transportation route assessment conducted by Project engineers, it was determined that a direct route from Kahului Harbor to the wind farm site along Haleakalā and Kula Highways is not practicable, because there are several portions of Kula Highway, between Pukalani and ʻUlupalakua Ranch, where turn radii and slopes of the highway are not adequate for the size of transport truck required to haul the turbine components. Therefore, this alternative was eliminated from further consideration and evaluation.

Direct Route from the end of Piʻilani Highway through the proposed Honuaʻula Development

Auwahi Wind considered two potential options for a route from the end of Piʻilani Highway to Upcountry Piʻilani Highway by creating a road through the proposed Honuaʻula Development. These routes would have allowed the Project to avoid construction traffic through Wailea and Mākena. Based on a transportation route assessment conducted by Project engineers, it was determined neither of these routes were practicable because the routes would require construction of more than an additional 2.5 miles of graded road including construction of several bridges to cross ravines and would be cost prohibitive. In addition, both of these alignments pass through several privately owned parcels and it was determined that the appropriate approvals may not be obtained for use of these parcels within the Project time constraints. Therefore, these alternatives were eliminated from further consideration and evaluation.

2.2.2.5 Alternative Alignment for Pāpaka Road

The vicinity of Pāpaka 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 within the Project time constraints. As such, the alignment was modified to stay primarily within ʻUlupalakua Ranch property and the existing road alternative was eliminated from further evaluation.

2.2.2.6 Alternative Project Size

As documented in Section 1.1, Background and History, several variations in the generating capacity have been considered throughout the planning phase of the proposed Project. The existing electrical grid on Maui can accept only a limited amount of wind-generated energy; MECO has determined that the grid can accept no more than approximately 21 MW of energy from the proposed Project at this time.

Given grid constraints that are outside the Applicant's control, the Project has already been reduced from 42 MW to 21 MW. A further reduction in the generating capacity would further diminish the Project's economic viability and would directly impact the price at which the energy could be sold to MECO. Accordingly, the generating capacity of the proposed Project was determined to be the appropriate project size, and alternative project sizes were eliminated from further evaluation.

2.2.2.7 Off-Shore Wind Farm Alternative

Off-shore wind farms are becoming a growing alternative energy source, successfully operating in eight countries. Currently, the United States has no operating off-shore wind farms, although several are in different stages of planning and development. The Applicant's renewable energy expertise at this time focuses on land-based wind and solar generation. While there are advantages to off-shore wind farms, such as the potential for higher and steadier winds, and the ability to generate power in areas where land is not available (AWEA 2009), there are many negative aspects to this alternative in Hawai‘i as summarized below:

- They are typically built in shallow coastal areas. Hawai‘i's extensive near-shore coral reefs limit shallow coastal areas that would be feasible.
- Most of the shallow Hawaiian coastal areas fall within the Hawaiian Islands Humpback Whale National Marine Sanctuary, an area considered to be one of the world's most important humpback whale habitats. The area off-shore from the Auwahi parcel is within this marine protected area.
- Turbine foundation costs increase rapidly with increasing water depth and wave height, as does the cost of connecting with utility power lines as the distance from shore increases.
- Operations and maintenance costs would be substantially higher given accessibility issues, potentially making this alternative economically infeasible.

For these reasons, this alternative was eliminated from further evaluation.

2.2.2.8 Pumped Storage Hydropower

Pumped storage hydropower is a technology that involves pumping water to a high-storage reservoir using available excess power and then releasing the water through turbo-generators to produce electricity when it is needed, which in this case would be when wind conditions are light. Typically, pumped storage requires two large reservoirs and an adequate water supply. This would be problematic for several reasons. There is no water source or reservoir near the wind farm site, so power would have to be transmitted to an offsite reservoir location. No such reservoir system currently exists at this location on Maui, so an additional large-scale construction project would be required, resulting in a much larger capital investment and greater project impacts. In addition, impacts to the human and natural environment would increase. For these reasons, this alternative was dismissed from further consideration.

2.2.2.9 Other Renewable Energy Sources

Renewable energy sources such as geothermal or solar are complementary to wind energy. The purpose of this proposed Project, however, is to bring renewable wind energy to Maui. The Auwahi Wind Project does not preclude others from pursuing other alternative energy sources; rather, it is intended to contribute to the many efforts in progress to help the county and state reach their renewable energy goals. These other renewable energy sources will not be examined further in this EIS.

3.0 EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

3.0 EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This chapter presents the environmental, cultural, and socioeconomic resources that have the potential to be affected by the proposed Project as described in Chapter 2. For most resources, Project impacts would be limited to areas on and immediately around the proposed Project. However, for some resources a wider geographic area is considered to capture all direct and indirect effects of the Project. The Region of Influence (ROI) is used to describe the impact analysis area for each resource. The discussion below is organized by resource (e.g., geology and topography, vegetation, noise, and so on). Each subsection presents the definition of the resource, a description of the existing environment to orient the reader to the proposed Project, and an analysis of potential impacts to that resource, as well as proposed resource-specific avoidance, minimization, mitigation measures. Industry standard BMPs, design features, and Project plans that would be implemented to avoid and minimize impacts to multiple resources associated with construction and operations are also mentioned below and described in detail in Table 2-4.

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, elevation, and proximity to the ocean. Climatic regions are typically characterized by temperature, humidity, wind patterns, and rainfall. The ROI for purposes of this analysis is the leeward side of Maui.

3.1.2 Existing Conditions

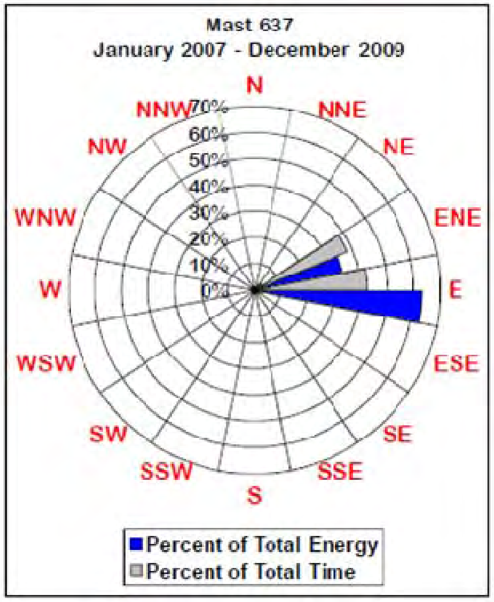
Hawai‘i's climate is characterized by two seasons: summer (May through September) and winter (October through April). In general, the islands have relatively mild temperatures and moderate humidity throughout the year (except at high elevations), with persistent northeasterly trade winds and infrequent 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, thereby decreasing the prevalence of the trade winds to about 50 to 80 percent of the time (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 51 centimeters to 762 centimeters (20 inches to 300 inches) (WRCC 2009a).

The proposed Project 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 78.5 centimeters (30.9 inches), with monthly totals ranging between 4.1 centimeters (1.6 inches) in August to 12.4 centimeters (4.9 inches) in 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) and nighttime temperatures in the 60s to 70s. The prevailing wind direction is from the east, as shown on Figure 3.1-1.

Figure 3.1-1. Wind Rose Auwahi Parcel



3.1.3 Potential Impacts and Mitigation Measures

3.1.3.1 Impact Methodology and Factors Considered for Impact Analysis

By altering the atmospheric mixing that occurs as wind passes over a site, WTGs do have the potential to affect certain aspects of the wind regime. However, a wind farm project of the scale proposed would not have the potential to affect temperature, rainfall, humidity, or most other meteorological parameters. The proposed Project has been sited to benefit from the strong wind resources in this area.

3.1.3.2 Construction Impacts

Construction activities would have no impact on temperature, rainfall, humidity, or aspects of the wind regime. Construction related impacts to GHG emissions are discussed in Section 3.12 – Air Quality. Potential impacts to climate characteristics resulting from construction of the straightened road alignment for the WTG access roads (see Section 2.1.1.2 for additional details) would be the same as for construction of the proposed WTG access road alignment.

3.1.3.3 Operations and Maintenance Impacts

As noted above, wind farm project of the scale proposed would not have the potential to affect temperature, rainfall, humidity, or most other meteorological parameters. Wind turbine generators, on the order of 10,000 WTGs concentrated into an area 97 kilometers (60 miles) wide, do have the potential to affect certain aspects of the wind regime leading to warming and drying of surface air (Roy et al. 2004). However, the physical constraints of the island of Maui preclude the construction of the number of WTGs necessary to generate such changes. Because the WTGs would extract only a small percentage of the wind energy necessary to generate these changes, the potential climatological impact of the proposed Project is not significant. Any potential adverse effects on climate from this proposed Project would be deemed insignificant. Conversely, there are potentially beneficial effects on climate from the proposed Project. If the energy generated by the proposed Project replaces energy generated by the combustion of fossil fuels, the reduction in the emissions of GHGs that contribute to global warming could occur. (For more information on the Project-related effects on GHGs, please see Section 3.12 – Air Quality.) Potential impacts to climate characteristics resulting from O&M along WTG access roads if the straightened road alignment were constructed would be the same as those for the proposed WTG access road alignment, and would be less than significant.

3.1.3.4 No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed and climate characteristics would remain unchanged. The potential for reduction in GHGs would not occur. The No Action Alternative would result in less than significant impacts to climate characteristics.

3.1.3.5 Avoidance, Minimization, and Mitigation Measures

As described above, the impacts of the proposed Project related to climate characteristics would be less than significant; therefore, no avoidance, minimization, or mitigation measures would be required.

3.1.3.6 Summary of Impacts

Table 3.1-1 summarizes impacts to climate resulting from the proposed Project.

Table 3.1-1.
Summary of Potential Climate Impacts

Impact Issues	Proposed Project	No Action Alternative
Temperature	○	○
Rainfall	○	○
Humidity	○	○
Aspects of the wind regime	⊙	○
Greenhouse gas emissions	+	⊙

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⃠= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A=Not applicable
○= No impact

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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. The ROI includes those areas where ground-disturbing activities from the proposed Project would occur.

3.2.2 Existing Conditions

Maui is the second largest of the Hawaiian Islands and is 77 kilometers (48 miles) long and 42 kilometers (26 miles) wide, for an area of 1,886 square kilometers (728 square miles). The island is composed of two volcanic mountains, Haleakalā and West Maui, separated by a low-lying isthmus that was created as the lava from Haleakalā flowed into West Maui. Haleakalā forms East Maui, and is 3,056 meters (10,025 feet) above sea level (ASL) and 53 kilometers (33 miles) across. At 1,476 square kilometers (570 square miles), it comprises approximately 77 percent of the island (USGS 1996a). West Maui is 1,764 meters (5,788 feet) ASL and 29 kilometers (18 miles) across.

Haleakalā 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 1996a). Subsequently, its flows merged with other nearby volcanoes, including West Maui, Kahoʻolawe, Lānaʻi, East Molokaʻi, West Molokaʻi, and Penguin Bank (Stearns 1966), covering at least 16,058 square kilometers (6,200 square miles). Over the course of the last 400,000 years, the volcanoes subsided to form four distinct islands: Maui, Molokaʻi, Lānaʻi, and Kahoʻolawe. Haleakalā was formed over three rift (fissure) zones, extending to the northwest, east, and southwest, each of which is marked by a series of cinder cones (Stearns 1966). Volcanic activity at Haleakalā in the past 30,000 years has occurred along the southwest and east rift zones, with approximately 10 eruptions in the past 1,000 years (USGS 1996a). The proposed Project does not contain areas of geologic importance as defined in the North American Stratigraphic Code (AAPG 2005) or other unique geologic features. There are no mineral resources of economic value to the region and residents of the state in the area

The results of the preliminary geotechnical study indicate that the geologic profile underlying the wind farm site consists primarily of recent basalt flows of the Hāna 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 an initial geotechnical investigation, a subsurface void was observed to the west of Puʻu Hōkūkano. In addition, a buried soil layer was found between basalt flows at a relatively shallow depth of approximately 2 to 3 meters (6.5 to 10 feet), north of Puʻu Hōkūkano. (Black & Veatch 2008). During subsequent field surveys, lava tubes were encountered within the wind farm site footprint. In some locations, the wind farm site access roads may cross over lava tubes. Bridges would be constructed over lava tubes in areas where archaeological resources are known to be present to avoid potential impacts. In locations where there are no archaeological resources present, the lava tubes may be filled with structural materials (e.g. rock, gravel, or concrete). A detailed geotechnical investigation would be conducted prior to construction to confirm the absence of subsurface voids and buried soils in the footprint of the proposed Project facilities, and the design would be modified to account for detected voids.

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 488 meters (1,600 feet) ASL on the northern edge to 70 meters (200 feet) ASL on the southern edge, which equates to a slope of an approximately 14 percent (Figure 3.2-1). The slope is fairly uniform across the site, with the

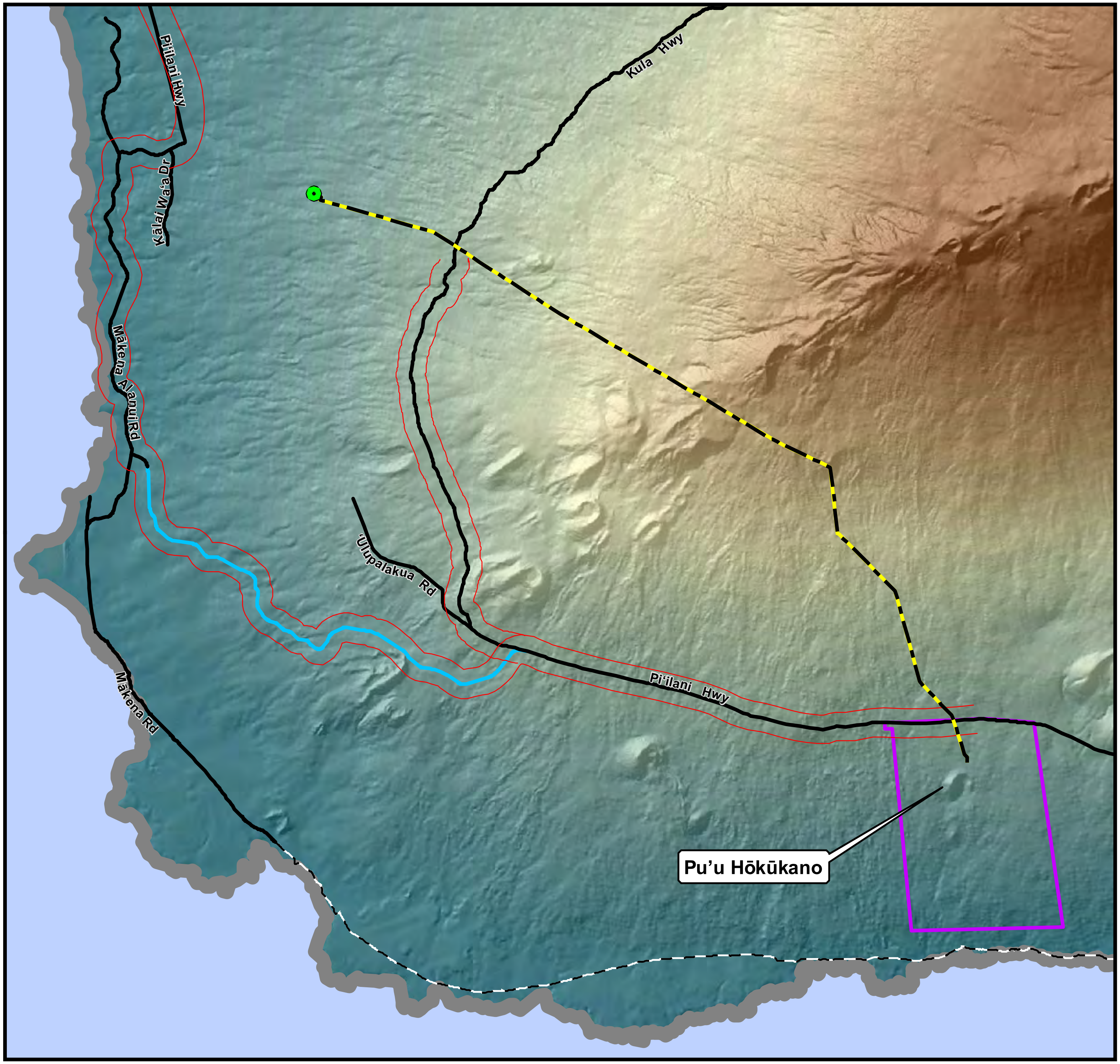

FIGURE 3.2-1

AUWAHI WIND PROJECT

TOPOGRAPHY

- Wind farm site
- Interconnection Substation
- Generator-Tie Line
- Construction Access Route
- Road
- Pāpaka Road
- Hoapili Trail

Elevation (meters amsl)

High : 3052.88

Low : 0

DATA SOURCES:

Project Infrastructure:
Sempra Generation Energy
Elevation:
USGS National Elevation Dataset. 10m
City/Road:
ESRI Streetmap 2007

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JANUARY 10, 2011

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exception of Pu‘u Hōkūkano., which rises to approximately 445 meters (1,460 feet) ASL near the center of the wind farm site, approximately 76 meters (250 feet) above the surrounding terrain. The generator-tie line would extend from the wind farm site to an elevation of approximately 293 meters (960 feet) ASL at the existing Wailea substation. The generator-tie line would have a maximum elevation of approximately 1,341 meters (4,400 feet) ASL as it crosses the southwest rift zone. Pāpaka Road, one of the construction access roads, ranges from approximately 24 meters (80 feet) ASL at its western end to approximately 543 meters (1,780 feet) ASL at its eastern end. The eastern end of Pāpaka Road connects with Upcountry Pi‘ilani Highway, which drops to approximately 490 meters (1,608 feet) ASL at the entrance to the wind farm site.

3.2.3 Potential Impacts and Mitigation Measures

3.2.3.1 Impact Methodology and Factors Considered for Impacts Analysis

The proposed Project was evaluated to identify potential adverse effects on geological resources and topography. Factors considered in determining whether the Project would have a significant impact on geology and topography include the extent to which its implementation would:

- Damage or prevent access to areas of geologic importance or mineral resources with economic value to the region;
- Increase the exposure of people or structures to geologic hazards; or
- Alter the function of the landscape, e.g., by altering drainage patterns through large-scale excavation, filling, or leveling.

The following sections address potential impacts to geology and topography from construction and O&M of the proposed Project.

3.2.3.2 Construction Impacts

As noted above, there are no areas of geologic importance or mineral resources with economic value within the proposed Project. Therefore, the proposed Project would have no impact to these resources. Additionally, given the infrequency of volcanic activity at Haleakalā, and the potential for impacts on Project construction from geologic hazards is negligible. Therefore, construction of the proposed Project would not result in increased exposure of people or structures to geological hazards.

The proposed Project would have a temporary effect on landscape function through ground excavation, filling or leveling during the construction of WTG pads, access roads, underground electrical collection system, and operations buildings. Construction earthwork would be performed to create adequate foundation conditions for the proposed WTGs as well as associated support buildings and structures and to establish the appropriate grades for access roads. Ground-disturbing activities would consist of clearing and grubbing, topsoil stripping, grading, compaction, blasting, utility trenching, and placement of aggregate surfacing. Grading and blasting activities would consist of the removal, storage, and/or disposal of earth, gravel, vegetation, organic matter, loose rock, and debris to the lines and grades necessary for construction. Excavated materials would be crushed and used onsite for structural or general fill. If there is not enough basaltic rock fill material available from onsite grading, fill would either be imported from an offsite borrow source or from another location onsite. Construction materials and methods are described in detail in Chapter 2.

In total, the Project would result in approximately 98 hectares (244 acres) of ground disturbance during construction (Table 2-3). Depending on which WTG model is selected and the grading analysis to be conducted during the final design, the wind farm site access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Chapter 2 for additional details). If the straightened road alignment for the WTG access roads is selected (see Chapter 2 for additional details), the area to be disturbed would decrease by approximately 3.9 hectares (10 acres).

Grading and blasting have the potential to alter drainage patterns within the proposed Project. To minimize this effect, construction plans for these activities would incorporate civil design considerations for control of stormwater runoff and drainage. All Project access roads would be located to follow natural contours and minimize side hill cuts to the extent possible and would include other BMPs such as ditches and culverts to capture and convey stormwater runoff. These measures would reduce the potential for erosion and adverse effects on drainage patterns. Additionally, blasting would be conducted such that it would minimize the creation of excessive slopes. Slope stability does not appear to be an issue based on preliminary geotechnical investigations. However, as noted above, design-level geotechnical investigations would be conducted prior to construction to identify geologic conditions that could require additional design consideration or mitigation measures. With the exception of areas where permanent surface recontouring is required, disturbed areas would be restored to pre-existing grades. All disturbed areas where permanent gravel or aggregate is required would be revegetated. Collectively, these measures would minimize potential impacts from construction of the proposed Project on geology and topography.

3.2.3.3 Operations and Maintenance Impacts

Permanent disturbance would be restricted to the location of each permanent Project structure including generator-tie line poles, met tower pole and guy wires, WTGs, buildings, and the permanent access roads, resulting in a total permanent disturbance of approximately 31 hectares (78 acres). During operations, the access roads would be maintained by grading and compacting to minimize erosion. Maintenance vehicles and service trucks would continue to use the access roads for routine maintenance of the WTGs. The graveled areas around the WTG pads would be maintained similar to the access roads.

Routine servicing of all components of the proposed Project typically does not require heavy equipment such as large cranes but does require service vehicle access. If there were a major component replacement (e.g., blades, gearboxes, or generators), heavy equipment similar to that used during construction would be required. Should component replacement be required, BMPs similar to those in place during construction would be followed.

Operations and maintenance activities associated with the O&M building would include basic maintenance and upkeep. Permanent infrastructure would include water and wastewater systems, potentially an onsite well, and a septic system. The graveled areas for parking and storing spare parts would be maintained to minimize erosion and control stormwater runoff and drainage.

Pāpaka Road would neither be used for routine O&M activities nor would it serve as the primary access route to the wind farm site following construction. Upcountry Pi‘ilani Highway between the Pāpaka Road and the wind farm site would continue to be used for normal public traffic and routine

O&M activities. Generator-tie line maintenance would be accomplished using off-road vehicles and light trucks.

3.2.3.4 No Action Alternative

Under the No Action Alternative, there would be no demolition, new construction, modifications, or other ground-disturbing activities. There would be no potential to damage or prevent access to valuable geologic areas or mineral resources, alter the landscape, or increase exposure to geologic hazards; therefore, there would be no impact on geology and topography resources under the No Action Alternative.

3.2.3.5 Avoidance, Minimization, and Mitigation Measures

As described above, the Applicant will implement the design features, industry-standard BMPs, and Project plans for control of stormwater runoff and drainage listed in Table 2-4 that will result in less than significant impacts related to geology and topography; therefore, no additional avoidance, minimization, or mitigation measures are required.

3.2.3.6 Summary of Impacts

Table 3.2-1 summarizes the potential impacts to geology and topography associated with the proposed Project.

Table 3.2-1.
Summary of Potential Geologic and Topographic Impacts

Impact Issues	Proposed Project	No Action Alternative
Damage or prevent access to areas of geological importance	○	○
Increase the exposure of people or structures to geologic hazards	○	○
Alter the function of the landscape	⊙	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⃠= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A= Not applicable
○= No impact

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3.3 SOILS

3.3.1 Definition of Resource

Soils are unconsolidated surface materials that form from the weathering of underlying bedrock or other parent material. Soil drainage, texture, strength, shrink and swell potential, and rates of erosion affect the suitability of the ground to support manmade structures and facilities. In combination with other factors (e.g., climate and terrain), these characteristics are also important considerations for soil productivity and suitability for cultivation. The ROI for assessing potential impacts to soils includes all areas to be disturbed by construction of the proposed Project.

3.3.2 Existing Conditions

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey (2010); the Soil Survey of the Islands of Kaua‘i, O‘ahu, Maui, Moloka‘i and Lāna‘i (Foote et al. 1972); the University of Hawai‘i Land Study Bureau Detailed Land Classification (1967); and the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawai‘i (ALISH; 1977) describe the dominant soil types and assess their productivity. A description of each of these studies follows.

3.3.2.1 NRCS Soil Survey

According to the NRCS Soil Survey (Foote et al. 1972), the soils in the proposed Project consist predominantly 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 Hōkūkano. The generator-tie line and Pāpaka 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 3.3-1 and illustrated in Figure 3.3-1.

Table 3.3-1.
Soil Types in the Proposed Project

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	—	—	—
Generator-tie 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

Table 3.3-1.
Soil Types in the Proposed Project

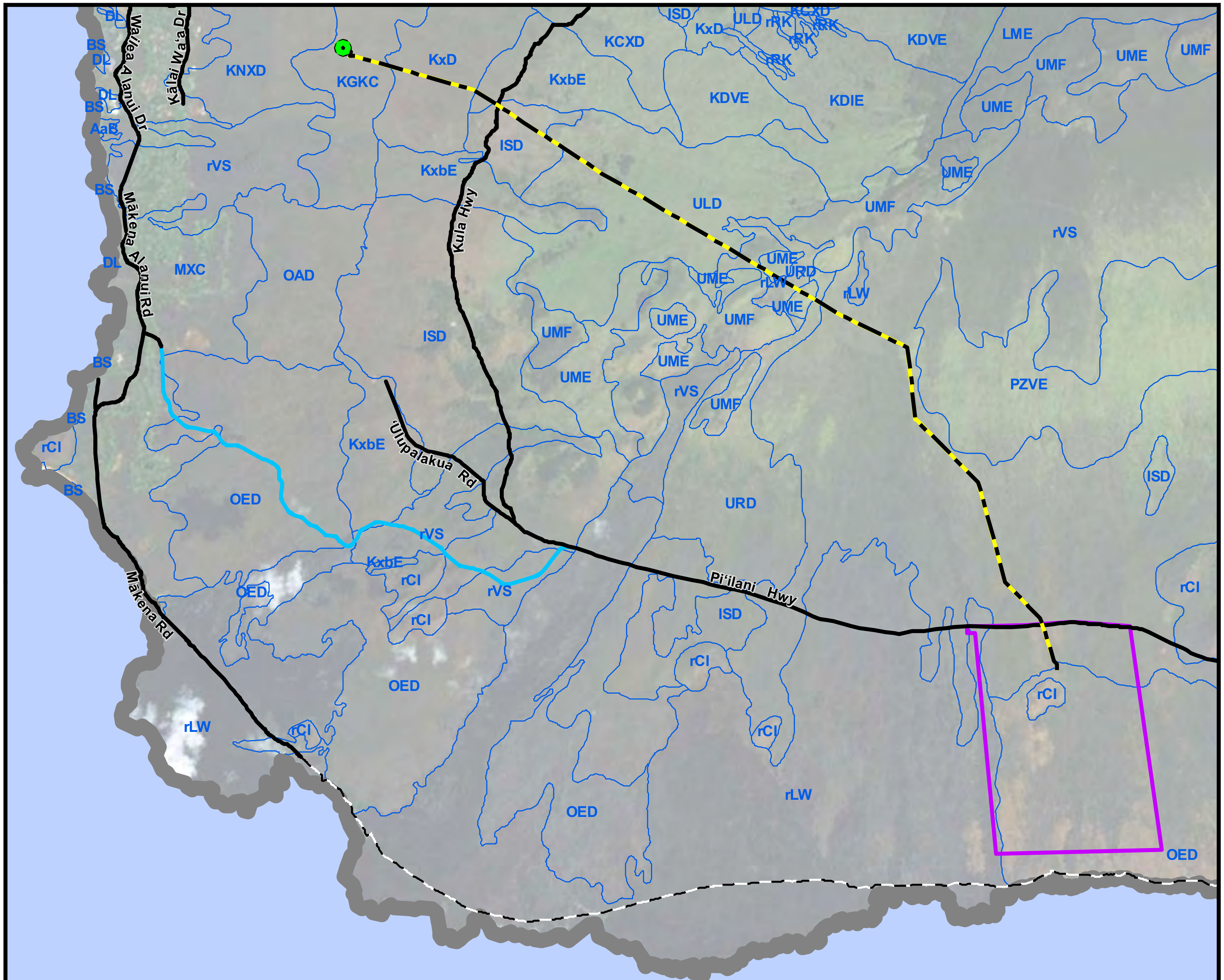
Soil Name	Slope (%)	Description	Permeability[1/]	Runoff[1/]	Erosion Hazard[1/]
Uma loamy coarse sand (UME)	15–40	Excessively drained, sandy soils on smooth, intermediate mountain slopes	Very rapid	Slow	Slight to moderate
Lava flows, a'a (rLW)	—	Consists of young lava flows	—	—	—
Uma loamy coarse sand (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
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
Pāpaka Road					
Oanapuka extremely stony silt loam (OED)	7–25	Well-drained, very stony soils on low uplands	Moderately rapid	Slow	Slight to moderate
Mākena 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

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 et al. (1972)

FIGURE 3.3-1

AUWAHI WIND PROJECT

SOILS



AaB	Alae sandy loam, 3 to 7 percent slopes
BS	Beaches
DL	Dune land
ISD	Io silt loam, 7 to 25 percent slopes
KCXD	Kaimu extremely stony peat, 7 to 25 percent slopes
KDIE	Kaipoioi loam, 7 to 40 percent slopes
KDVE	Kaipoioi very rocky loam, 7 to 40 percent slopes
KGKC	Kamaole very stony silt loam, 3 to 15 percent slopes
KGLC	Kamaole extremely stony silt loam, 3 to 15 percent slopes
KNXD	Keawakapu extremely stony silty clay loam, 3 to 25 percent slopes
KxD	Kula loam, 12 to 20 percent slopes
KxbE	Kula very rocky loam, 12 to 40 percent slopes
LME	Laumaia loam, 7 to 40 percent slopes
MXC	Makena loam, stony complex, 3 to 15 percent slopes
OAD	Oanapuka very stony silt loam, 7 to 25 percent slopes
OED	Oanapuka extremely stony silt loam, 7 to 25 percent slopes
PZVE	Puu Pa very stony silt loam, 7 to 40 percent slopes
ULD	Ulupalakua silt loam, 7 to 25 percent slopes
UME	Uma loamy coarse sand, 15 to 40 percent slopes
UMF	Uma loamy coarse sand, 40 to 70 percent slopes
URD	Uma rocky loamy coarse sand, 7 to 25 percent slopes
rCI	Cinder land
rLW	Lava flows, aa
rRK	Rock land
rVS	Very stony land

Wind farm site
Interconnection Substation
Generator-Tie Line
Road
Pāpaka Road
Hoapili Trail
Soil classes

DATA SOURCES:

Project Infrastructure:
Sempra Generation Energy
Soils:
U.S. Dept. of Agriculture - Natural Resources Conservation Service
City/Road:
ESRI Streetmap 2007

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Miles

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3.3.2.2 Land Study Bureau Detailed Land Classification

The University of Hawai'i Land Study Bureau (1967) rates the agricultural productivity of soils throughout the state based on characteristics that include the following:

- Texture—the proportion of sand, silt, and clay in a particular soil.
- Structure—the cohesion of soil material into aggregates or clumps.
- Depth—the distance to which roots can penetrate.
- Drainage—the frequency and duration of soil saturation with moisture.
- Parent material—the geologic material from which a soil has developed.
- Stoniness—affects the productivity of land by limiting the use of machinery and the selection of crops.
- Topography—the slope and surface configuration. Cultivated lands generally have slopes of less than 20 percent. Lands with slopes between 20 and 35 percent usually are not machine-tilled, but are still suitable for certain uses such as orchards and grazing.
- Climate, temperature, sunlight, and rainfall—constitute the exterior environment of land, unlike the soil properties which constitute the interior segment.
- Rain—the basic source of irrigation. Ideally, it should fall at the place, in the quantity, and at the time when it is needed (University of Hawai'i Land Study Bureau 1967).

The productivity ratings are used to designate each area as Category A, B, C, D, or E, with Category A representing the most productive soils and Category E the least productive soils. The classification also includes Category U, urban lands, which is for soils that were not rated (Figure 3.3-2).

The soils found within the wind farm site and Pāpaka Road are classified as Category E by the Detailed Land Classification System. The soils along the eastern half of the generator-tie line are also Category E, and those along the western half are Categories C and D.

3.3.2.3 Agricultural Lands of Importance to the State of Hawai'i

Agricultural Lands of Importance to the State of Hawai'i, known as ALISH, is a system that identifies land suitable for agricultural use and classifies identified lands primarily (though not exclusively) on the basis of soil characteristics. Land is classified as agricultural if it does not meet any of the following criteria:

- Developed urban land over 10 acres;
- Natural or artificial enclosed bodies of water over 10 acres;
- Forest reserves;
- Public use (parks and historic sites) lands;
- Lands with slopes in excess of 35 percent; or
- Military installations (except undeveloped areas over 10 acres).

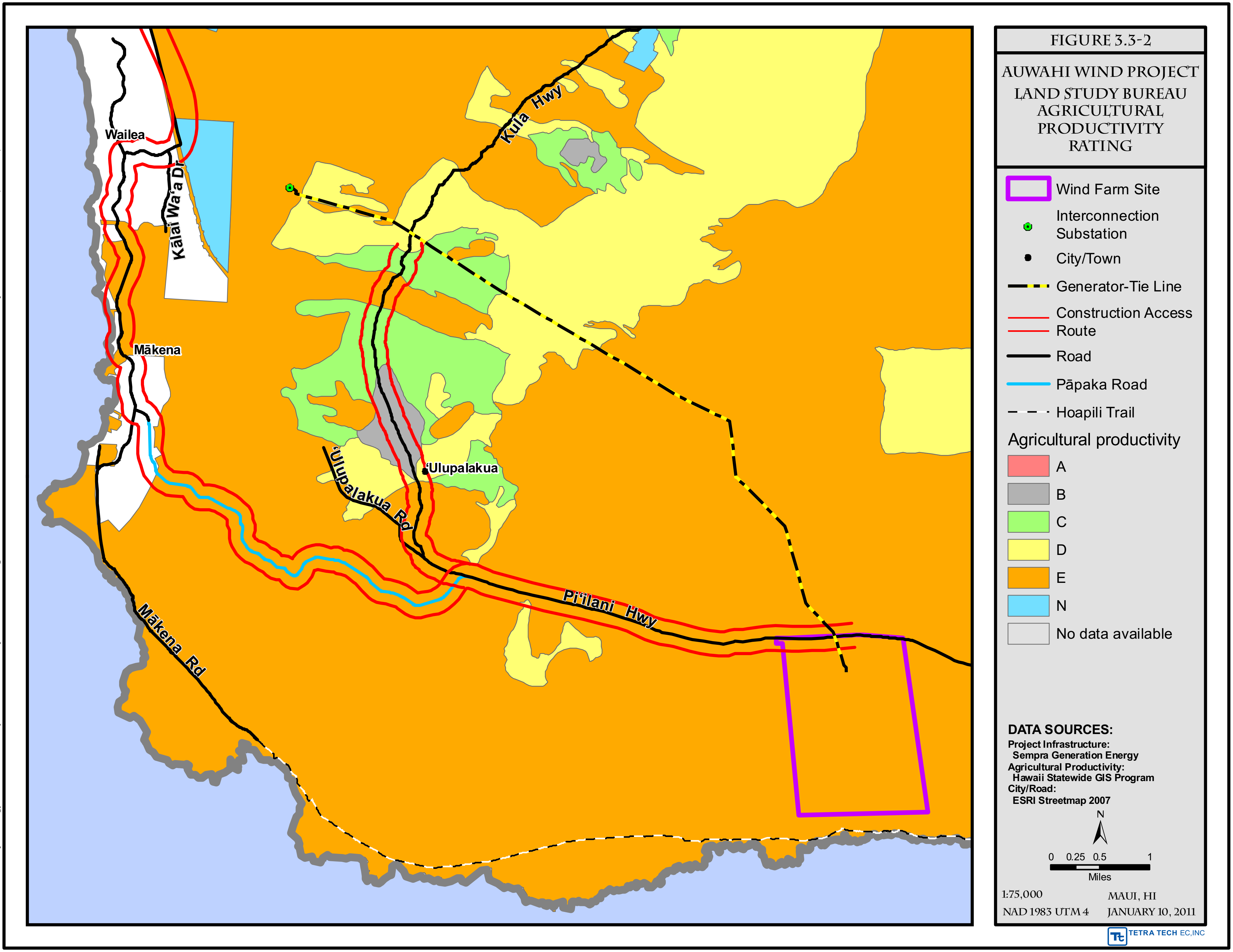
FIGURE 3.3-2
AUWAHI WIND PROJECT
LAND STUDY BUREAU AGRICULTURAL PRODUCTIVITY RATING
Wailea
Kālai Wa'a Dr
Kula Hwy
Mākena
'Ulupalakua
'Ulupalakua Rd
Pi'ilani Hwy
Mākena Rd
Wind Farm Site
Interconnection Substation
City/Town
Generator-Tie Line
Construction Access Route
Road
Pāpaka Road
Hoapili Trail
Agricultural productivity
A
B
C
D
E
N
No data available
DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Agricultural Productivity:
Hawaii Statewide GIS Program
City/Road:
ESRI Streetmap 2007
N
0 0.25 0.5 1
Miles
1:75,000
NAD 1983 UTM 4
MAUI, HI
JANUARY 10, 2011
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All other land is classified as one of three major types of agricultural land: prime agricultural land, unique agricultural land, or other important agricultural land.

Most of the proposed Project is not classified as agricultural land by ALISH (Figure 3.3-3). The western portion of the generator-tie line and two small segments of Pāpaka Road are classified as "Other Important Agricultural Land," agricultural land of state-wide or local importance for the production of food, feed, fiber, and forage crops. The lands in this classification are important to agriculture in Hawaiʻi yet they exhibit properties such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, or droughtiness that exclude them from the prime or unique agricultural land classifications. These lands can be farmed satisfactorily by applying more fertilizer and other soil amendments, improving drainage, implementing erosion control practices, and implementing flood protection. They produce fair to good crop yields when managed properly (Hawaiʻi State Department of Agriculture 1977).

3.3.3 Potential Impacts and Mitigation Measures

3.3.3.1 Impact Methodology and Factors Considered for Impacts Analysis

The proposed Project was analyzed to determine impacts to soil resources. Factors considered in determining whether the proposed Project would have a significant impact on soils include the extent to which the proposed Project would:

- Increase the probability or magnitude of mass soil movement through erosion (e.g., slope failures, slumps, or wind erosion);
- Increase soil loss due to disturbance causing the formation of rills or gullies, and deposition of sediment in downgradient areas or water bodies;
- Cause a long-term loss of productivity or vegetative growth from compaction or mixing of soils;
- Cause a loss of soil that uniquely supports threatened or endangered plant species or sensitive existing ecosystems; and
- Result in a loss of prime or unique farmland.

3.3.3.2 Construction Impacts

Descriptions of construction activities that could affect soil resources are similar to those that could affect geologic resources and are summarized in Section 3.2.3.1 of this EIS. During construction of the proposed Project, ground disturbing activities could increase the potential for soil erosion. Depending on which WTG model is selected and the grading analysis to be conducted during the final design, the proposed WTG access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Section 2.1.1.2 for additional details). A comparison of the impacts of this straightened road alignment relative to the proposed WTG access roads is provided below where appropriate.

<u>Impacts from Erosion</u>

Removing vegetation and disturbing the soil may increase wind erosion in areas that contain soil made up of fine sediment. During construction, erosion would be minimized using common dust suppression techniques, such as regularly watering exposed soils, stockpiling soils, and stabilizing

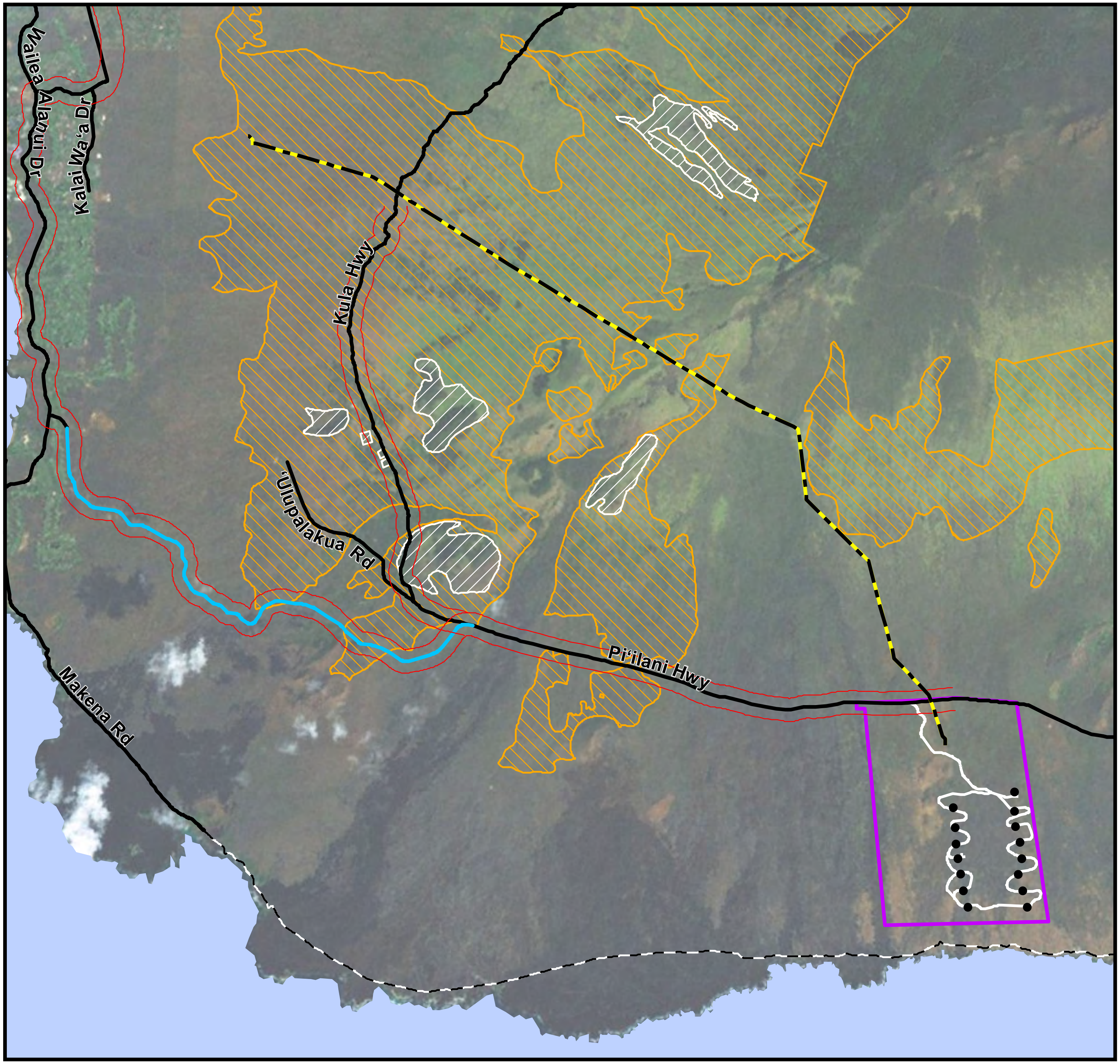

FIGURE 3.3-3

AUWAHI WIND PROJECT

AGRICULTURAL LANDS OF IMPORTANCE

- Wind farm site
- WTG
- Generator-Tie Line
- Site Access Road
- Construction Access Route
- Pāpaka Road
- Road
- Hoapili Trail

ALISH Designation

- Other Land
- Unclassified

DATA SOURCES:

Project Infrastructure:
Sempra Generation Energy
Land Types:
Agricultural Lands of Importance
State of Hawaii - Hawaii Statewide GIS Program 2011
City/Road:
ESRI Streetmap 2007

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MAUI, HI
JANUARY 14, 2011

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P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXDs\EIS\Sempra_Auwahi_EIS_Fig3_3-3_ALISH_85i11i_011411 - Last Accessed: 1/14/2011 - Map Scale correct at: ANSI A (11" x 8.5") soils. Excavation, grading, trenching, and other earth-disturbing activities can expose soils to runoff, potentially causing the formation of rills and gullies. The slope of the disturbed areas within the wind farm site could be as high as two to one (horizontal to vertical) on cut and fill slopes at the edges of access roads and laydown/assembly areas. Slope of the aggregate surface access roads may be up to 17 percent in the direction of travel if the straightened road alignment is selected, which would result in a higher potential for soil erosion, although with the implementation of BMPs (described below), the impacts would be similar to those described for the proposed WTG access road alignment. The slope of the disturbed areas along the proposed generator-tie line would typically follow the grade of the existing terrain.

To minimize impacts associated with soil erosion, the Applicant would prepare a TES) Plan that would be implemented by the construction contractor. The Temporary Erosion and Sediment Control (TESC) Plan would include standard stormwater BMPs including building during the summer months when rainfall potential is low, using silt fences or hay bales to prevent eroded soil from being transported offsite, and contouring to stop drainage from entering the site and to prevent runoff would also be implemented to reduce the risk of erosion. Temporary ditches and culverts used to capture and convey stormwater would be installed in areas of temporary disturbance. Permanent stormwater control structures would be installed to prevent erosion where access roads, buildings, storage areas, and parking areas are constructed. Upon completion of construction, disturbed areas would be revegetated; therefore, any potential effects would be short term and temporary. For these reasons, construction activities would not increase the probability of mass soil movement or wind or water erosion and would not result in long-term loss of soil productivity.

Impacts to Sensitive Species or Ecosystems

The proposed Project would not impact threatened or endangered plant species or sensitive systems (see Sections 3.6 – Vegetation and 3.7 – Wildlife) due to the potential for soil loss. Soil loss would be mitigated through BMPs; therefore, loss of soil would not threaten productivity or the existence of protected species or sensitive ecosystems.

Impacts from Loss of Agricultural Land

The wind farm site and Pāpaka Road generally contain soils with low productivity ratings. However, the western half of the proposed generator-tie line would be located in areas dominated by more productive soils. Although a small portion of Pāpaka Road and the western half of the proposed generator-tie line corridor are important to agriculture in Hawaiʻi, they exhibit properties, such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, and droughtiness that exclude them from being classified as prime or unique agricultural land. Therefore, no impacts to prime or unique agricultural land are anticipated. Upon completion of construction, disturbed areas would be revegetated and any construction impacts would be short-term and temporary.

3.3.3.3 Operations and Maintenance Impacts

Potential erosion impacts, including mass soil movement, would be less than significant because features designed to control stormwater and minimize erosion would be included in the site design and engineering. Of the area affected by construction of the proposed Project (98 hectares; 244 acres), only 32 percent of that area (31 hectares; 78 acres) would be permanently disturbed. Engineering and design features to minimize erosion would include stormwater management features and planting and maintaining vegetative cover.

During operations, roads, buildings, WTGs, generator-tie lines, and electrical collecting systems would be maintained in good condition to prevent adverse effects on soil resources. Routine servicing of all components of the proposed Project typically does not require heavy equipment such as large cranes that would disturb soil and increase erosion, but does require service vehicle access.

In the event of a major component replacement (e.g., blades, gearboxes, or WTGs), heavy equipment similar to that used during construction would be required and soil disturbance and erosion would result. Likewise, access by larger vehicles would be required for non-routine maintenance of the generator-tie line, which could also result in soil disturbance and erosion. However, in these instances, BMPs similar to those in place during construction would be followed, reducing soil impacts to less than significant. For these reasons, significant adverse impacts to soil resources would not be anticipated as a result of O&M activities, for both the proposed wind farm access road and straightened road alignments and the generator-tie line access road.

3.3.3.4 No Action Alternative

Under the No Action Alternative, there would be no new construction, modifications, or ground-disturbing activities. Therefore, there would be no potential to disturb soils or increase erosion and thus no impact to soil resources under the No Action Alternative.

3.3.3.5 Avoidance, Minimization, and Mitigation Measures

As described above, the Applicant will implement the erosion-reducing engineering and design features, industry-standard BMPs, and Project plans (e.g., TESC Plan) listed in Table 2-4, resulting in less than significant impacts to soil resources; therefore, no additional avoidance, minimization, or mitigation measures are required.

3.3.3.6 Summary of Impacts

Table 3.3-2 summarizes the potential impacts to soils associated with the proposed Project.

Table 3.3-2.
Summary of Potential Soils Impacts

Impact Issues	Proposed Project	No Action Alternative
Increase the probability or magnitude of mass soil movement through erosion (e.g., slope failures, slumps, or wind erosion)	⊙	○
Increase soil loss due to disturbance causing the formation of rills or gullies, and deposition of sediment in downgradient areas or water bodies	⊙	○
Cause a long-term loss of productivity or vegetative growth from compaction or mixing of soils	○	○
Cause a loss of soil that uniquely supports threatened or endangered plant species or sensitive existing ecosystems	○	○
Result in a loss of prime or unique farmland	○	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.
LEGEND:
⊗= Significant impact
⃠= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A= Not applicable
○= No impact

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3.4 NATURAL HAZARDS

3.4.1 Definition of Resource

A natural hazard is a naturally occurring event that could negatively affect people, infrastructure, and the environment. Many natural hazards can be triggered by another event, though they may occur in different geographical locations. For example, an earthquake can cause a tsunami in an entirely different geographic area. The ROI for natural hazards covers east Maui.

3.4.2 Existing Conditions

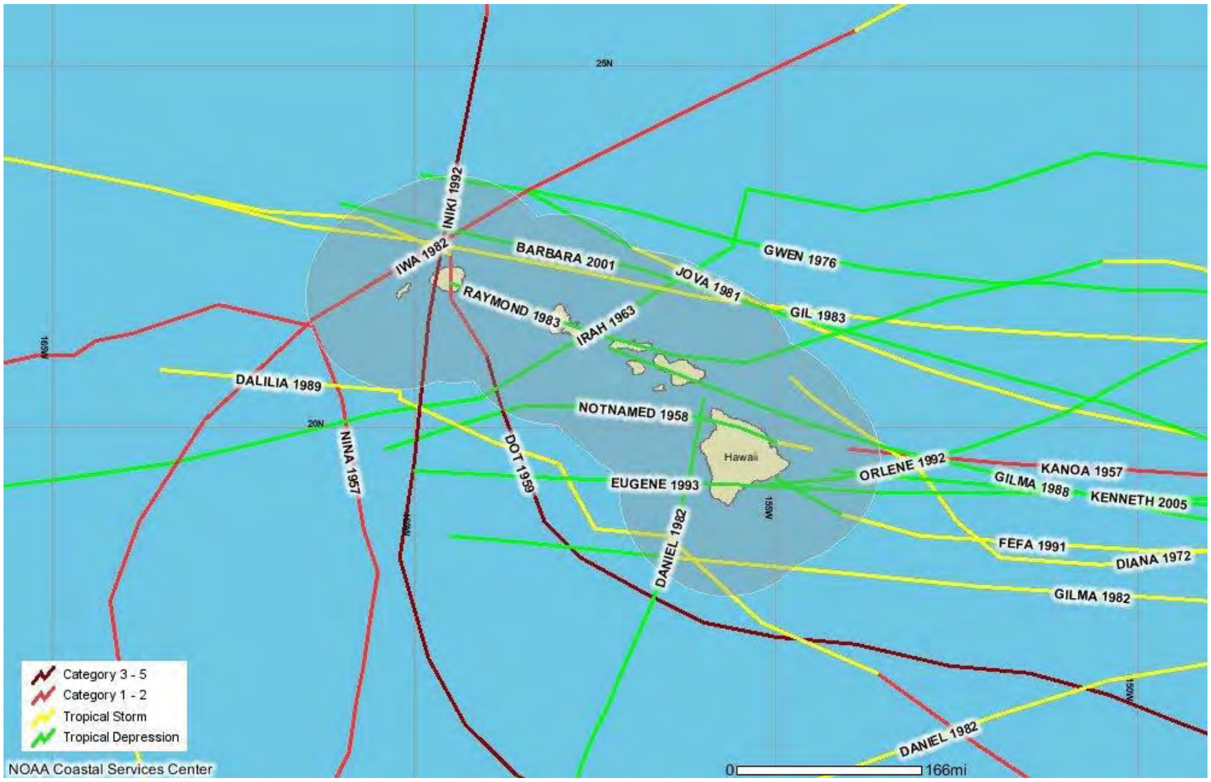
Although uncommon, a variety of natural hazards can affect Hawai'i, including hurricanes and tropical storms, tsunamis, volcanic eruptions, earthquakes, floods, and wildfires. Within the proposed Project, there is potential for all of the hazards listed above to occur. The potential for each of these hazards to affect the proposed Project is discussed in more detail below.

3.4.2.1 Hurricanes and Tropical Storms

Hurricanes develop over warm tropical oceans and have sustained winds that exceed 119 kph (74 mph). There are five hurricane categories: Category 1 is sustained winds between 119 and 153 kph (74 and 95 mph); Category 2 is sustained winds between 154 and 177 kph (96 and 110 mph); Category 3 is sustained winds between 179 and 211 kph (111 and 131 mph); Category 4 is sustained winds between 211 and 249 kph (131 and 155 mph); and Category 5 is sustained winds greater than 249 kph (155 mph; County of Maui 2010a). Tropical storms are similar to hurricanes, except that the sustained winds are less than 119 kph (74 mph). These events can also produce torrential rains. The Central Pacific Hurricane season runs from June 1 to November 30.

True hurricanes are rare in Hawai'i—only five have affected the islands over the last 50 years (Bussinger 1998; County of Maui 2010a). 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 2009a) (Figure 3.4-1). No hurricane or tropical storm has ever made landfall on the island of Maui (or Maui County, which includes Kaho'olawe, Lāna'i, Moloka'i, and Maui Islands) (County of Maui 2010a).

Figure 3.4-1. Hurricanes and Tropical Storms within 75 Miles of Hawai'i, 1949–2005



Source: County of Maui (2010a)

3.4.2.2 Tsunamis

Tsunamis are large, rapidly moving ocean waves triggered by disturbances around the Pacific Rim (i.e., teletsunamis) and by earthquakes and landslides near Hawai'i (e.g., local tsunamis). No portion of the proposed Project is in the Civil Defense Tsunami Evacuation Zone (NOAA 2010).

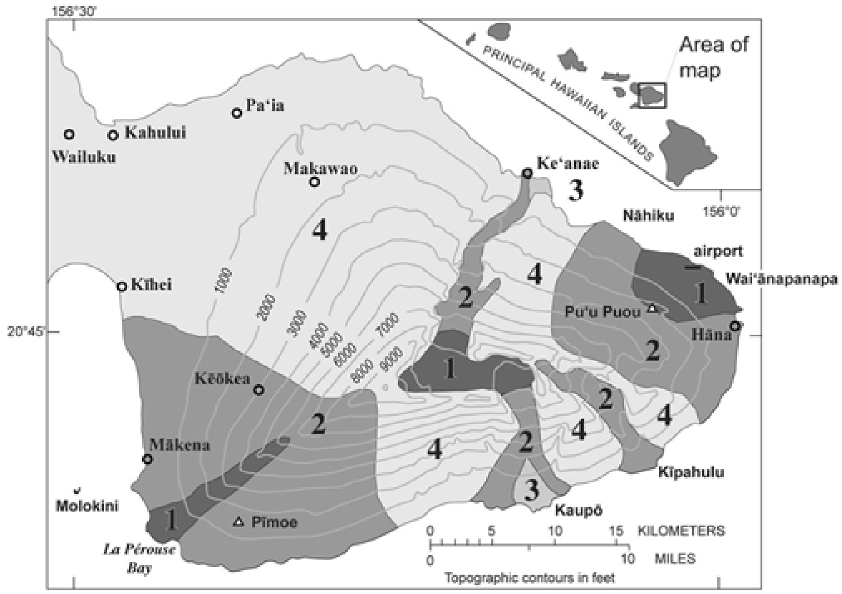
3.4.2.3 Volcanic Eruptions

Haleakalā is the only active volcano in Hawai'i not located on the Big Island (Hawai'i Island). The last eruption of Haleakalā 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, producing 8.7 square miles of lava flows (USGS 1996a).

Lava-flow hazards are rated on a scale of 1 through 9, with 1 being the zone of highest hazard and 9 being the zone of lowest hazard. Lava-flow hazard zones and the corresponding numbers are unique to each island. For example, East Maui's eruptive potential is much less than that of many places on Hawai'i Island. Maui's Zone 1 is most like Hawai'i Island's Zone 4 in terms of eruptive frequency (USGS 2010).

The wind farm site is in Zone 2; the proposed generator-tie line corridor is mostly in Zone 2, with a small portion in Zone 1; the interconnection substation is in Zone 2; and the construction access route is mostly in Zone 2 with a small section in Zone 1 (Figure 3.4-2).

Figure 3.4-2. Lava Flow Hazard Zones on East Maui



Lava flow hazard zones on East Maui

Zone 1—In past 1,500 years:
(1) At least five eruptive events, each with several lava flows;
(2) 50 percent of area covered by lava flows

Zone 2—In past 5,000 years:
(1) At least one episode of lava encroachment or lies within topographic boundary of areas that might be affected by upslope eruptions;
(2) 5–15 percent of area covered by lava flows

Zone 3—Area sheltered by topographic buildup, even though within potentially active lava-flow inundation zone

Zone 4—Area shield during past 100,000 years or for which off-axis volcanism has been sparse and sporadic in distribution.
Essentially no hazard from lava-flow inundation

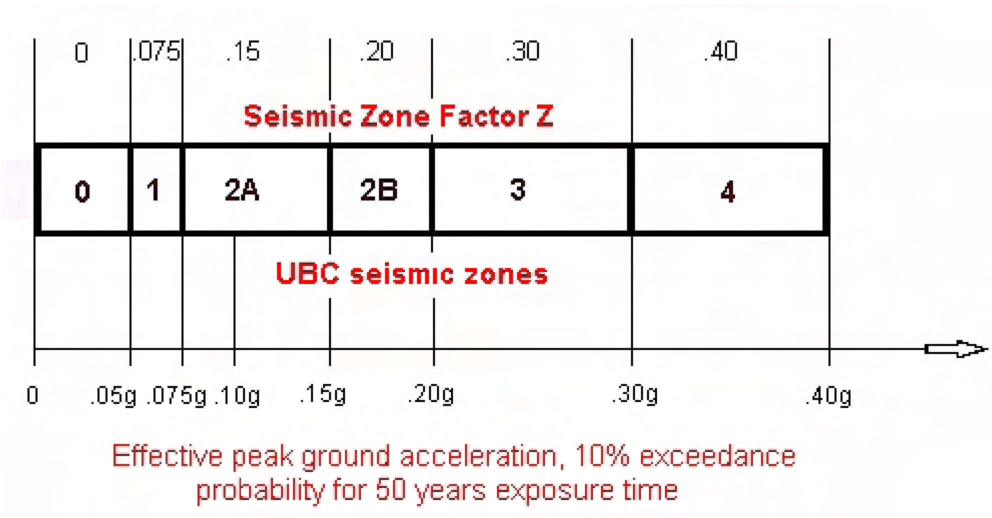
Source: USGS (2010)

3.4.2.4 Earthquakes and Seismicity

Earthquakes in Hawai'i are linked with volcanic activity (USGS 2001). The Uniform Building Code (UBC) was developed to address building codes in a specific area to account for seismic hazards. The UBC's seismic hazard is based on expected ground shaking strength and probability of specified time (USGS 2001). Hawai'i has four UBC seismic hazard zones. According to the U.S. Geological Survey (USGS), Zone 0 means that there is "no chance of severe ground shaking" and a seismic hazard rating of 4 means that there is a "10 percent chance of severe shaking in a 50-year interval" (USGS 2001). G-force is used to quantify the shaking (USGS 2001). See Figure 3.4-3 for a USGS illustration of seismic zones and g-force. All of Maui County has a UBC seismic risk zone ranking of 2B (Figure 3.4-4).

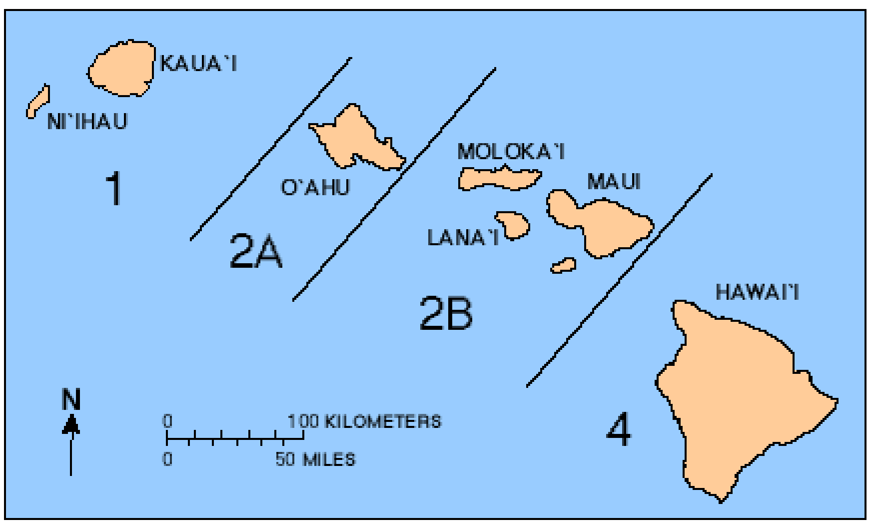
Studies by the University of Hawai'i suggest that Maui can expect a magnitude 3 to 5 earthquake to occur approximately every 2 to 5 years, and a magnitude 7 earthquake to happen approximately every 250 years (USGS 1996b). The 2006 version of the International Building Code will be used for design of structural components of the proposed Project.

Figure 3.4-3. UBC Seismic Zones and G-Force



Source: USGS (2001)

Figure 3.4-4. UBC Seismic Zones



Source: USGS (2001)

3.4.2.5 Flooding

Potential flood hazards are identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program and are mapped on the Flood Insurance Rate Maps. According to 2009 FEMA data, the flood zone designation for most of the proposed Project is designated as Flood Zone X. Zone X is assigned to those areas that are determined to be outside the 1 percent annual chance floodplain (Figure 3.4-5; FEMA 2009). A portion of the wind farm site near pads 8, 9, and 10 is designated as Flood Zone A, which corresponds to those areas determined to be subject to inundation by the 1 percent annual chance flood (FEMA 2009). Any construction within Flood Zone A would require a Flood Development Permit.

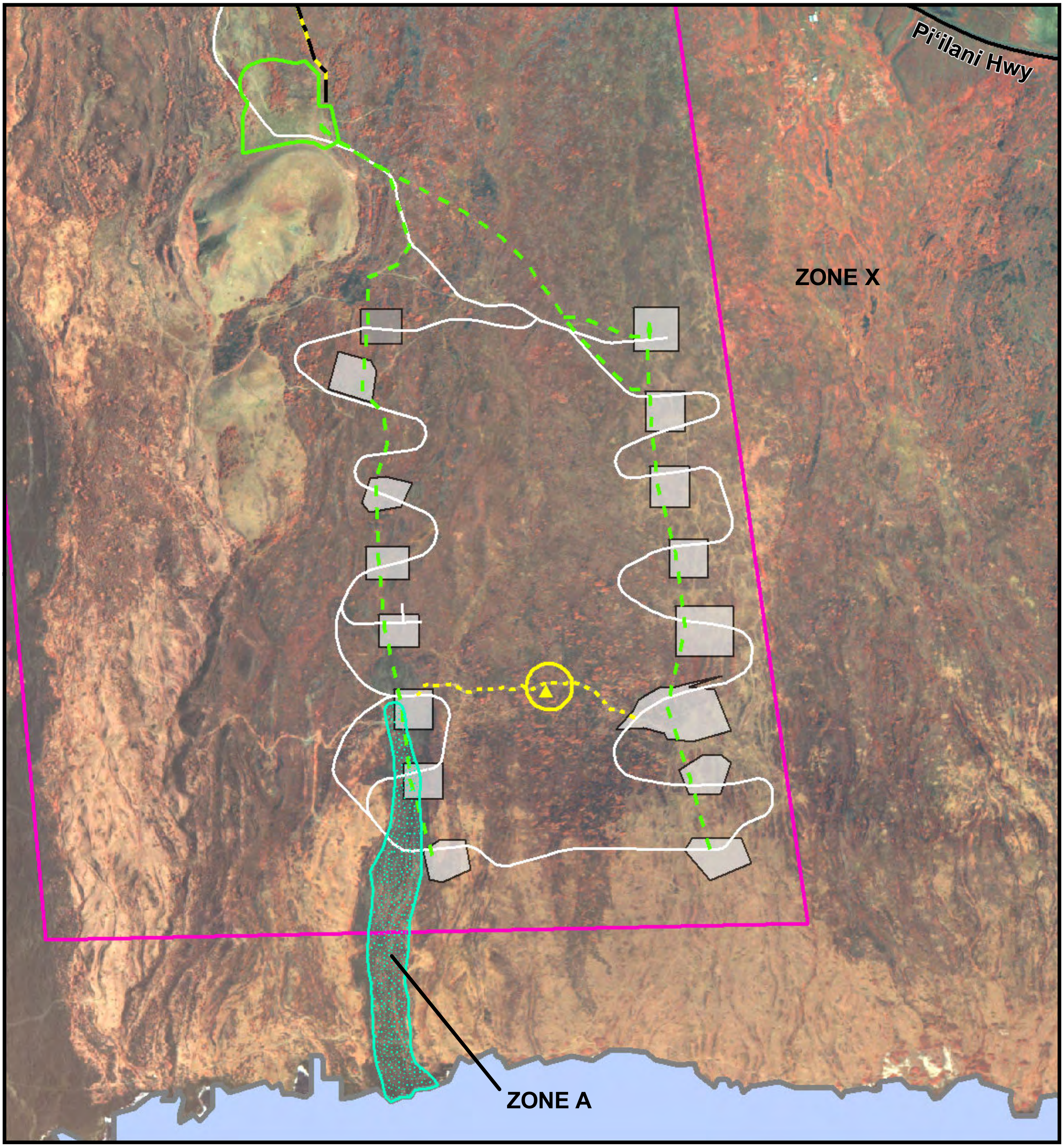


FIGURE 3.4-5

AUWAHI WIND PROJECT

FLOOD ZONE MAP

N

0 255 510 1,020
Feet

1:15,000
NAD 1983 UTM 4

MAUI, HI
JANUARY 14, 2011

Special Flood Hazard Area *
Wind Farm Site
Collector Switchyard/ Laydown Area
WTG Pad
Alternate WTG Pad
MET Tower
MET Tower Access Road
Generator-Tie Line
Site Access Road
Electrical Collection
Road

* Represents the area subject to inundation by the 1% annual chance flood

DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Road:
ESRI Streetmap 2007
Special Flood Hazard Area:
FEMA Flood Insurance Rate Map 2009

TETRA TECH EC,INC

P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXDs\EIS\Sempra_Auwahi_EIS_Fig3_4-5_SFHA_11i85i_011411 - Last Accessed: 1/14/2011 - Map Scale correct at: ANSI A (8.5" x 11")

3.4.2.6 Lightning Strikes

In Hawai'i, lightning does not occur as often or is not as severe as in many continental areas (NOAA 2007). It would therefore be uncommon for a lightning strike to start a fire in the proposed Project.

3.4.2.7 Wildfire

Wildfire occurs on all of the major Hawaiian Islands, with human activity the primary cause (Pacific Disaster Center 2008). Hawai'i's native ecosystems are not adapted to wildfire; therefore, wildfire can result in extinction of native species and increased coverage by non-native invasive species. Other effects include soil erosion, increased runoff, and decreased water quality. In Maui County, there were 1,291 brush fires that burned 26,000 hectares (64,248 acres; 100 square miles) between 1972 and 1999. The number of wildfires increased from 118 in 2000 to 271 in 2003 (Pacific Disaster Center 2008).

Based on the recollection of 'Ulupalakua Ranch personnel, there have been about six fires on or near 'Ulupalakua Ranch land within the past 6 years. With the exception of one unknown fire source, all of these fires were started by humans—most of them intentionally and some by carelessness (e.g., discarded cigarette from moving vehicle) (Kona'aihele 2010).

Sempra received statistics about the risk of fire in WTGs from the WTG manufacturers being considered for the proposed Project. As of October 2010, Siemens has installed over 11,000 MW worldwide with almost 4,000 MW in the United States. These figures include over 3,000 individual Siemens 2.3-MW WTGs representing approximately 7,000 MW of generating capacity. Of all the Siemens 2.3-MW WTGs installed worldwide, there have been no reported fires in the nacelle located at the top of the WTG tower. For fire prevention, Siemens installs smoke detectors in areas where there could be an electrical fire. The nacelles have an efficient lightning protection system consisting of steel mesh that acts as a Faraday Cage to prevent fires resulting from lightning strikes. The monitoring and control capability (both onsite and remote) further reduces the risk of fire by monitoring key component temperatures. In addition, the advanced Siemens 3.0-MW WTG has no gearbox lubricating oil inside the nacelle because the direct drive design eliminates the gearbox. Therefore, this WTG design should reduce the risk of fire even further. Another WTG being evaluated is the GE 1.5-MW model. GE has installed almost 15,000 wind turbines of this type worldwide over the past ten years. During this period, the rate of fire was less than three-tenths of one percent (0.027 percent), representing four reported fires out of nearly 15,000 installations. GE determined the cause was a faulty capacitor inside the converter cabinet, and subsequently fixed the problem in 2004. The affected area was inside the bottom part of the steel tower shell and did not involve the nacelle at the top of the tower. Like other WTG suppliers, GE has over-temperature sensors that will shut down the WTG if normal temperature limits are exceeded.

3.4.3 Potential Impacts and Mitigation Measures

3.4.3.1 Impact Methodology and Factors Considered for Impacts Analysis

Impacts from natural hazards are assessed qualitatively based on known information about natural hazard occurrences on Maui. Although the occurrence rate is very low, construction and operations of the proposed Project could be adversely affected by a natural hazard such as a hurricane or earthquake. Depending on the severity of the natural hazard, electrical supply to the MECO grid could be disrupted. Construction and operations of the proposed Project would increase the potential for wildfires related to the use of vehicles and electrical equipment and increased human presence in the proposed Project. Depending on which WTG model is selected and geotechnical studies to be conducted during the final design, the WTG access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Section 2.1.1.2 for additional details). If the straightened road alignment is selected, the impacts would be the same as those described below for the proposed WTG access road.

3.4.3.2 Construction Impacts

In the event of a hurricane, tropical storm, tsunami, volcanic eruption, earthquake, flooding, lightning, or a wildfire, safety procedures in the Site Safety Handbook would be implemented. For more information on the Site Safety Handbook, see Section 3.15 – Public and Construction Safety.

Hurricanes and Tropical Storms

No impacts to construction activities resulting from hurricanes or tropical storms are anticipated. In the event that the National Weather Service issues a storm watch or warning, the site construction manager would be responsible for implementing the appropriate procedures in accordance with the Site Safety Handbook to ensure the safety of staff.

Tsunamis

No impacts to the proposed Project from tsunamis are anticipated. No portion of the proposed Project is within the Civil Defense Tsunami Evacuation Zone (Hawai‘i State Civil Defense 2008).

Volcanic Eruptions

The probability of impacts to the proposed Project from volcanic eruptions anticipated from the proposed Project during the construction phase is low. The site is in an area of a lava-flow hazard rated as Zone 2, and there is the possibility that Haleakalā could erupt even though it is not currently active (USGS 2010). If an eruption and lava flow near the wind farm site or generator-tie line occurred, electrical service to the MECO grid would likely be disrupted. Such an occurrence would be out of the Project's control. The site construction manger would be responsible for implementing the appropriate procedures in accordance with the Site Safety Handbook to ensure the safety of staff if government agencies issue a warning or if there is an eruption.

Earthquakes and Seismicity

No impacts to the proposed Project from earthquakes and seismicity are anticipated during construction. As discussed in Section 3.4.2.4, all of Maui is designated as seismic zone 2B (USGS 2010). To reduce the risk of earthquake damage, all structural elements of the proposed Project would meet or exceed current building code requirements for the seismic risk on Maui. The current design standard is defined by the 2006 UBC. In the event of an earthquake, the site construction manager would be responsible for implementing the appropriate procedures in accordance with the Site Safety Handbook.

Flooding

No impacts to the proposed Project from flooding are anticipated from the proposed Project during the construction phase due to the low anticipated flooding frequency of the area in which the propose Project is located. However, because a portion of the wind farm site near pads 8, 9, and 10 is located in Flood Zone A, a Flood Development Permit will obtained prior to construction.

Lightning Strikes

The potential for lightning strikes on construction cranes is low because lightning does not occur in this area very often. In addition, construction cranes would be equipped with protection systems in accordance with the International Electrotechnical Commission (IEC) publication 61400-24 (IEC 2010). On occasion, lightning does strike cranes.

Wildfire

The proposed Project would increase the potential for wildfires associated with the use of vehicles and electrical equipment and increased human presence near the proposed Project. The risk would be highest during the construction phase. Sparks from vehicles and construction equipment, spark-producing construction activities such as welding, and improper disposal of matches or cigarettes, for example, could start a fire. There would also be increased presence and use of petroleum products, including oils and lubricants onsite, thereby increasing the potential for fires.

Of particular concern is the generator-tie line corridor and its close proximity to the Hawai‘i Kanaio NAR and the Auwahi Forest Restoration Project site. An FMP has been prepared for the proposed Project. The FMP analyzed the available pertinent information including fuel conditions, weather and climate conditions, fire history of Maui, terrain, firefighter access, and other factors (see Appendix A). The FMP concluded that through a program of engineering, maintenance, and fuels management, the fire risk posed by the wind farm and the generator-tie line is low and could be mitigated to acceptable levels.

Implementation of the FMP would include education of Auwahi Wind employees of the fire risk, standard regular maintenance of all WTGs and electrical components, fuels reduction in high-priority areas via grazing, construction of firebreaks in high-priority areas, and construction of a water source for aerial resources and ground-based firefighters near high-priority areas. Pi‘ilani Highway creates a natural firebreak between the wind farm site and upcountry. The FMP also establishes the responsibilities of each stakeholder. For specific information on the wildfire risk and mitigation measures, see the FMP included in Appendix A, which has been reviewed by both the Hawai‘i State Division of Forestry and Wildlife (DOFAW) and U.S. Fish and Wildlife Service (USFWS). Section 3.17 – Public Infrastructure and Services also discusses the capabilities to suppress and respond to fires.

The impacts related to wildfires are anticipated to be less than significant with mitigation measures in place. There would also be beneficial impacts because additional fire prevention practices and firefighting resources (e.g., water tank, firebreaks, fuel breaks, etc.) and management procedures would be implemented during construction.

3.4.3.3 Operations and Maintenance Impacts

Hurricanes and Tropical Storms

Impacts to the O&M of the proposed Project from hurricanes or tropical storms are anticipated to be low. The WTGs being considered for this proposed Project are designed to operate in winds up to approximately 89 kph (55 mph). When the wind speed reaches 3.5 meters per second (11.4 feet per second or 7.8 mph), the controller automatically “pitches” the blades into the wind and the rotor starts low speed revolutions. At wind speeds in excess of 25 meters per second (82 feet per second) or 89 kph (55 mph), the controller automatically “pitches” the blades out of the wind and the rotor comes to a complete stop until the wind speeds drop below 25 meters per second (82 feet per second) or 89 kph (55 mph). In the unlikely event that wind speeds are high enough to damage a WTG and cause it to fall, the damage would likely be confined to the site and potentially the areas immediately adjacent. See Section 3.15 – Public and Construction Safety, for more information on tower collapse and blade throw. It is very rare for a WTG to collapse or rotor blades to be dropped or thrown from the nacelle, but such incidents do occur. The closest structures are approximately 0.5 mile away.

Tsunamis

Impacts are the same as those discussed for the construction phase; no impacts to the proposed Project O&M from tsunamis are anticipated.

Volcanic Eruptions

Impacts are the same as those discussed for the construction phase; no impacts to the proposed Project O&M from volcanic eruptions are anticipated.

Earthquakes and Seismicity

Impacts are the same as those discussed for the construction phase; no impacts to the proposed Project O&M from earthquakes or seismicity are anticipated. The wind farm is designed to withstand earthquakes per the appliance building codes for Maui's seismic zone 2B and the Design Site Class B under the International Building Code (2006 Edition). If an earthquake occurred, it is possible that the electricity fed to the MECO grid could be disrupted.

Flooding

Impacts are the same as those discussed for the construction phase; no impacts to the proposed Project O&M from flooding are anticipated. As noted above, because a portion of the wind farm site near pads 8, 9, and 10 is located in Flood Zone A, a Flood Development Permit will obtained prior to construction.

Lightning Strikes and WTG Fires

The risk of lightning strikes in Hawai'i is lower than in many continental areas (NOAA 2007). WTGs are designed with lightning receptors and are grounded to mitigate the effects of a lightning strike (IEEE 2010), and all WTGs would be compliant with IEC 61400-24 (IEC 2010). As identified in Section 3.4.2.7, the data provided by both Siemens and GE demonstrated that the chance of fire in a WTG is negligible. Maintenance of mechanical and electrical systems in the turbine and nacelle would occur regularly, as recommended by the manufacturer, to limit mechanical failures. See Section 3.15 – Public and Construction Safety for more information on WTG fires. The impacts related to lightning strikes and WTG fires are anticipated to be less than significant. An emergency plan in accordance with Confederation of Fire Protection Associations guidelines (CFPA 2010) would be prepared to help limit equipment losses and potential fire spread within components of the WTG and the wind farm site area because of lightning strikes.

Wildfire

As with the impacts discussed for the construction phase, the O&M phase of the proposed Project requires implementation of the FMP. The FMP includes measures for the O&M phase similar to that described above for construction (see Appendix A).

3.4.3.4 No Action Alternative

No impacts to the proposed Project related to natural hazards would occur under the No Action Alternative because the proposed Project would not be built and conditions would remain unchanged.

3.4.3.5 Avoidance, Minimization, and Mitigation Measures

The potential for impacts from natural hazards is low. As described above, the Applicant will implement the design features, industry-standard BMPs, and Project plans (e.g., the Site Safety Handbook) listed in Table 2-4, which will result in less than significant impacts related to natural hazards; therefore, no additional avoidance, minimization, or mitigation measures are required. In the event of an emergency, Pāpaka Road may be opened for public use to assist in an evacuation.

3.4.4 Summary of Impacts

Natural hazards associated with the proposed Project are summarized in Table 3.4-1.

Table 3.4-1.
Summary of Potential Natural Hazards Impacts

Impact Issues	Proposed Project	No Action Alternative
Hurricanes and Tropical Storms	○	○
Tsunamis	○	○
Volcanic Eruptions	○	○
Earthquakes and Seismicity	○	○
Flooding	⊙	○
Lightning Strikes and WTG Fires	⊙	○
Wildfires	⊙ / +	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⦸= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A= Not applicable
○= No impact

3.5 HYDROLOGY AND WATER RESOURCES

3.5.1 Definition of Resource

Hydrology and water resources include groundwater, surface water features, and other resources such as watersheds and floodplains. Groundwater refers to the subsurface hydrologic resources, often 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. For the purposes of this analysis, the ROI includes the proposed wind farm site, generator-tie line corridor, interconnection substation location, and construction access route (Pāpaka Road).

3.5.2 Existing Conditions

The western half of the wind farm site is in the Kanaio watershed and the eastern half is in the Kipapa watershed. The generator-tie line spans the Kanaio and Wailea watersheds, with the boundary located along the southwest rift zone. Pāpaka Road crosses through the Kanaio, ʻAhihi Kinaʻu, Moʻoloa and Wailea watersheds. The general characteristics of these watersheds are listed in Table 3.5-1.

Table 3.5-1.
Characteristics of Watersheds in the Proposed Project

Watershed Name	Watershed area (acres)	Perennial Streams	Range of Annual Rainfall (inches)
ʻAhihi Kinaʻu	2,986.7	None	15.75 to 29.53
Kanaio	18,409.9	None	15.75 to 39.37
Kipapa	20,743.4	None	19.69 to 39.37
Moʻoloa	1,212.6	None	9.84 to 29.53
Wailea	21,985.5	None	9.84 to 39.37

Source: Hawaiʻi Institute of Marine Biology (2006)

3.5.2.1 Groundwater

Within the watersheds, the wind farm site is located in the Lualailua aquifer subunit (aquifer code 60603) of the Kahikinui aquifer unit (aquifer code 606) that have sustainable yields of 11 and 36 million gallons per day (MGD), respectively (CWRM 2008). The Laulailua aquifer consists of an upper unconfined aquifer and lower basal aquifer. The unconfined aquifer consists of perched fresh water (less than 250 milligrams per liter of chlorine) that has potential use as a drinking water source and has a high vulnerability to contamination. The basal aquifer is an unconfined flank aquifer with low salinity (250 to 1,000 milligrams per liter of chlorine). It is a potential drinking water source and is moderately vulnerable to contamination (Mink and Lau 1990).

Within the watersheds, the generator-tie line and Pāpaka Road both cross into the Kamaole aquifer (aquifer code 60304) of the Central hydrologic unit (aquifer code 603), which have sustainable yields of 11 and 27 MGD, respectively (CWRM 2008). The Kamaole subunit consists of an upper dyke impounded aquifer and a lower basal unconfined flank aquifer. The upper unconfined aquifer has potential drinking water use, has fresh to low salinity (less than 250 to 1,000 milligrams per liter of chlorine), is irreplaceable, and has a moderate to high vulnerability to contamination. The basal aquifer is not used as a drinking water source, has moderate to high salinity (1,000 to 5,000 milligrams per liter of chlorine), is replaceable, and has a moderate to high vulnerability to contamination (Mink and Lau 1990).

Given the steep terrain and lack of surface water features throughout the ROI (see additional discussion below), it is believed that the groundwater levels are deep below the ground surface. No groundwater was encountered in the borings (ranging from 9.8 meters to 12.5 meters [32 feet to 41 feet] deep) conducted during the geotechnical investigation (Black & Veatch 2008).

Groundwater recharge in the area is limited by surface conditions. Surface soils in the ROI consist of well-drained stony soils, young lava flows, and exposed bedrock as detailed in Section 3.3 – Soils. These soils, and the limited existing development of impervious structures such as buildings, roads, and other infrastructure, allow for substantial amounts of precipitation to infiltrate into the groundwater system beneath the ROI.

3.5.2.2 Surface Water

There are no wetlands or other perennial surface water features within the proposed Project. No "waters of the U.S." are in or near the proposed Project that are subject to jurisdiction under Section 404 of the Clean Water Act (CWA; David and Guinther 2011). The proposed Project is subject to compliance with CWA Section 402, the National Pollutant Discharge Elimination System (NPDES), for construction activities. There are several broad drainage swales along Pāpaka Road that are generally grass-dominated and have no defined bed and bank features that demonstrate conveyance of stormwater runoff from upland areas. There is also a gully between Mākena (near the proposed interconnection substation) and Lualailua Hills (east of the wind farm site) along the western edge of the wind farm site, west of the WTG pads and internal access roads. These drainage features are characterized by low-volume, infrequent, or short duration flows. They carry water only during exceptional storms, with flow ceasing soon after the rainfall ends. The jurisdictional waters determination is included in Appendix B. Existing site drainage patterns are described in the Preliminary Drainage Report in Appendix C.

3.5.3 Potential Impacts and Mitigation Measures

3.5.3.1 Impact Methodology and Factors Considered for Impacts Analysis

The proposed Project was evaluated to assess the potential effects on hydrologic conditions. Factors considered in determining whether the proposed Project would have a significant impact on groundwater include:

- Groundwater quality degradation causing groundwater quality to exceed state or federal standards; or
- Groundwater depletion or interference with groundwater recharge that adversely affects existing or proposed uses of the groundwater aquifer.

There would be a significant impact to surface water hydrology of the Project site and region if construction or operations of the proposed Project were to cause:

- Contamination of surface water from erosion or stormwater runoff that would be a violation of federal or state water quality standards;
- Degradation of surface water quality causing a long-term loss of use by humans or aquatic wildlife and plants; or
- Alteration of the existing drainage pattern of the site or area that would cause offsite erosion or siltation, adversely affecting adjacent properties.

3.5.3.2 Construction Impacts

Groundwater

During construction, approximately 25,000 gallons per day of water would be required for dust suppression and emergency fire suppression. This water would either come from an existing source (trucked in or pumped from the Mākena Resort; see Section 3.17 – Public Infrastructure and Services for additional information) or would be obtained from an onsite well. If an onsite well is required, the well would be constructed within the wind farm site and would tap into the Lualailua aquifer. The Lualailua aquifer has a sustained yield, or maximum amount that can be developed or extracted for water supply, of 11 MGD. The amount of water required by the Project comprises less than one percent the capacity of this aquifer. Therefore, construction of the proposed Project would not measurably reduce the quantity of available groundwater in the ROI.

Construction activities would require the use of hazardous materials such as fuels (e.g., diesel fuel, gasoline), lubricants, cleaning solvents, and paints. If these materials were to enter stormwater, they could reduce groundwater quality. Prior to construction, Auwahi Wind would prepare a project Spill Prevention, Containment, and Countermeasures (SPCC) Plan that would include measures for the safe transport, handling, and storage of these materials (see Section 2.1.4). The groundwater in the Lualailua aquifer is considered to have high vulnerability to contamination; however, with implementation of the SPCC Plan, in addition to the absence of surface water features in the ROI to provide groundwater recharge, construction of the proposed Project would have negligible adverse impacts to groundwater quality.

Surface Water

Construction of the proposed Project would not disturb any surface waters or intermittent drainage features. The generator-tie line would span the upper portion of the gully between Mākena and Lualailua Hills north of Upcountry Pi‘ilani Highway, so no disturbance would occur in the gulch. In addition, the proposed Project would be designed to minimize changes to naturally existing topography and drainage and to ensure that, during construction, stormwater is conveyed away from structures and directed to the designated drainage systems. Therefore, conditions that would increase the potential for flood hazards are not expected.

Ground disturbance during construction of the proposed Project would increase the potential for sediment and other pollutants present onsite to become entrained in stormwater runoff and flow into receiving surface waters (Pacific Ocean). In compliance with the U.S. Environmental Protection Agency (EPA) NPDES regulations, Auwahi Wind would prepare a site-specific Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would include BMPs to reduce impacts to hydrology, drainage, and surface waters (see Section 2.1.4). The Applicant would also prepare a TESC Plan. Erosion control measures included in the TESC Plan and employed during construction would prevent water quality degradation from stormwater runoff (see Section 2.1.4). Therefore, any Project-related impacts to surface water quality, if any, would be highly localized, short-term, and temporary.

3.5.3.3 Operations and Maintenance Impacts

Groundwater

The proposed Project would result in a small increase in the amount of new impervious (concrete) and semi-impervious (aggregate) surfaces in the ROI (approximately 31 hectares [78 acres]) of which only 2.4 hectares (5.9 acres) would be truly impervious. The semi-impervious area would be approximately 4 hectares (10 acres) acres less if internal access roads were to be constructed because the straightened road alignment was selected (see Chapter 2 for details). Aggregate is considered semi-impervious because it has a runoff coefficient (percentage of precipitation that appears as runoff) approximately midway between that of pervious and impervious surfaces, thereby allowing some infiltration. Precipitation falling on these new impervious surfaces would drain to adjacent pervious surfaces, and therefore O&M of the proposed Project would not measurably reduce the potential for groundwater recharge.

During O&M, water would be required for use at the O&M building resulting in an average daily demand of approximately 3,006 liters (529 gallons) of water per day, with a maximum daily demand of 6,007 liters (794 gallons) and a peak hour demand of 4.2 liters per minute (1.1 gallons per minute). These estimates are based on HAR § 11-62 and represent a preliminary, conservative estimate. It is anticipated that actual domestic water consumption during Project operations would be less. If water were to be sourced from an onsite well as described above, the proposed Project would result in a very minor increase in demand. If a well was not installed, water for the O&M building would be trucked or pumped in and stored in tanks for operations. Therefore, operations of the proposed Project would not measurably reduce the quantity of available groundwater in the ROI.

In addition, an irrigation system would be established where the generator-tie line runs adjacent to the Kanaio NAR. This system would be used to keep the vegetation in this area green, thereby reducing fire risk, and would also be used for fire fighting should a fire erupt in this area. Water for the system would come from an existing 50,000-gallon tank located approximately 2 kilometers (1.2 miles) west of the generator-tie line. This tank is filled and used as part of normal ranch operations and would be available for use if a fire were to occur during Project operations. Thus, no new water source would be required for this use.

Surface Water

As noted above, the proposed Project would result in a minor increase in the amount of impervious surface in the ROI. Because very little impermeable surface would be added, the proposed Project would not substantially increase the volume of stormwater runoff that reaches established watercourses. A preliminary drainage plan is provided in Appendix C of the Draft EIS.

Alterations to topography within the proposed Project resulting from site grading and construction for the WTG pads, access roads, and other permanent Project structures would be highly localized and consequently would alter drainage patterns and stormwater runoff pathways locally. Therefore, the operations of the proposed Project would not affect hydrology or water resources in the ROI over the long term. A detailed discussion of Project drainage patterns and impacts is provided in Appendix C.

3.5.3.4 No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed and the current drainage patterns and groundwater recharge on the site would not be altered. Therefore, there would be no impact to hydrologic resources under the No Action Alternative.

3.5.3.5 Avoidance, Minimization, and Mitigation Measures

As described above, the Applicant will implement the design features, industry-standard BMPs, and Project plans (e.g., SPCC, TESC, and SWPP Plans) listed in Table 2-4 related to hydrology, drainage, and water quality, which will result in less than significant impacts to hydrology and water resources; therefore, no additional avoidance, minimization, or mitigation measures are required.

3.5.3.6 Summary of Impacts

Table 3.5-2 summarizes potential impacts to water resources.

Table 3.5-2.
Summary of Potential Water Resources Impacts

Impact Issues	Proposed Project	No Action Alternative
Groundwater quality degradation	⊙	○
Groundwater depletion or interference with groundwater recharge	⊙	○
Reductions in surface water quality or quantity	○	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:
⊗= Significant impact
⃠= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A = Not applicable
○= No impact

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3.6 VEGETATION

3.6.1 Definition of Resource

The following section presents a general overview of vegetation communities and rare or special status plant species. The ROI for vegetation impacts includes the proposed wind farm site and interconnection substation as well as the area within a 0.4-kilometer (0.25-mile) buffer around the generator-tie line corridor centerline and construction access route (Pāpaka Road). This area encompasses the disturbance footprint of the proposed Project, or the area where potential direct effects to vegetation could occur, as well as areas where indirect effects to vegetation such as invasive plant species introduction and increased fire risk could occur. The analysis of impacts to vegetation communities and special status plant species during construction and O&M of the proposed Project, as well as the mitigation measures that are part of the proposed Project, are also presented.

Sources of information used in the preparation of this analysis include state and federal agency data as well as the results of Project-specific surveys as follows:

- The Hawaiian Biodiversity and Mapping Program (data on land cover and species occurrences acquired in May 2010), and
- Botanical surveys conducted in the proposed Project in 2007 and 2010 (David and Guinther 2011).

3.6.2 Existing Environment

A reconnaissance-level botanical survey of the proposed Project was conducted in May 2007. A more detailed botanical survey, focusing on specific areas where direct disturbance is proposed, was conducted between May and October 2010 (David and Guinther 2011). The objectives of the 2010 surveys were to map vegetation communities within the ROI and to determine the presence of any federally or state-listed species, other special status species, or rare native plant species. Proposed Project areas surveyed in 2010 included 0.6 hectare (1.5 acres) around each turbine pad; 20 meters (66 feet) on either side of the wind farm access road centerlines, Pāpaka Road centerline, and the generator-tie line corridor centerline; and the 0.8-hectare (2.0-acre) interconnection substation site.

Species that are federally listed as threatened or endangered are protected under the Endangered Species Act of 1973 (ESA) (16 United States Code [U.S.C.] §§ 1531-1544) as amended. Likewise, species listed as threatened or endangered by the state of Hawai‘i are protected under Hawai‘i state law (HRS § 195D-4). A complete list of plant species observed during the botanical surveys is included in Appendix D.

3.6.2.1 Vegetation Communities

The proposed Project is located on the leeward side of Haleakalā in the Hawaiian dry tropical forest ecoregion. The ROI consists primarily of disturbed grasslands and shrublands used for grazing, with scattered remnants of the native dryland forest and shrublands that historically occupied the entire area. These remnants include several groves of native wiliwili (*Erythrina sandwicensis*;endemic to Hawai‘i) mixed with non-native species including kiawe (*Prosopis pallida*) and koa haole (*Leucaena leucocephala*). The intactness of the understory plant community in these groves, or the extent to which they support the original suite of native species, depends on the underlying substrate and grazing pressure. In general, portions of the ROI located on recent lava flows coincide with areas of native vegetation (David and Guinther 2011). Most of the wiliwili groves in the ROI have a degraded understory primarily consisting of non-native shrubs or a mixture of grasses and shrubs, supporting few native plant species.

A more detailed description of the vegetation communities that occur within the wind farm site, generator-tie line corridor, interconnection substation, and along the construction access route is provided below. Table 3.6-1 provides a summary of the general vegetation communities within the ROI. There are no wetlands or vegetation characteristics indicative of wetlands onsite (David and Guinther 2011). Hydrology and water resources are described in Section 3.5 – Hydrology and Water Resources.

Table 3.6-1.
Vegetation Communities Within the ROI

Vegetation Community	Acres	Percent of ROI
Grassland/Pasture	2,035	35
Scrub/shrub	2,241	38
Savanna	481	8
Mixed native forest	745	13
Secondary/non-native forest	36	1
Disturbed/Developed	256	4
Restoration Area	33	1
Total	**5,825**	**100**

Vegetation communities were mapped during 2010 botanical surveys (David and Guinther 2011).

Wind Farm Site

The wind farm site is characterized by a combination of dry, rocky pastureland and scrub vegetation on rugged lava flows. This area, heavily grazed by cattle and feral ungulates, 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*). There are several well-developed groves of wiliwili, a few scattered native trees such as hao (*Rauvolfia sandwicensis*), and some large specimens of naio (*Myoporum sandwicense).*

Generator-tie Line and Interconnection Substation

The generator-tie line traverses several plant communities along its route, which travels mauka (inland) from the wind farm site, toward the Southwest Rift ridgeline, crosses the ridgeline, and then descends to the Wailea substation. Vegetation communities include dry shrubland/scrub vegetation (from the wind farm site upslope to approximately 1,220 meters [4,000 feet] ASL) dominated by koa haole, glycine, lantana (*Lantana camara*), buffel grass (*Cenchrus ciliaris*), narrow-leaved plantain (*Plantago lanceolata*); grasslands and pastures (from approximately 1,220 meters [4,000 feet] to 305 meters [1,000 feet] ASL on the windward slope) dominated by kikuyu grass (*Pennisetum clandestinum*), and Guinea grass (*Urochloa maxima*); and savanna (below 365 meters [1,200 feet] on the windward slope) consisting of grassland with scattered trees and dominated by kikuyu grass, sweet vernal grass (*Anthoxanthum odoratum*), and kiawe trees. Areas crossed by the generator-tie line are also grazed by cattle and feral ungulates and are dominated by non-native species interspersed with patches of native vegetation. The savannah transitions to dryland forest as indicated by increased canopy cover below 240 meters (800 feet) ASL but this vegetation community occurs outside the generator-tie line corridor. The most significant remaining dryland forest in the vicinity is located within the adjacent Kanaio NAR, located west (but outside) of the generator-tie line corridor. Figure 3.6-1 depicts vegetation communities mapped during botanical surveys (David and Guinther 2011) within each community.

Construction Access Route (Pāpaka Road)

The eastern half of Pāpaka Road, between Upcountry Piʻilani Highway and approximately 780 feet ASL, is characterized by a combination of dry rocky pastureland and scrub vegetation. Species including koa haole, indigo (*Indigofera suffruticosa*), ʻākia (*Wikstroemia oahuensis*), ʻaʻaliʻi, glycine, air plant (*Kalanchoë pinnata*), and ʻuhaloa (*Waltheria indica*) are common to abundant. A relatively recent lava flow located along the west side of the Puʻu Naio cinder cone supports native species including natal redtop, ʻaʻaliʻi, common sword fern (*Nephrolepis multiflora*), and lantana (*Lantana camara*). Downslope, the vegetation changes gradually to a kiawe/buffel grass association mixed with groves of wiliwili.

3.6.2.2 Special Status and Rare Plant Species

Information about special status plants that could potentially occur in the ROI (Table 3.6-2) was obtained from the Hawaiʻi Biodiversity and Mapping Database from known records in the vicinity. Three special status species were documented within the area surveyed in 2010 (David and Guinther 2011). Botanical surveys conducted in 2007 and 2010 documented 59 plant species within the wind farm site, 136 species adjacent to and within the generator-tie line corridor, and 98 species along the construction access road, including a number of rare or uncommon endemic (native to Hawaiʻi and found naturally nowhere else) and indigenous (native to Hawaiʻi but not unique to the Hawaiian Islands) species. Species found during the 2010 botanical surveys are listed in Appendix D. It should be noted that some species documented during the 2007 surveys, which covered a broader area than the proposed Project, were not documented in 2010, including the endangered mahoe. These species, in addition to those listed in Table 3.6-2 that were documented in the Hawaiʻi Biodiversity and Mapping Database but not during Project botanical surveys still have potential to occur within the proposed Project vicinity depending on conditions from year to year. Prior to construction, additional botanical surveys would be conducted to identify occurrences, if any, of special status plant species.

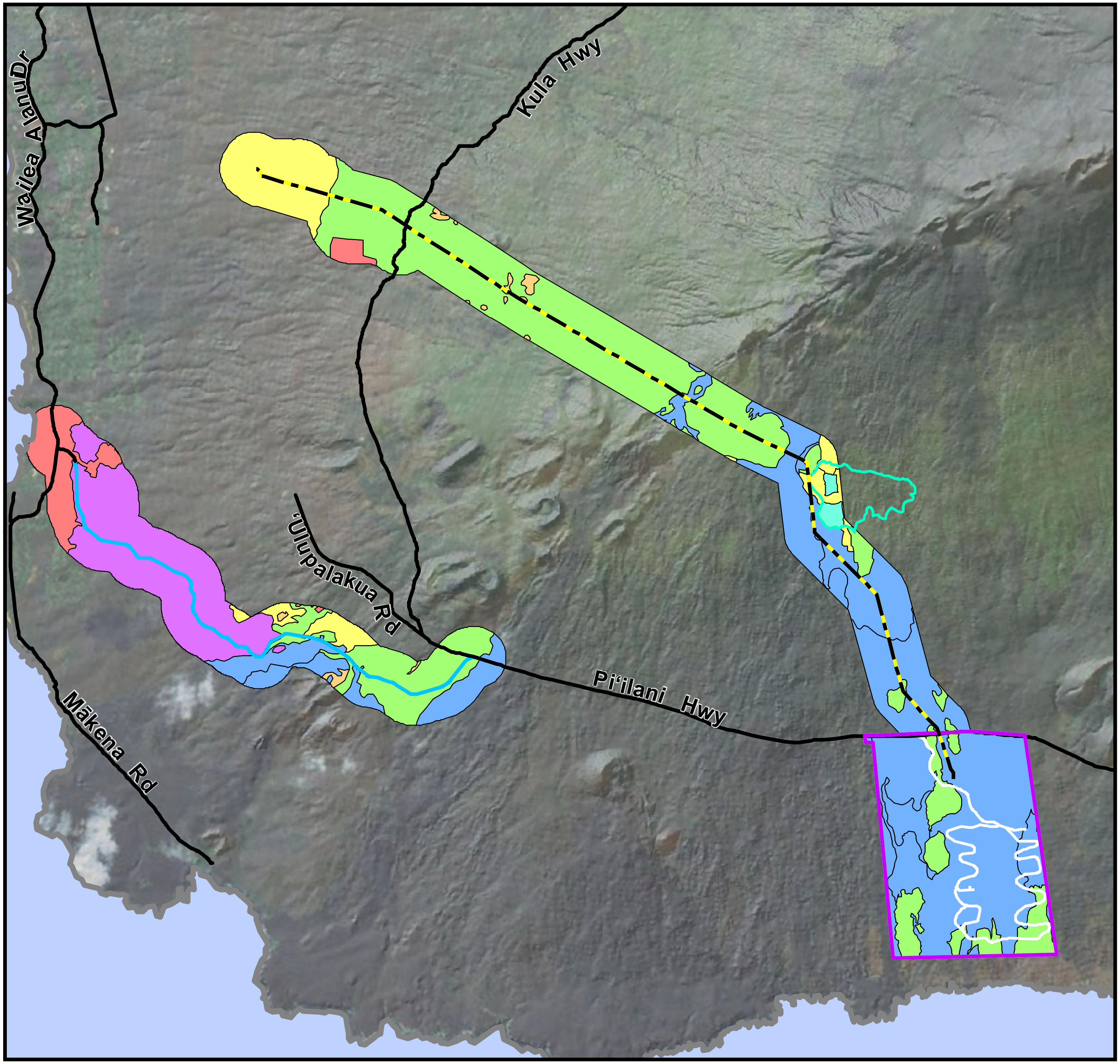

FIGURE 3.6-1

AUWAHI WIND PROJECT

VEGETATION

Wind Farm Site
Auwahi Forest Restoration Project
Generator-Tie Line
Road
Pāpaka Road
Site Access Road

Vegetation
- Grassland/Pasture
- Scrub/Shrub
- Savanna
- Mixed Native Forest
- Secondary/Non-native Forest
- Disturbed/Developed
- Restoration Area

DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
City/Road:
ESRI Streetmap 2007
Vegetation:
AECOS, Inc 2010

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MAUI, HI
JANUARY 25, 2011

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Table 3.6-2.
Plant Species Documented by the Hawai'i Biodiversity and Mapping Database as Potentially Occurring Within the ROI for the Auwahi Wind Farm Project

Scientific Name	Common Name	Hawaiian Name	USFWS/State Status[1/]	Habitat	Documentation During Botanical Surveys[2/]
Melicope hawaiensis	manena	alani	SOC	Moist or, less often, dry forests. On ridges and in gulches and, on parts of East Maui, on old lava flows and on old ash deposits.	Not documented.
Alectryon macrococcus	māhoe	'ala'alahua	LE	Dry to mesic lowland forest types, growing on dry slopes or in gulches from 360 to 1,070 meters (1,200 to 3,500 feet) above sea level (ASL).	Not documented.
Ochrosia Haleakalae	---	Hole'i	SOC	Dry and mesic forests; often on lava scattered on East Maui from700 to over 1,189 meters (2,300 to over 3,900 feet) ASL.	Not documented.
Capparis sandwichiana	maiapilo	pua pilo	SOC	Coral, basalt, or rocky soil along the coast or slightly inland.	Documented adjacent to the construction access route.
Zanthoxylum hawaiiense	Hawaiian prickly-ash	Hea'e, a'e	LE	Dry to moist forests (or, rarely, wet forests); old lava flows.	Not documented.
Cyanea arborea	tree cyanea	'ohā, hāhā, 'ōhā wai	SOC	Moist forests in gulches; known historically from East Maui.	Not documented.
Stenogyne microphylla	little-leaved stenogyne	none	None	Subalpine forest.	Not documented.
Melicope knudsenii	Knudsen's pelea	alani	LE	Montane mesic forests; gently sloped old lava flows.	Not documented.
Santalum freycinetianum var. lanaiense	---	'iliahi	LE	Dry, moist and wet forests and shrublands; old lava flows.	Documented within the transmission line corridor (leeward slope, above 850 meters [2,800 feet]).
Nesoluma polynesicum	island nesoluma	keahi	SOC	Dry and moist forests on ridges, in gulches, on plains, and on gently sloping old lava flows.	Not documented.
Ophioglossum concinnum	tropical adder's-tongue	pololei	None	Sandhills and dunes, dry lava flows, fine coral and lava rubble.	Not documented.
Nothocestrum latifolium	'aiea	'aiea	C	Dry and moist forests; on dry leeward hills and old lava flows.	Documented within the transmission line corridor (leeward slope, above 850 meters [2800 feet]).

1/ LE = listed endangered; SOC = species of concern; C = candidate for listing.
2/ Based on 2010 botanical surveys (David and Guinther 2011).
Source: Mitchell et al. (2005); HBMP (2010)

Wind Farm Site

No listed species were documented within the wind farm site. However, scattered remnants of wiliwili (isolated trees and some well-developed groves) occur within this area. Although wiliwili is not a listed species, it is an endemic to Hawai'i and is considered a keystone species of the native dry forest ecosystem, with less than 10 percent of its original distribution remaining (USGS 2006). Wiliwili is also important from a Hawaiian cultural/ethnobotanical perspective because its lightweight wood is used for constructing outriggers and fishfloats and its seeds are used for making leis and other traditional adornments (Bishop Museum 2011). However, the understory of the wiliwili tree groves in the wind farm site is no longer intact and often dominated by non-native grasses and shrubs.

Generator-tie Line and Interconnection Substation

One federally listed endangered species, 'iliahi, and one candidate for federal listing, 'aiea, were documented within the generator-tie line corridor. Occurrences consisted of a single individual of each species. Two additional 'aiea plants are located adjacent to the generator-tie line corridor, and four additional 'aiea plants are located farther outside of the generator-tie line corridor (17 to 38 meters [56 to 125 feet] east) and outside of the potential disturbance area. Another candidate for federal listing, hōlei *(Ochrosia haleakalae*), was documented approximately 150 meters (492 feet) east of the generator-tie line centerline, but outside of any area of potential disturbance. These species are all endemic to the Hawaiian Islands. Critical habitat for 10 plant species has been designated by the USFWS east and west of generator-tie line corridor in units 9 and 13, respectively, of an area referred to as "Maui H" (USFWS 2003). The generator-tie line corridor does not coincide with either unit but borders Maui H Unit 13, which includes the Kanaio NAR, for approximately 1.6 kilometers (1 mile) before it veers west (Figure 3.6-2). Native dryland forest associated species including individual wiliwili and 'ilima were also documented within the generator-tie line corridor.

Construction Access Route (Pāpaka Road)

Two federal species of concern, maiapilo (*Capparis sandwichiana*) and island nesoluma (*Nesoluma polynesicum*), were documented in the vicinity of Pāpaka Road. A few maiapilo plants were documented near Pāpaka Road. A single occurrence of island nesoluma (identified in the Hawai'i Biodiversity and Mapping Database) is located several miles from the road. Pāpaka Road passes through several areas of remnant wiliwili forest, though these trees are primarily outside the areas where proposed road improvements would occur.

3.6.3 Potential Impacts and Mitigation Measures

3.6.3.1 Impact Methodology and Factors Considered for Impacts Analysis

Impacts to vegetation were evaluated by overlaying the vegetation community map (as mapped during the 2010 botanical surveys) with the proposed Project footprint to estimate the acreage of each vegetation community that would be temporarily or permanently affected. Impacts were also evaluated based on the potential for the proposed Project to promote, spread, or expand the range of invasive weed species or result in increased fire risk. Effects to special status and rare native plant species are possible if populations of any species are found within the potentially affected areas. The degree of effect would depend on the sensitivity of the species and the type of effect imposed. The 2010 botanical surveys mapped occurrences of special status and rare plant species. As noted above, additional botanical surveys would be conducted prior to construction, once the Project design has been finalized, to identify special status and rare plants to avoid.

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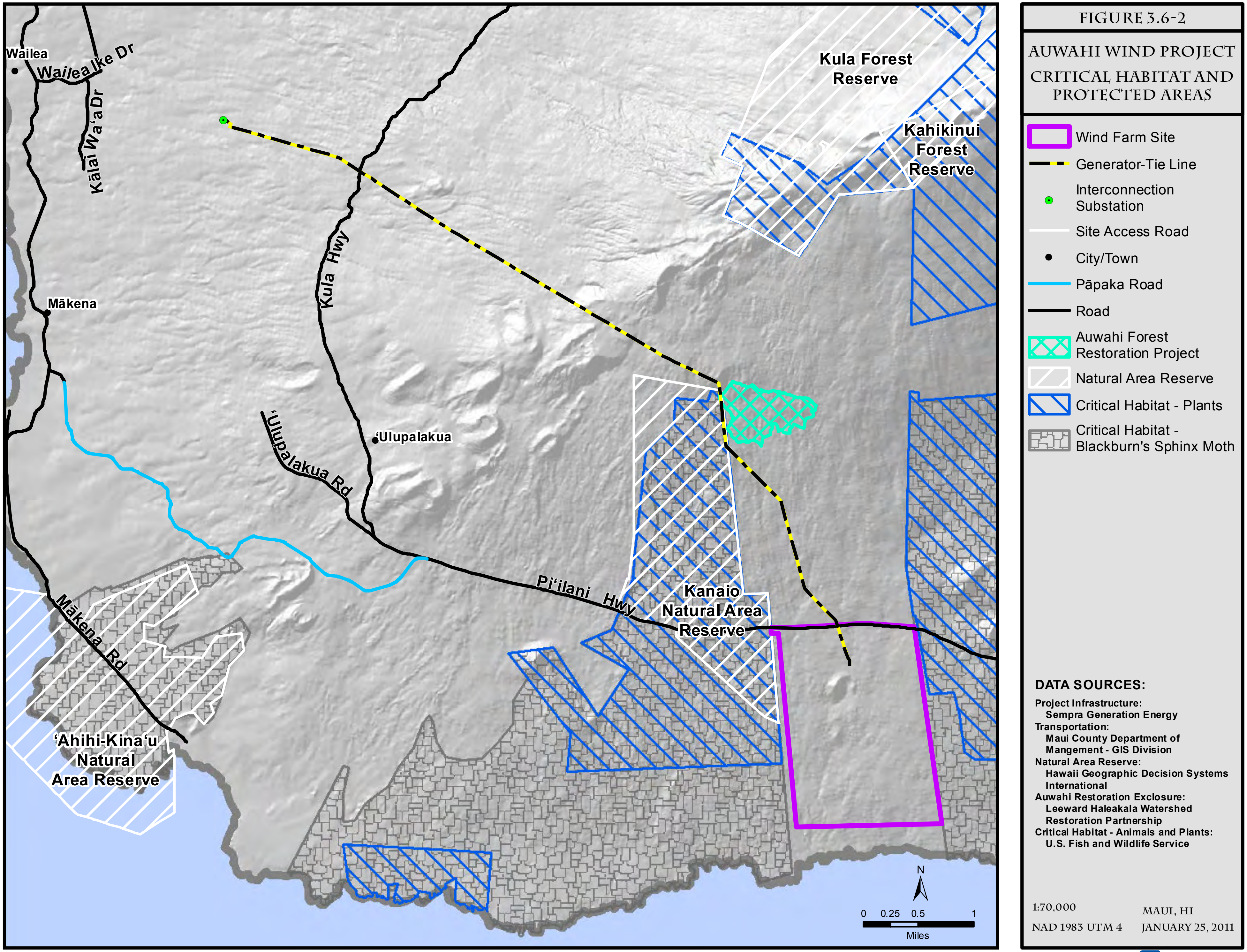
FIGURE 3.6-2

AUWAHI WIND PROJECT CRITICAL HABITAT AND PROTECTED AREAS



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A significant impact on vegetation would result if any of the following were to occur as a result of construction or operations of the proposed Project:

- Loss to any population of plants that would result in a species being listed or proposed for listing as threatened or endangered; or
- Introduction or increased spread of invasive species.

Vegetation would be allowed to regrow or would be reseeded following construction in areas outside the permanent Project structures and cleared areas that must be maintained for Project facilities, such as WTG pads. Therefore, conversion of one vegetation type to another (e.g., conversion of forest vegetation to non-forest vegetation) and associated effects are not issues associated with this Project.

3.6.3.2 Construction Impacts

Vegetation

Construction of the Project would result in ground clearing for installation of Project facilities (e.g., the WTG pads) at the wind farm site and temporary disturbances to vegetation (e.g., within the generator-tie line corridor and laydown areas). Given that much of the vegetation affected by the proposed Project is low-growing non-native species (e.g., shrubland, grasslands, and pasture), direct impacts would generally be minor, beyond the localized impacts of structure installation and the construction of roads and other facilities. Existing vegetation within the generator-tie line corridor would remain as long as the fire and safety clearance distances from the line are maintained, which could require limited cutting back of individual trees and shrubs.

Total and temporary construction impacts to vegetation communities associated with the proposed Project are listed in Table 3.6-3. The proposed Project would disturb approximately 244 acres during construction, primarily consisting of scrub/shrub vegetation (46 percent) and grassland/pasture (35 percent). These acreages represent the maximum build-out estimate and assume that all 15 WTG pads are constructed if the GE 1.5-MW model is selected. Selection of Siemens 2.3-MW and 3.0-MW models would require 10 and 8 WTG pads, respectively, which would result in less vegetation removal.

Depending on which WTG model is selected, the proposed WTG access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Section 2.1.1.2 for additional details). This straightened road alignment would further reduce total vegetation disturbance compared to the proposed WTG access road alignment by approximately 10 acres primarily consisting of scrub/shrub vegetation (Table 3.6-3). Areas temporarily disturbed during construction would be revegetated using native plants or approved pasture grasses.

The proposed Project has been sited at the current location to avoid the dryland forests reserves within the Kanaio NAR and the dryland forest restoration activities on the ‘Ulupalakua Ranch (the Auwahi Forest Restoration Project). The Project is not expected to significantly affect botanical resources,

Table 3.6-3.
Estimated Temporary and Total Construction Disturbance by Vegetation Community

Project Component	Disturbance (acres) Grassland/Pasture		Scrub/Shrub		Savanna		Mixed Native Forest (Kiawe, Koa Haole, Wiliwili)		Secondary Forest/ Non-native		Disturbed/ Developed		Total	
	Total	Temp	Total	Temp	Total	Temp	Total	Temp	Total	Temp	Total	Temp	Total	Temp
WTG Access Roads–Proposed Alignment	15.9	9.1	56.1	33.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.9	42.9
WTG Access Roads–Straightened Road Alignment1/	16.5	9.5	45.5	27.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.0	36.8
WTG Pads	3.5	2.3	11.6	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	10.5
Underground Electrical Collection System	1.0	1.0	10.4	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4	11.4
Meteorological Tower (including access road)	0.0	0.0	4.7	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	3.7
Construction Staging and Equipment Laydown Area (includes O&M building, storage, parking, and collector switchyard)	4.5	3.3	4.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3	7.6
Generator-tie Line Corridor	32.2	21.4	20.6	13.8	4.6	3.1	0.0	0.0	0.6	0.4	0.0	0.0	58.0	38.6
Interconnection Substation	0.0	0.0	0.0	0.0	3.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0	3.1	1.8
Interconnection Substation Access Roads	8.4	6.3	0.0	0.0	6.7	5.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	11.2
Construction Access Route, Pāpaka Road	19.0	13.3	4.6	3.2	0.6	0.4	30.9	21.7	0.0	0.0	0.3	0.2	55.4	38.8
Total	**84.5**	**56.7**	**112.9**	**77.3**	**14.9**	**10.2**	**30.9**	**21.7**	**0.6**	**0.4**	**0.3**	**0.2**	**244.1**	**166.5**

Acreages calculated using GE 1.5 turbine configuration (15 pads); disturbance acreages would be less under Siemens 2.3 and 3.0 configurations, which require 10 and 8 turbines, respectively. Totals may not add up due to rounding. 1 acre = 0.4 hectare

1/ Acreage impacted by construction of the straightened road alignment is not included in the total because if selected would replace the currently proposed WTG access road alignment.

given the general degradation of the habitat and minimal distribution of native communities (e.g., native dryland forest) within the ROI (Table 3.6-3). There are no large, contiguous blocks of intact vegetation that would be fragmented by the proposed Project. The proposed Project occurs on the ʻUlupalakua Ranch, which has been extensively grazed in the past and is currently used for cattle ranching. The generator-tie line corridor and area adjacent to Pāpaka Road are also subject to grazing by cattle and feral ungulates and vegetation includes many introduced species.

The ROI does not have any sizable sections that are free of non-native species given the preexisting disturbances from development and from cattle grazing. Non-native species and invasive species infestations are typically greatest near disturbed areas, although wind dispersal has likely contributed to the spread of these species throughout the general area, which is open and sparsely vegetated.

Over time, non-native species infestations would continue to spread throughout the area with or without construction of the proposed Project, although ground disturbance and vehicular traffic are two Project-related factors that have the potential to result in an increase in non-native species distribution, particularly those that could be invasive. Non-native plant encroachment has the potential to change the composition and diversity of native plants through competition by altering the natural fire regime, and by altering other ecosystem processes (e.g., nitrogen cycling). The introduction and spread of invasive species associated with Project construction would be minimized through the implementation of standard BMPs such as washing equipment prior to entering construction sites from other areas and controlling the quality of seed mixtures used to revegetate disturbed areas. Disturbance associated with Project construction would be localized and temporary, and with BMPs in place is not expected to have a significant effect on increasing invasive species.

There is also a very slight chance for Project-related fires during construction that are related to the presence and use of vehicles and heavy equipment and activities such as welding and grinding that produce sparks. Implementation of the Project FMP (Appendix A), which includes restrictions on vegetated areas of vegetation and requirements for equipment safety features (e.g., spark arrestors), would minimize the potential for Project-related fires during construction.

Special Status and Rare Plant Species

No special status plant species were documented within the wind farm site (Table 3.6-2). Therefore, no impacts to these species would occur as a result of construction of the wind farm.

One federal species of concern, maiapilo, was identified adjacent to the construction access road. Two individual maiapilo may occur within an area of temporary disturbance along Pāpapka Road; seven other plants of this species occur adjacent to the construction access route but well outside the area of disturbance. Although Auwahi Wind would, to the extent possible, avoid these plants during construction because they are located at the edge of the construction work area, it is conservatively assumed that they may be removed during construction but considered an insignificant impact.

One endangered plant species, ʻiliahi, and one candidate plant species, ʻaiea, were documented within the generator-tie line corridor in an area of temporary disturbance. Because there is some flexibility in the installation of generator-tie line pole locations, it is assumed that these occurrences would be flagged and avoided during construction by fencing them. Consequently, no impacts would occur to listed or candidate species in association with the generator-tie line. Based on the significance criteria, the proposed Project would not have a significant effect on special status plants associated with construction of the generator-tie line or any other Project components.

Rare native plant species, such as wiliwili and other dryland forest ecosystem associates, could also be directly impacted during construction by trampling. Rare native plants would be avoided to the extent possible. The proposed Project has been sited so that it does not cross the Kanaio NAR or the Auwahi Forest Restoration Project, which includes the greatest concentrations of rare native species in the vicinity. Wiliwili trees within areas of Project disturbance, primarily occurring adjacent to Pāpapka Road, will be avoided to the extent possible.

There is the potential for indirect effects to special status and rare native plants associated with the spread of invasive species and the very slight risk of fire. To ensure that the proposed Project does not result in further degradation of suitable habitat for special status and rare plants, standard BMPs would be implemented such as washing equipment prior to entering construction sites from other areas and controlling the quality of seed mixtures used to revegetate disturbed areas. In addition, where the generator-tie line runs adjacent to the Kanaio NAR and the Auwahi Forest Restoration Project, additional fire prevention measures would be implemented during construction (see description under Vegetation above and the Project FMP in Appendix A) to reduce the chance of Project-related fires in areas with higher concentrations of rare or native plants.

3.6.3.3 Operations and Maintenance Impacts

<u>Vegetation</u>

Permanent Project facilities including WTG pads, permanent access roads, the substation, O&M building, and generator-tie line structures would result in permanent vegetation removal. Of the 244 acres of total ground disturbance, approximately 78 acres would be permanently impacted. These permanent impacts are listed in Table 3.6-4. Following construction, cleared areas around the gravel WTG pads and generator-tie line structures and temporary construction staging and laydown areas, would be reseeded with native vegetation or pasture grasses and encouraged to return to pre-construction conditions.

Routine O&M activities would have minimal impacts to vegetation. Qualified personnel would routinely monitor, inspect, and maintain the components of the wind farm (e.g., WTGs, collector system, and communications equipment) and generator-tie line facilities during Project operations. These O&M activities would be accomplished with the use of off-road vehicles and light trucks, which would result in temporary trampling of vegetation if off-road travel is necessary. To minimize new road construction, and thus impacts to vegetation, O&M personnel would use a combination of existing field roads, new gravel road, and two-track road over vegetation. It is anticipated that off-road travel during operations would be rare. However, should a major component replacement be necessary for any of these facilities (e.g., blade, gearbox, or transformer), heavy equipment similar to that used during construction would be required and the access roads, crane pads (WTGs only), and staging areas would be used in a similar manner as with the original construction resulting in similar disturbance impacts to vegetation with similar mitigation being required.

Table 3.6-4.
Estimated Permanent Disturbance by Vegetation Community

Project Component	Disturbance (acres)						
	Grassland/ Pasture	Scrub/ Shrub	Savanna	Mixed Native Forest (Kiawe, Koa Haole, Wiliwili)	Secondary Forest/ Non-native	Disturbed/ Developed	Total
WTG Access Roads—Proposed Alignment	6.8	22.3	0.0	0.0	0.0	0.0	29.1
WTG Access Roads—Straightened Road Alignment1/	7.0	18.2	0.0	0.0	0.0	0.0	25.2
WTG Pads	1.2	3.4	0.0	0.0	0.0	0.0	4.5
Underground Electrical Collection System	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Meteorological Tower (including access road)	0.0	1.1	0.0	0.0	0.0	0.0	1.1
Construction Staging and Equipment Laydown Area (includes O&M building, storage, parking, and collection substation)	1.2	0.6	0.0	0.0	0.0	0.0	1.8
Generator-tie Line Corridor	10.8	6.8	1.6	0.0	0.2	0.0	19.4
Interconnection Substation	0.0	0.0	1.3	0.0	0.0	0.0	1.3
Interconnection Substation Access Roads	2.1	0.0	1.7	0.0	0.0	0.0	3.8
Construction Access Route, Pāpaka Road	5.7	1.4	0.2	9.2	0.0	0.1	16.6
Total	**27.7**	**35.6**	**4.7**	**9.2**	**0.2**	**0.1**	**77.6**

Acreages calculated using GE 1.5-MW turbine configuration (15 pads); disturbance acreages would be less under Siemens 2.3-MW and 3.0-MW configurations, which require 10 and 8 WTGs, respectively.
1/ Acreage impacted the straightened road alignment is not included in the total because if selected would replace the currently proposed WTG access road alignment.

O&M activities could result in the introduction and spread of invasive species or very low increased risk of fire. Prior to the start of O&M activities, standard BMPs to control the spread of invasive species would be implemented. Vegetation maintenance (trimming) may be required in areas where vegetation exceeds maximum height limitations in relation to the generator-tie line. However, fire risk associated with generator-tie line operations is extremely low. The probability of a fire is approximately 0.5 percent for the lifetime of the Project (see the FMP in Appendix A). Likewise, fire risk associated with WTG operations is also very low (and would be prevented by the design features and various onsite and offsite control capabilities of the WTG model selected. Information provided by the WTG manufacturers regarding the occurrence of gear box failures and preventative design features is described in detail in Section 3.15 – Public and Construction Safety. Therefore, during O&M, implementation of the Project FMP (Appendix A) would minimize the already extremely low risk of fire on vegetation.

Special Status and Rare Plant Species

There is lower potential for adverse impacts to occur to special status or rare native plant species during O&M activities because disturbance of vegetation would be limited. Fencing around listed plant species would remain during Project O&M to enable continued avoidance of these species. However, some disturbances could occur related to routine O&M activities. As noted above, standard BMPs for reducing the spread of invasive plant species during operations and implementing additional fire prevention measures during operations in the vicinity of the Kanaio NAR and the Auwahi Forest Restoration Project (see the FMP in Appendix A) would reduce the chance of indirect effects on special status or rare native plants.

3.6.3.4 No Action Alternative

Vegetation

Under the No Action Alternative, the Project would not be constructed. Therefore, there would be no effect on vegetation.

Special Status and Rare Plant Species

Under the No Action Alternative, the Project would not be constructed. Therefore, there would be no effect to special status and rare plant species.

3.6.3.5 Avoidance, Minimization, and Mitigation Measures

In addition to the BMPs listed in Table 2-4, including revegetation of disturbed areas and prevention of Project-related fires and introduction and spread of invasive plant species, which will be implemented by the Applicant to minimize impacts to vegetation, the following additional measures will be taken to avoid or minimize the impacts to special status and rare species:

- ʻIliahi, the only listed endangered plant species documented during 2010 botanical surveys, has the potential to be impacted by Project construction. Prior to construction, additional botanical surveys will be conducted to identify any occurrences of this or any other listed plant species within the proposed Project based on the final Project design. The ʻiliahi will be fenced and avoided during construction. Many of the listed species with potential to be affected by the proposed Project are known to occur in dryland forests on Maui and within the nearby Auwahi Forest Restoration Project and Kahikinui Forest Project. Mitigation measures identified in Section 3.7 – Wildlife will also benefit ʻiliahi and other dryland forest associates by protecting and enhancing vegetative communities.
- Rare or culturally important native plant species that have been documented within the Project footprint will be avoided to the extent possible..

Invasive Species Prevention/Control

To prevent the spread of invasive species in the ROI, the following measures will be implemented during and following construction:

- Inspecting potential offsite sources of materials (gravel, fill, etc.), and prohibiting the import of materials from sites that are known or likely to contain seeds or propagules of invasive species;
- Requiring that vehicle operators transporting materials to the proposed Project site from offsite follow protocols for removing soils and plant material from vehicles and equipment prior to entry onto the site; and
- Consulting with the Hawai'i Department of Agriculture and Maui Invasive Species Commission to establish protocols and training orientation methods for screening invasive species introductions during construction.

Fire Prevention/Control

- Implementation of the Project FMP will reduce the potential for fires during construction and operations.

Revegetation

- All temporarily disturbed areas will be reseeded and planted with native vegetation or pasture grasses following construction.

3.6.3.6 Summary of Impacts

Table 3.6.-5 summarizes potential impacts to vegetation.

Table 3.6-5.
Summary of Potential Vegetation Impacts

Impact Issues	Proposed Project	No Action Alternative
Introduction or spread of noxious weeds	⊙	○
Loss to any population of plants resulting in proposal for listing or listing	⊙	○
Loss of rare plants, native plant communities	⊙	○
Fire	⊙	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⦸= Significant but mitigable to less than significant impact
⊙= Less than significant impact
\+ = Beneficial impact
N/A=Not applicable
○= No impact

3.7 WILDLIFE

This section describes the avian and terrestrial wildlife present in and near the proposed Project including common wildlife species, rare species and migratory bird species, and threatened and endangered species. This section also presents the impacts analysis that was conducted to identify describes potential direct and indirect impacts resulting from the implementation of the proposed Project. Proposed engineering and design features, BMPs, and mitigation measures that would serve to reduce impacts to less than significant levels are also presented.

The ROI for impacts to wildlife includes the proposed wind farm site, as well as a 0.4-kilometer (0.25-mile) buffer on either side of the proposed generator-tie line centerline and the Pāpaka Road centerline. This area encompasses all potential effects to wildlife and habitats including habitat loss or alteration, noise disturbance, and direct mortality within the footprint of the proposed Project (area of disturbance associated with Project structures) as well as areas extending beyond where wildlife could be exposed to disturbance.

Migratory birds, as well as some non-migratory birds that are endemic to the Hawaiian Islands, are afforded protection under the federal Migratory Bird Treaty Act (MBTA). Numerous species intentionally introduced to the Hawaiian Islands from the continental United States are now protected under the MBTA, even though they are non-native (e.g., cattle egret, mourning dove, and barn owl). The MBTA has no provision for excluding a species from protection in designated parts of its range, so a species protected by the MBTA is protected anywhere that it might occur nationwide, even in localities where they are non-native and introduced by humans.

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 ESA (16 U.S.C. §§ 1531-1544) as amended. Likewise, species listed as threatened or endangered by the state of Hawai'i are protected under Hawai'i state law (HRS § 195D-4). In accordance with these regulations, Auwahi Wind has consulted with the USFWS and the Hawai'i Department of Land and Natural Resources (DLNR)/ DOFAW to acquire an Incidental Take Permit (ITP) and an Incidental Take License (ITL) issued by these agencies, respectively, given the potential for Project-related incidental take of five listed species and one species under consideration for listing. These permits require the preparation of a Habitat Conservation Plan (HCP) in cooperation with DOFAW and USFWS. Applicable components of the draft HCP, including estimates of Project-related take and associated mitigation, have been incorporated into this section to support the EIS analysis. The HCP is currently under development and therefore estimated take and mitigation options are still being considered by the agencies and have not yet been finalized. Project impacts to listed species reported here are conservative and the maximum anticipated. Pursuant to HRS Section 195D, DLNR will require the mitigation to provide a net benefit to the covered species.

Sources of information on wildlife and habitat resources found within the proposed Project include agency data as well as data from Project-specific field surveys as follows:

- The Hawaiian Biodiversity and Mapping Program (data on land cover and species occurrences acquired in May 2010);
- Avian, botanical, and terrestrial mammal surveys conducted in June 2007 and May-October 2010 (David and Guinther 2011; Appendix D);

- Radar surveys and associated risk-of-collision analysis for threatened and endangered bird and bat species conducted in fall 2006 and spring 2010 (Hamer Environmental 2010a);
- A survey of invertebrate resources conducted by Dr. Steven Montgomery, March 2008 (Montgomery 2008); and
- Recovery plans for the Hawaiian petrel and Newell's shearwater (USFWS 1983), Hawaiian hoary bat (USFWS 1998), nēnē (USFWS 2004), and Blackburn's sphinx moth (USFWS 2005a).

3.7.1 Existing Environment

The proposed Project site consists of grassland and dry shrubland communities that have been degraded by ongoing cattle ranching. These communities contain scattered remnant patches of native dryland forest and shrubland including several groves of wiliwili. These patches of native habitat coincide with geologically diverse areas that are not accessible for grazing. The generator-tie line corridor starts at the north boundary of the wind farm site, crosses through mixed dryland shrubs and pasture, and, at its highest point on the Southwest Rift ridgeline, crosses a treeless high elevation pasture before returning to pasture near the Wailea substation. The proposed Pāpaka Road is surrounded by pastureland. Vegetation communities within the ROI are described in detail in Section 3.6.1.

The ROI provides habitat for a variety of birds, most of which are non-native, as well as for several non-native mammal species and numerous invertebrates. There are no wetlands or waterbodies within the proposed Project and the layout does not include any areas where congregations of birds occur. Site-specific avian surveys indicate that the proposed Project is not located in a movement corridor for daily movements by water birds.

3.7.1.1 Non-listed Wildlife Species

This section addresses non-listed wildlife species likely to be found within the proposed Project. Species protected by the MBTA are briefly addressed in Section 3.7.1.2. State and federally listed species are addressed separately in Sections 3.7.1.3 and 3.7.1.4. During the avian and terrestrial mammalian surveys, 11 mammalian species and 27 avian species were observed (Table 3.7-1). An additional three avian species were observed incidentally: chukar and barn owl during avian surveys and amakihi along the proposed generator-tie line corridor during the invertebrate surveys. All but three species documented are common and not native to the Hawaiian Islands. The native avian species observed include the Hawaiian short-eared owl and amikihi, which are endemic subspecies, and the Pacific golden plover, which is indigenous to Hawai‘i and a migrant that winters in coastal and upland areas of the main Hawaiian Islands.

Table 3.7-1.
Bird and Mammal Species Observed in the Proposed Project

Birds	Protected Status1/
African silverbill (*Lonchura cantans*)	None
Hawai‘i amakihi (*Hemignathus virens*)2/	None
Barn owl (*Tyto alba*)	MBTA
Black francolin (*Francolinus francolinus*)	None
California quail (*Callipepla californica*)	None
Cattle egret (*Bubulcus ibis*)	MBTA

Table 3.7-1.
Bird and Mammal Species Observed in the Proposed Project

Birds	**Protected Status[1/]**
Chukar (*Alectoris chukar*)	None
Common myna (*Acridotheres tristis*)	None
Common peafowl (*Pavo cristatus*)	None
Gray francolin (*Francolinus pondicerianus*)	None
House finch (*Carpodacus mexicanus*)	MBTA
Japanese bush-warbler (*Cettia diphone*)	None
Japanese quail (*Coturnix japonica*)	None
Japanese white-eye (*Zosterops japonicus*)	None
Java sparrow (*Padda oryzivora*)	None
Mourning dove (*Zenaida macroura*)	MBTA
Northern cardinal (*Cardinalis cardinalis*)	MBTA
Northern mockingbird (*Mimus polyglottos*)	MBTA
Nutmeg mannikin (*Lonchura punctulata*)	None
Pacific golden plover (*Pluvialis fulva*)	MBTA and Hawai‘i Species of Concern
Red junglefowl (*Gallus gallus*)	None
Red-crested cardinal (*Paroaria coronata*)	None
Ring-necked pheasant (*Phasianus colchicus*)	None
Short-eared owl (*Asio flammeus sandwichensis*)	MBTA and Hawai‘i Species of Concern
Sky lark (*Alauda arvensis*)	MBTA
Spotted dove (*Streptopelia chinensis*)	None
Zebra dove (*Geopelia striata*)	None
Mammals	
Axis deer (*Axis axis*)	None
Domestic cat, feral cat (*Felis catus*)	None
Domestic cattle (*Bos taurus*)	None
Domestic dog (*Canis f. familiaris*)	None
Feral goat (*Capra h. hircus*)	None
Domestic horse (*Equus c. caballus*)	None
European house mouse (*Mus musculus domesticus*)	None
Feral pig, wild boar (*Sus s. scrofa*)	None
Roof rat (*Rattus r. rattus*)	None
Small Indian mongoose (*Herpestes a. auropunctatus*)	None

1/ MBTA= Migratory Bird Treaty Act
2/ An amakihi song was heard during the invertebrate surveys of the generator-tie line.

The invertebrate survey results, which covered a much larger area than the proposed Project, indicated that the proposed Project site and surrounding area supports a variety of native terrestrial mollusks and native and adventive arthropod species, including the federally and state listed Blackburn's sphinx moth (*Manduca blackburnii*) and the yellow-faced bee, which is currently the subject of a federal 12-month review for listing. The Blackburn's sphinx moth and yellow-faced bee are addressed in the HCP for the proposed Project and therefore are further discussed in Section 3.7.1.3 below. Thirty-six of the 49 total invertebrate species documented are endemic or indigenous to the Hawaiian Islands. Twenty-one species were documented in the wind farm site vicinity, 34 species were documented along the proposed generator-tie line route vicinity, and 16 species were documented along the proposed construction access route. A full list of invertebrate species observed during the surveys is given in Table 3.7-2.

Table 3.7-2.
Invertebrate Species Documented within the Proposed Project and Surrounding Area (Montgomery 2008)

Species[1/]	Common Name	Abundance[2/]	Project Component[3/]
MOLLUSCA GASTROPODA			
PULMONATA	Snails and slugs		
Succinea sp.	Hawaiian amber snail	Occasional	W, T
Achatinellidae	None		
Tornatellaria sp. or Tornatellides sp.	None	Occasional	W, T
ARTHROPODA			
ARANEAE	Spiders		
Mecaphesa sp.	crab spider	Uncommon	T
INSECTA			
COLEOPTERA	Beetles		
Aglycyderidae	None		
Proterhinus sp.	weevils	Uncommon	T
DIPTERA	Flies		
Drosophilidae	pomace flies; picture-wing flies		
Antopocerus aduncus	None	Rare	T
Drosophila crassifemur	None	Rare	T
Drosophila haleakalae	None	Uncommon	T
Drosophila mecatorum	None	Common	T, R
Drosophila suzukii	None	Abundant	T, R
***Drosophila (Nudidrosophila)* sp. 1**	None	Rare	T
Drosophila sp. near dracaenae	None	Uncommon	T
***Scaptomyza* sp. 1**	None	Uncommon	T
Tephritidae	None		
Trupanea artemisiae	None	Rare	T
***Trupanea* sp. 1**	None	Uncommon	T
LEPIDOPTERA			
Cosmopterigidae	case bearers		
***Hyposmocoma* sp. 1**	None	Uncommon	T, W
***Hyposmocoma* sp. 2**	None	Occasional	T, W
***Hyposmocoma* sp. 3**	None	Occasional	T, W, R
***Hyposmocoma* sp. 4**	None	Uncommon	T, R
***Hyposmocoma* sp. 5**	None	Uncommon	W, R
***Hyposmocoma* sp. 6**	None	Rare	T
Crambidae	micro-moths		
Eudonia passalota	None	Rare	T, W
Eudonia tetranesa	moss moth	Uncommon	T, W
Eudonia sp. 1	None	Rare	
Nomophila noctuella	None	Abundant	T, W, R
Omiodes continuatalis	None	Uncommon	T

Table 3.7-2.
Invertebrate Species Documented within the Proposed Project and Surrounding Area (Montgomery 2008)

Species[1/]	Common Name	Abundance[2/]	Project Component[3/]
Omiodes monogona	Hawaiian bean leafroller	Uncommon	T, W
Stemorrhages exaula	Hao leaf web worm	Rare	T, W
Tamisica hyacinthina	None	Occasional	T, W, R
Uresiphita polygonalis subsp. Virescens	None	Uncommon	T
***Mestolobes* sp.**	None	Occasional	T, W, R
Noctuidae	miller moths		
Anomis noctivolans	None	Rare	
Ascalapha odorata	black witch moth	Uncommon	R
***Schrankia* sp.1**	None	Rare	T
Oecophoridae	None		
***Thyrocopa* sp.**	None	Rare	CR
Plutellidae	None		
Plutella xylostella	diamondbacked moth	Uncommon	R
Sphingdae	hawk moths		
Agrius cingulata	sweetpotato hornworm	Uncommon	W, R
Deilephila nerii	oleander hawk moth	Rare	W, R
Hyles calida calida	None	Rare	W
Manduca blackburni	Blackburn's sphinx moth	Rare	W, R
HETEROPTERA	true bugs		
Miridae	leaf bugs		
Orthotylus perkinsi	on pilo (Coprosma sp.)	Uncommon	T
Lygaeidae	None		
***Nysius* sp.**	None	Uncommon	T
HOMOPTERA	cicadas, hoppers, aphids		
Cixiidae	planthoppers		
***Oliarus* sp.**	None	Uncommon	T
HYMENOPTERA	wasps, bees, ants		
Apidae	bees		
Apis mellifera	honey bees	Common	W
Colletidae	wasp-like bees		
Hylaeus assimulans assimulans	yellow-faced bee	Uncommon	W
Formicidae	ants		
Anoplolepis gracilipes	longlegged ant	Uncommon	W, R
Pheidole megacephala	bigheaded ant	Common	R
Linepithema humile	Argentine ant	Uncommon	T
Vespidae	wasps		
Polistes exclamans	common paper wasp	Uncommon	W, R

Table 3.7-2.
Invertebrate Species Documented within the Proposed Project and Surrounding Area (Montgomery 2008)

Species[1/]	Common Name	Abundance[2/]	Project Component[3/]
ONONATA	dragonflies, damselflies		
Cenagrionidae	damselfly		
Megalagrion sp.	None	Rare	T

1/ Bold= endemic subspecies
2/ Rare=seen in only one or two locations; Uncommon= seen at most in several locations; Occasional= seen with some regularity; Common= observed numerous times during the survey; Abundant= found in large numbers
3/ W= wind farm site; T= generator-tie line; R= construction access road

3.7.1.2 Hawaiʻi State Species of Concern

Two Hawaiʻi state species of concern that may occur within the proposed Project include the Hawaiian short-eared owl and Pacific golden plover (David and Guinther 2011; Hamer Environmental 2010). These species are addressed below.

Hawaiian Short-eared Owl

The Hawaiian short-eared owl is considered a species of concern by the USFWS and is listed as endangered by the state of Hawaiʻi on the island of Oʻahu, and also afforded protection under the MBTA (Mitchell et al. 2005). The Hawaiian short-eared owl (called pueo) is found on all the main Hawaiian Islands from sea level to 2,450 meters (8,000 feet). This diurnal species nests on the ground but little is known about the breeding biology of the short-eared owl. Nests of this species have been found throughout the year. The current population status is unknown although Hawaiian short-eared owls are thought to be declining. This owl species occupies a variety of habitats, including dry forests and rain forests, but is observed most often in grasslands. The Hawaiian short-eared owl was observed very infrequently flying within the wind farm site during point count surveys (early June 2007) and radar surveys (David and Guinther 2011; Hamer Environmental 2010).

Hawaiian short-eared owls have the potential to collide with WTGs and other Project structures. As of August 2010, there have been three Hawaiian short-eared owl fatalities documented at the Kaheawa I wind farm, two due to turbine collisions and one due to a vehicle collision (Hufana 2010).

Pacific Golden Plover

The Pacific golden plover (*Pluvialis fulva*) is a migratory shorebird and a state species of concern in Hawaiʻi. The winter range of this species occurs from the South Pacific and Japan through southern Asia and the Middle East to northeast Africa. This species over-winters in Hawaiʻi from breeding grounds in Alaska and is found in short-grass prairie, pastures, mudflats, sandy beaches, and flooded fields. The Pacific golden plover was observed flying over the wind farm site during the fall 2006 radar surveys (Hamer Environmental 2010).

The Pacific golden plover also has the potential to collide with WTGs and other Project structures. Pacific golden plovers have been killed by collisions with tall structures (e.g., radio towers) and aircraft strikes at the Kahului airport on Maui occur occasionally in the fall, apparently as juvenile birds attempt to establish foraging territories on airport ground (Mitchell et al. 2005). As of August

2010, there have been no documented Pacific golden plover fatalities at the operating Kaheawa I wind farm on Maui (Hufana 2010).

3.7.1.3 MBTA-protected Species

As indicated above in Table 3.7-1, nine avian species protected by the MBTA were documented during avian surveys in the proposed Project. Most of these species intentionally introduced to the Hawaiian Islands from the continental United States (e.g., cattle egret, mourning dove, and barn owl) are now protected under the MBTA, even though they are non-native and quite common. These species may use the proposed Project for nesting or foraging and are associated with a variety of habitats.

3.7.1.4 ESA-listed Species and Species under Consideration for Listing

Five state and federally listed wildlife species are known to occur, or could potentially occur, in the vicinity of the proposed Project, including the Hawaiian petrel, Newell's shearwater, Hawaiian hoary bat, Blackburn sphinx moth, and nēnē. There are also five of seven species of Hawaiian yellow-faced bee undergoing a 12-month review for federal listing that have the potential to occur in the ROI. The following subsections describe the status (state and federal statuses for these species are the same), biology, current threats, and potential occurrence of ESA-listed species and species under consideration for listing within the proposed Project. A search of the Hawai‘i Biodiversity and Mapping database indicated no known occurrences of additional sensitive or listed wildlife species within the wind farm site, generator-tie line corridor, or adjacent to the construction access road (Hawaii Biodiversity and Mapping Database 2010).

Hawaiian Hoary Bat—Endangered

Distribution, Population Estimates, and Ecology

The Hawaiian hoary bat or ‘ōpe‘ape‘a (*Lasiurus cinereus semotus*) is the only fully terrestrial native mammal in the Hawaiian Islands. Reports of the Hawaiian hoary bat are known from all the main islands except Ni‘ihau (HBMP 2007), although this species is most often seen on Hawai‘i, Maui, and Kaua‘i (Kepler and Scott 1990). Today, the largest populations and only known breeding populations are thought to occur on Kaua‘i and Hawai‘i (Duvall and Glassman-Duvall 1991). Duvall and Glassmann-Duvall (1991) suggested that at least one resident population of the Hawaiian hoary bat, a potentially breeding population, exists on Maui.

Relatively little research has been conducted on this endemic Hawaiian bat and data regarding its habitat and population status are very limited. Population estimates for this species have ranged from hundreds to a few thousand; however, these estimates are based on limited and incomplete data (USFWS 2007).

The Hawaiian hoary bat breeds between September and December with implantation delayed until spring, after they emerge from winter torpor (USFWS 1998). Gestation and rearing of young takes place between April and August; the birth of typically two young usually occurs between April and June. Lactating females have been documented from June to August and post-lactating females have been documented from September to December (Menard 2001). Until weaning, young of the year are completely dependent on the female for survival.

The Hawaiian hoary bat is found in both wet and dry areas from sea level to 3,962 meters (13,000 feet) elevation, with most observations occurring up to 2,286 meters (7,500 feet); it uses a variety of habitats that include open pastures and more heavily forested areas in both native and non-native habitats (DLNR 2005a). Typically, this species feeds over streams, bays, or along the seacoast, over lava flows, in open pastures, or at forests edges. The Hawaiian hoary bat is an insectivore, and prey items include a variety of native and non-native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites (Whitaker and Tomich 1983). Hawaiian bats are known to roost solitarily in tree foliage and have only rarely been seen exiting lava tubes, leaving cracks in rock walls, or hanging from man-made structures. Foliage roosting for this species has been documented in hala (*Pandanus tectorus*), coconut palms (*Cocos nucifera*), kukui (*Aleurites moluccana*), pūkiawe (*Styphelia tameiameiae*), Java plum (*Syzygium cumini*), kiawe, avocado (*Persea americana*), shower trees (*Cassie javanica*), ‘ōhi‘a trees (*Meterosideros polymorpha*), and fern clumps; they are suspected to roost in Eucalyptus (*Eucalyptus* spp.) and Sugi pine (*Cyrptomeria japonica*) stands (USFWS 1998; DLNR 2005a).

While the Hawaiian hoary bat may migrate inter-island and within topographical gradients on the islands, long distance migration like that of the North American hoary bat is unknown (USFWS 1998). Seasonal and altitudinal differences in bat activity have been suggested (Menard 2001) but the timing and extent of this variation are unknown.

Current Threats

The main threats to the Hawaiian hoary bat may include reduction in tree cover, pesticide use, prey availability due to the introduction of non-native insects, and predation. It is unknown what effect these threats have on the population. Observation and specimen records do suggest, however, that these bats are now absent from historically occupied ranges. The magnitude of any population decline is unknown. The hoary bat (*Lasiurus cinereus*) in North and South America is one of the bat species most frequently killed by WTGs, primarily during fall migration (Kunz et al. 2007). To date, one Hawaiian hoary bat has been killed at the existing Kaheawa Wind Power facility during its 3.5 years of operation (Hufana 2010).

Occurrence within the Proposed Project

Limited available information on habitat for this species indicates a preference for forested areas for roosting and foraging, which suggests that the occurrence of this species in the proposed Project is infrequent due to the lack of suitable forested habitat. Therefore, the species is not expected to roost or breed in the proposed Project area but may use the area for foraging. Historically, Hawaiian hoary bats have been observed on ‘Ulupalakua Ranch in low numbers (David and Guinther 2011). More recently, biologists recorded a single Hawaiian hoary bat audio detection and observed bat-like targets on the radar screen during the May 2010 radar surveys (Hamer Environmental 2010b). As part of an ongoing monitoring effort, two Anabat detectors were erected on the temporary met tower located within the proposed turbine string in July 2010. Based on the limited availability of data on seasonal occurrences, it is conservatively assumed that bats could occur within the proposed Project.

<u>Hawaiian Petrel—Endangered</u>

Distribution, Population Estimates, and Ecology

The endemic ‘ua‘u or Hawaiian petrel (*Pterodroma sandwichensis*) is one of the larger species in the *Pterodroma* group. This species formerly nested in large numbers on all of the main islands in the Hawaiian chain except Ni’ihau. Currently, Hawaiian petrels nest at high elevations on Maui, primarily in Haleakalā National Park, and in smaller colonies on Kaua‘i, Hawai‘i, Moloka‘i, and Lāna‘i. Population estimates for the species are mainly based on at-sea numbers; the total population of Hawaiian petrels is estimated to be 20,000, with an estimated 4,500 to 5,000 nesting pairs on Kaua'i and Maui (Mitchell et al. 2005). The more recently rediscovered colony on Lāna'i is thought to number over 1,000 birds (Tetra Tech 2008).

Haleakalā National Park in East Maui supports the largest known nesting colony of Hawaiian petrels (USFWS 2005b; Hodges and Nagata 2001) with approximately 1,000 known burrows. The nests are within the crater of the dormant shield volcano; the highest concentration occurs on the western rim between 2,400 and 3,055 meters (7,874 and 10,023 feet) in elevation. A small subcolony has been located along the south rim of the crater (Simons and Hodges 1998). Field studies and research conducted in support of the Kaheawa I HCP confirmed the presence of a small nesting colony in West Maui in the lower portion of Kahakuloa Valley (Makamaka'ole Colony), later corroborated by DLNR/DOFAW biologists, and documented evidence of a potential nesting colony in the West Maui Mountains in the upper portions of Kahakuloa and Honokōhau (KWP 2010).

During the non-breeding season, Hawaiian petrels are found far offshore, primarily in waters of the eastern tropical Pacific. Nesting colonies are typically located on steep slopes at high elevation, xeric habitats or wet, dense forests. Nests may be in burrows, crevices, or cracks in lava tubes in both sparsely vegetated areas and areas with dense vegetation (e.g., uluhe fern [*Dicranopteris linearis*]). In the nesting colony in the south rim of the Haleakalā Crater, nests occur in more densely vegetated areas of shrub cover (Simons and Hodges 1998).

Adult Hawaiian petrels are long lived (up to 30 years) and return to their colonies, and to the same burrows each year between March and April. One egg is laid by the female, which is incubated alternately by both parents, for approximately 55 days. The egg is not replaced if it is lost to predation. When eggs hatch in July or August, both adults make nocturnal flights out to sea to bring food back to the nestlings. In October and November, the fledged young depart for the open ocean. Adults do not breed until age 6 and may not breed every year, although they all return to the colony to socialize (USFWS 1983; Mitchell et al. 2005). Hawaiian petrels feed their young mostly at night and movements take place during crepuscular periods. Hawaiian petrels travel primarily inland in the evening, seaward in the morning, and in both directions in the night (Day and Cooper 1995).

Current Threats

A variety of threats have been documented for the Hawaiian petrel, but the greatest limiting factors include habitat degradation at breeding colonies and disturbance or predation by introduced animals during the breeding season (USFWS 1983; Carlile et al. 2003; Mitchell et al. 2005). Introduced ungulates, including feral goats, pigs, axis deer, and cattle, browse on native vegetation and groundcover within petrel colonies and trample and collapse burrows causing nest abandonment. The soil disturbance caused by ungulates also facilitates the introduction and spread of invasive plants, further reducing habitat suitability for this species (Reeser and Harry 2005). Ungulates also create trails in the colony that increase access to active burrows by predators. Annual monitoring of nests at Haleakalā National Park has shown that predation by cats and mongooses causes more than 60 percent of all egg and chick mortality in some years (Simons 1998 as cited in Carlile et al. 2003). Rats also prey upon Hawaiian petrels but to a lesser extent, and they provide a prey base for cats and mongooses. Even an individual predator, such as a small Indian mongoose can be extremely destructive with the potential to decimate an entire population of colony-nesting seabirds (Hodges and Nagata 2001). Development of new fisheries may directly or indirectly harm seabird populations by eliminating predatory fish needed to drive petrel prey species closer to the surface. Also, live bait needed for the fishery could potentially decrease prey items. Development of a fishery for squid, a primary food source, could also impact Hawaiian petrels (USFWS 1983).

In addition, fledgling petrels sometimes collide with power lines, fences, and other structures (Hodges 1994) or become disoriented by lights (Telfer et al. 1987). Adults apparently are not attracted to lights to the same degree as fledglings or Newell's shearwater (see below) but adults may collide with structures. Since the beginning of operations in 2006, one Hawaiian petrel WTG-related fatality has been recorded at Kaheawa I Wind Project (Hufana 2010).

Occurrence within the Proposed Project

Hawaiian petrels have been documented flying over the wind farm site during radar surveys conducted in the proposed Project site in fall 2006 and spring 2010. Additionally, radar surveys have been conducted by other entities in the vicinity of where the proposed generator-tie line crosses a ridge next to the communication towers owned by Island Airwaves. The towers are located on the ʻUlupalakua Ranch within a 1.2-hectare (3-acre) parcel at roughly 1,356-meter (4,450-foot) elevation. Radar surveys were conducted over five nights in 2007. Petrel passage rates over this area averaged 2.3 petrel targets per hour (Gall and Day 2007 as cited in USFWS 2008).

Newell's Shearwater—Threatened

Distribution, Population Estimates, and Ecology

The Newell's shearwater is the Hawaiian endemic sub-species of the Townsend's shearwater (*Puffinus auricularis auricularis*), a medium-sized "Manx-type" shearwater. Historically, Newell's shearwater was once abundant on all the main Hawaiian Islands. Newell's shearwater is known to nest on Kauaʻi and Hawaiʻi and may also nest in small numbers on Maui, Molokaʻi, Oʻahu, and Lehua (off Niʻihau) (Spear et al. 1995; Ainley et al. 1997). Although there are no confirmed breeding colony locations on Maui, there have been several reports that Newell's shearwaters are suspected to nest on the island. In 2004, a suspected nesting site was documented around the headwaters of Piʻinaʻau stream situated within the Koʻolau Forest Reserve and just above the western wall of Ainahou Bowl of Koʻolau Gap (north slope of Haleakalā), East Maui (Wood and Bily 2008). Calls of Newell's shearwaters have been heard from various locations in the Kīpahulu Valley and along the northern slope of Haleakalā near Koʻolau Gap which are located on the north and east side of Haleakalā from the proposed Project (Natividad Bailey 2009). In West Maui, recent radar and audio-visual surveys suggest that Newell's shearwaters may be potentially nesting in the upper portions of the Kahakuloa Valley, but their occurrence has not yet been confirmed (KWP 2009).

From at-sea counts conducted in 1994, the total population for Newell's shearwater was estimated to be 84,000 birds (Spear et al. 1995; Ainley et al. 1997). However, recent radar target data from 1993 to 1999-2001 indicate the population may have declined by 63 percent from those estimates (Day et al. 2003). Numbers of both colonies and individuals are greatest on Kauaʻi.

The breeding season for this species begins in April when Newell's shearwaters return to look for nesting sites and continues through mid-July. Nesting burrows are used year after year and usually by the same pair of birds (Mitchell et al. 2005). Pairs produce one egg that is incubated for an average of 53 or 54 days and most chicks fledge in October and November. Parents forage hundreds of kilometers offshore and return to the colony at night to feed their chick. First breeding occurs at approximately 6 years of age and a relatively high rate of non-breeding is reported even by experienced adults present at the summer colony.

During the non-breeding season, Newell's shearwaters are found offshore in the eastern Pacific Ocean. Nesting colonies on the Hawaiian Islands are often in burrows under ferns on forested mountain slopes. Newell's shearwater breeding colonies are primarily found at high elevations in areas of open native forest dominated by ʻohia with a dense understory of uluhe ferns.

Current Threats

An attraction to lights and collision with power lines and other structures are two of the more significant sources of mortality on fledglings and breeding adults (Mitchell et al. 2005; DLNR 2005b). When variables describing the anthropogenic mortality for Newell's shearwater (predation, light attraction, and collision) were included, models predicted a population decline of 30 to 60 percent over 10 years (Ainley et al. 2001).

Occurrence within the Proposed Project

Newell's shearwaters are not expected to fly over the proposed Project based on radar data collected during other studies elsewhere on the island and knowledge of the species use of the island (Duvall 2010). None were confirmed within the wind farm site during fall 2006 or spring 2010 radar surveys.

Nēnē —Endangered

Distribution, Population Estimates, and Ecology

The nēnē (*Branta sandvicensis*) is the only existing endemic goose in the Hawaiian Archipelago and was reintroduced on Maui as part of its recovery plan. Fossil evidence suggests that historically the nēnē occurred on all of the main Hawaiian Islands. However, the current population occurs from just above sea level to approximately 2,700 meters on the islands of Kauaʻi, Maui, Hawaiʻi, and Molokaʻi, a distribution influenced largely by the locations of release sites of captive-bred birds (Banko et al. 1999). The statewide population consists of more than 1,300 birds with approximately 450 on Maui (250 to 300 in Haleakalā National Park). Populations are increasing on Kauaʻi and Molokaʻi, while the Hawaiʻi and Maui populations are stable (HNP 2009). On Maui, the nēnē is found primarily within the boundaries of Haleakalā National Park at elevations between 1,920 and 2,347 meters (6,300 and 7,700 feet) ASL (Banko et al. 1999), as well as in West Maui Mountains, and around the towns of Lahaina, and Wailuku (USFWS 2004).

Nēnē nest between October and March, during the wet winter season. Clutch size is typically three to five eggs. Nēnē nest on sparsely vegetated lava flows or on the vegetated edges of kipukas islands of vegetation around which lava once flowed and which are now characterized by vegetation older than the surrounding areas). Historically, nēnē bred in lowland habitats; however, these areas have been destroyed by development or have become inundated with predators and now nesting occurs at higher elevations (Banko et al. 1999). Nēnē typically do not re-nest in the same season if the first attempt fails. At approximately 10 to 12 weeks, the young are able to fly. During the nonbreeding season, nēnē forage in pastures and grassland habitats. Unlike other species of goose, nēnē are non-migratory, making only island-wide movements of up to 10 kilometers (6 miles), and do not require standing water.

Current Threats

The 2004 draft recovery plan for nēnē (USFWS 2004) lists predation by non-native mammals as the greatest factor limiting nēnē populations. In Haleakalā National Park, rats and mongooses were observed to be the main predators (Baker and Baker 1995). Other threats to the species include exposure in high elevation habitats, insufficient nutritional resources for both breeding females and goslings, a lack of lowland habitat, human-caused disturbance and mortality (e.g., road mortality, disturbance by hikers), behavioral problems related to captive propagation, and inbreeding depression as primary threats to the species.

Occurrence within the Proposed Project

During spring 2010 radar surveys, nēnē vocalizations were heard adjacent to the proposed Project. However, nēnē have not been detected or heard vocalizing during any other Project surveys conducted to date. Also nēnē have not been observed onsite. Because the nēnē detection appears to have been a single event, and because suitable habitat does not exist in the proposed Project, Auwahi Wind anticipates there is only a small chance that nēnē could fly through the wind farm site or across the generator-tie line corridor.

Blackburn's Sphinx Moth—Endangered

Distribution, Population Estimates, and Ecology

The Blackburn's sphinx moth (*Manduca blackburni*) is one of Hawai'i's largest native insects and the only federally listed insect in Hawai'i. This species was once known to occur on all seven of the Hawaiian Islands and now is found only on three islands: Hawai'i, Maui, and Kaho'olawe. This species was believed extinct until 1984, when a single population was rediscovered on East Maui (USFWS 2003). Additional populations on two other islands were subsequently rediscovered. Blackburn's sphinx moth population numbers are known to be small based upon past sampling results, however, no accurate estimate of population sizes have been made due to the rarity and wide-ranging behavior of the adult moths (Black 2005). It is difficult to determine densities of this species given the high variability in populations between years and seasons in association with climatic and environmental conditions that affect the quality and quantity of available habitat.

Adult moths can be found year-round but are most active from January through April and from September through November. Larvae take 65 days to develop to adulthood, but pupae may remain in torpor in the soil for up to a year. Larvae sightings have only been documented between the months of October and May (USFWS 2005a). The lifespan for this moth is unknown but presumed to be short.

This species is most commonly found in dry to mesic forests throughout its current range between sea level and 1,525 meters (5,000 feet), and is known to occur in this habitat on Maui. Larvae of the Blackburn's sphinx moth feed on plants in the nightshade family (*Solanaceae*). The native host plants are trees within the genus *Nothocestrum* ('aiea; *N. latifolium* and *N. breviflorum*; Riotte 1986), on which the larvae consume leaves, stems, flowers, and buds. However, many of the host plants recorded for this species are not native to the Hawaiian Islands, including *Nicotiana tabacum* (commercial tobacco), *Nicotiana glauca* (tree tobacco), *Solanum melongena* (eggplant), *Lycopersicon sculentum* (tomato), and possibly *Datura stramonium* (Jimson weed; Riotte 1986). Although Blackburn's sphinx moth larvae feed on the non-native tree tobacco (*Nicotiana glauca*), the USFWS does not consider this plant a necessary biological requirement for this species given the ephemeral nature of this plant species and intolerance to drought. Three plant species—maiapilo (*Capparis sandwichiana*), 'ilie'e (*Plumbago zeylanica*), and koali 'awa (*Ipome indica*; native morning glory)—are thought to be food plants of adult moths.

Current Threats

The primary threats to the moth are predation by ants and parasitic wasps that prey on the eggs and larvae, and the continued decline of its native larval host plants (USFWS 2005a). The continued decline of the moth's native larval host plants are partly as a result of feral ungulates, wildfire, introduced plants, human development, and ranching. Other threats to the species include predation by ants and several species of parasitic wasps and flies. Blackburn's sphinx moth is also susceptible to over-collection for personal collections or for trade. No known populations are entirely protected and the species is endangered throughout its range.

Occurrence within the Proposed Project

Of the seven islands, this moth was historically most common on Maui, where the largest and most persistent population of this species currently occurs. The largest remaining grove of ʻaiea trees in Hawaiʻi is located on Maui in the Kanaio NAR, adjacent to the proposed Project (Mitchell et al. 2005). The USFWS designated critical habitat for this species in the vicinity of the Project, in critical habitat unit 9. Unit 9 contains what is likely the largest existing moth population or meta-population in its range. This unit contains native (ʻaiea) and introduced larval host plants as well as numerous nectar-supplying plants for adult moths. Areas within this unit may serve as a source area for local populations and habitat for dispersing adult moths. Although the Auwahi parcel of ʻUlupalakua Ranch was originally considered for inclusion in the critical habitat unit, ultimately the ʻUlupalakua Ranch land was removed from the critical habitat unit "because the benefits provided by the landowners' voluntary conservation activities within and adjacent to these units outweigh the benefits provided by a designation of critical habitat" (USFWS 2003).

The species' non-native host plant, tree tobacco, has been observed in the proposed Project (generator-tie line corridor and adjacent to the construction access road) during the invertebrate and botanical resources surveys conducted in 2007 and 2010. Three adult male Blackburn's sphinx moths and one larva were observed at survey stations within the vicinity of the wind farm site and along the construction access road during 2007 invertebrate surveys (Montgomery 2008). The single larva was observed on one of the tree tobacco plants, and no larvae were observed on the eight ʻaiea plants examined outside the generator-tie line corridor. The species' native host plant ʻaiea was documented within the proposed Project and also occurs within the adjacent Kanaio Reserve. No evidence of Blackburn's sphinx moth or larvae was observed on tree tobacco documented within the proposed Project during the 2010 botanical surveys.

<u>Yellow-faced Bee—Considered for Listing/Species of Concern</u>

Distribution, Population Estimates, and Ecology

There are 60 native species of yellow-faced bees that occur in the Hawaiian Islands. The current distribution of the seven species being considered for listing ranges from lower-elevation coastal and dry shrubland habitats to mid-elevation (up to 914 meters [3,000 feet]) mesic and wet forest habitats (Magnaccca 2005). Of these species, five (*H. facilis, H. longiceps, H. anthracinus, H. assimulans,* and *H. hilaris*) occur on Maui and their current distribution is restricted to remnant patches of native coastal strand and lowland dry habitat. These species are dependent on intact native vegetation communities and they are absent from many of their historical locations, which have been developed or overtaken by invasive vegetation.

Hawaiian yellow-faced bees belong to the *Hylaeus* genus, which is part of the Colletidae family of bees, also known as plasterer bees because they habitually line their nests with salival secretions

(USFWS 2010). Bees of this family are solitary nesters. Nests of *Hylaeus* species are usually constructed opportunistically within dead twigs or plant stems or other similarly small natural cavities under bark or rocks (USFWS 2010).

Hawaiian *Hylaeus* bees are the critical pollinators for one or more species of native Hawaiian plants (Magnacca 2005a,b,c,d,e; 2007). These species almost exclusively visit native plants to collect nectar and pollen, pollinating these plants in the process, and have been rarely observed visiting non-native plants. Known host plants include *Metrosideros polymorpha* (ʻōhiʻa), *Styphelia tameiameiae* (pūkiawe), *Chamaesyce* spp. (akoko), *Acacia koa* (koa), *Scaevola* spp. (naupaka), *Sida fallax* (ʻilima), *Myoporum sandwicense* (naio), *Santalum ellipticum* (iliahialoe; coast sandalwood), *Sesbania tomentosa* (ohai), and *Vitex rotundifolia* (pohinahina), *Argemone glauca* (pua kala), *Tournefortia argentea* (tree heliotrope), and *Lipochaeta lobata* (nehe). The continued decline or eventual extinction of *Hylaeus* bees may therefore negatively impact native Hawaiian plant species (Cox and Elmqvist 2000).

Current Threats

Degradation and loss of coastal and lowland habitat used by *Hylaeu*s bees on all of the main Hawaiian Islands is the primary threat to these species. Land management practices such as agriculture, grazing, and urban development; the deliberate and accidental introductions of nonnative animals and plants; and recreational activities are all factors attributed to habitat loss and degradation. These factors have reduced much of the native vegetation used by the bees. Many of the native plants that serve as foraging resources for the adults of the bee species are declining because of a lack of pollinators and the plants are found in very limited populations. Fire is also a potential threat to the habitat (USFWS 2010).

Occurrence within the Proposed Project

ʻIlima , a host plant, for the bee species, has been documented adjacent to the construction access route (David and Guinther 2011). Only one species, *H. assimulans*, was documented in the wind farm site on ʻilima flowers during 2008 invertebrate surveys. Approximately 40 bees were observed in one day (Montgomery 2008).

3.7.2 Potential Impacts and Mitigation Measures

This section assesses the potential effects of the proposed Project and the No Action Alternative on wildlife. Cumulative effects to wildlife are discussed separately in Chapter 4.

3.7.2.1 Impact Methodology and Factors Considered for Impacts Analysis

Effects to wildlife and wildlife habitat are assessed quantitatively, where possible. Habitat is assessed by acres of wildlife habitat (vegetation) temporarily and permanently disturbed by installation of proposed Project facilities. This was determined as identified in Section 3.6 – Vegetation. These acreages are maximum build-out estimates; it was assumed that all 15 turbine pads would be constructed if GE 1.5-MW models are selected. Selection of Siemens 2.3-MW and 3.0-MW models would require 10 and 8 turbine pads, respectively, and therefore would result in less vegetation removal and lower impacts to wildlife habitat.

Other effects to wildlife are assessed qualitatively through discussion of noise and disturbance, as well as potential impacts associated with noxious weeds. Effects to state- and federally-listed wildlife species, which are the subject of the HCP currently being developed for the Project, are addressed in greater detail and include a description of the calculation of direct and indirect take estimates associated with wind farm construction and operation.

Impacts to wildlife would occur when habitats or individuals are disturbed or killed during the Project's construction or operations. The significance of the impact depends, in part, on the sensitivity of the affected population. A significant impact on wildlife would result from the construction or operations of the Auwahi Wind Project if the following were to occur:

- Loss of individuals of a population of wildlife that would result in the species being listed or proposed for listing as threatened or endangered;
- Substantial local loss of high quality wildlife habitat (as compared to total available resources within the area); or
- Interference with nesting or breeding periods of wildlife species of concern.

A significant impact on endangered or threatened species or their critical habitats would result if the Auwahi Wind Project were to:

- Jeopardize the continued existence of a federally listed species;
- Result in the loss of individuals of a population of species that would result in a change in species status; or
- Adversely modify Critical Habitat to the degree it would no longer support the species for which it was designated.

3.7.2.2 Construction Impacts—Non-listed Wildlife Species, Hawai‘i State Species of Concern, and MBTA-protected Species

Potential impacts to approximately 241 acres of wildlife habitat could result from vegetation removal associated with the construction of proposed Project facilities, primarily consisting of grasslands, pasturelands, and savannah. Due to the ongoing ranch operations, wildlife habitat removed or disturbed by the proposed Project is not high quality. Tree removal would be minor, consisting of the removal of individual trees primarily in association with clearing for the generator-tie line corridor and the construction access route (Pāpaka Road); however, remnant native vegetation types would be avoided where possible. Potential habitat removal associated with construction is summarized by vegetation type in Table 3.6-4. Depending on the selection of turbine model, the wind farm access roads may be modified by shortening the length and increasing the grade. This straightened road alignment would result in less removal of wildlife habitat than the currently proposed WTG access road alignment (see Chapter 2 for additional details).

Depending on which WTG model is selected and geotechnical studies to be conducted during the final design, the WTG access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Section 2.1.1.2 for additional details). This straightened road alignment would result in less removal of wildlife habitat (approximately 10 acres) than the currently proposed WTG access road alignment (see Section 2.1.1.2 for additional details).

Non-listed Wildlife Species

Habitat Removal and Fragmentation

The proposed Project is on a portion of the 'Ulupalakua Ranch that has been extensively grazed in the past and is currently used for cattle ranching and the existing vegetation includes many introduced species. Thus, vegetation removal would occur in an area that has previously been disturbed and contains no large contiguous blocks of intact or high quality habitat. Additionally, most of the non-listed wildlife species that use the ROI are exotic. For these species, vegetation removal associated with the proposed Project represents a small amount of the habitat available to them within the ROI. Therefore, vegetation removal associated with the proposed Project would not result in a substantial local loss of wildlife habitat for non-listed species.

The proposed Project has been sited to avoid the Auwahi Forest Restoration Project, areas of native vegetation, and the Kanaio NAR. Thus, remnant habitats including dryland forest important to native wildlife species, including those protected by the MBTA, would be maintained under the proposed Project.

The introduction and spread of invasive species can reduce habitat quality both within and adjacent to the proposed Project by replacing native vegetation with exotic plant species that can favor wildlife species and compete with or prey on native wildlife. For example, in the Kanaio NAR native invertebrates have been heavily impacted by predation by an introduced ant species (Medeiros et al. 1993). Through the implementation of BMPs as identified in Table 2-4 for invasive species prevention and control, such as the cleaning and inspection of equipment and vehicles and revegetation of disturbed areas with native species or pastureland vegetation, the introduction or spread of invasive species would be minimized. Therefore, the proposed Project would not result in a substantial reduction in habitat quality for any wildlife species.

Direct Mortality

Non-listed avian species have the potential to collide with vehicles or equipment during construction. Mitigation measures including speed limits on Project roads would be implemented to minimize the risk of collisions. The proposed Project would further reduce the potential for collisions by marking the proposed generator-tie line and met tower with bird flight diverters to increase visibility of lines and burying collector lines between the WTGs.

Invertebrate species, given their limited mobility, are most likely to be killed or injured by construction equipment and vehicles. The grading of roads and turbine sites could potentially result in some fatalities of these species. Fatalities during construction would not reduce the viability of invertebrate population within the ROI given the temporary nature of potential effects.

Noise and Disturbance

Construction-related activities, including installation of WTG and generator-tie line structures as well as construction of access roads (including blasting) and other Project facilities, use of heavy equipment, and high levels of human activity around the construction sites would result in increased onsite noise and human presence that could disturb wildlife using the ROI. However, given the temporary nature of the construction period, the proposed Project would not preclude wildlife from using the ROI.

Hawai'i State Species of Concern

Hawaiian Short-eared Owl

It is assumed that the Hawaiian short-eared owl could occur within the proposed Project on occasion because one was documented during point count surveys. As noted in Section 3.7.1.2, they are associated with grasslands and shrublands and therefore likely use these habitats within the ROI for foraging. Project construction would disturb a total of approximately 80 hectares (197 acres) of grassland and shrubland habitat that could be potentially used for foraging. This comprises approximately 4 percent of the grassland and shrubland within the ROI, and therefore would not result in an appreciable loss of habitat for this species and at most would affect individual owls in the immediate vicinity of permanent project structures where no revegetation would occur. The removal or alteration of vegetation also has the potential to reduce available foraging habitat. However, this effect would also be localized.

Pacific Golden Plover

The Pacific golden plover has the potential to occur during the winter months in the ROI, where they are likely to forage for insects in open habitat. Removal of vegetation during construction would result in a minor loss of habitat for this species; however, this is not expected to preclude the species from using the ROI given that the minor amount of habitat removed comprises a small amount of the available habitat.

MBTA-protected Species

MBTA-protected species would be exposed to noise and disturbance during construction. To avoid and minimize impacts to MBTA-protected species that are not listed as threatened or endangered, Auwahi Wind, to the extent consistent with the proposed Project's purpose and need, has incorporated into the Project certain design features contained in the Wind Turbine Guidelines Advisory Committee (2010) draft recommendations for wind energy development (issued to the Secretary of the Interior March 4, 2010). These guidelines contain materials to assist in evaluating possible wind power sites and to assess potential impacts to wildlife, including MBTA-listed species. Although any impact to an MBTA-protected species is considered technically a violation of the MBTA, there are currently no "take" permits for MBTA-species available and therefore the USFWS exercises discretionary prosecutorial authority in this respect where a wind farm demonstrates a good faith effort to avoid and minimize take of MBTA species. By implementing the relevant and appropriate portions of the most recent agency-approved guidelines for construction and operations of a wind farm, the Applicant would avoid or minimize impacts to MBTA-protected species to the maximum extent possible.

3.7.2.3 Operations and Maintenance Impacts—Non-listed Wildlife Species, Hawai'i State Species of Concern, and MBTA-protected Species

The proposed Project would result in a permanent loss of wildlife habitat where vegetation removal is associated with permanent structure placements (e.g., WTG pads, generator tie-line structures, and access roads). The proposed Project would permanently remove approximately 78 acres of vegetation, a majority which consists of grazed grassland/pastureland and scrub/shrub vegetation. No additional tree removal would be required during operations of the proposed Project. Potential habitat removal associated with Project operations is summarized by vegetation type in Table 3.6-4.

Non-listed Wildlife Species

Habitat Removal

No additional habitat would be removed during operations of the proposed Project. Portions of the wind farm site and the generator-tie line corridor not needed for normal O&M would be revegetated and restored to approximate their pre-construction condition and function as wildlife habitat. In areas of taller vegetation along the generator-tie line corridor, vegetation would be trimmed to maintain fire and personnel safety clearance zones associated with the generator-tie line but would otherwise function as wildlife habitat.

Direct Mortality

Non-listed avian species have the potential to collide with operating WTGs or other Project structures such as the generator-tie line. At the existing Kaheawa I Wind Farm on Maui, as of August 2010, 13 fatalities of non-listed avian species were documented during the first 3.5 years of facility operations (Hufana 2010). It is foreseeable that similar impacts could occur as a result of the Auwahi Wind Project given the similar number of proposed WTGs. Post-construction fatality monitoring would be conducted within the wind farm site to assess potential impacts to non-listed and listed species as a result of operations of the Auwahi Wind Project. Collisions with power lines or the met tower would be avoided by burying onsite collection lines, installing bird flight diverters on the generator-tie line and wind farm met-tower guy wires, and flagging wind farm met-tower guy wires. Therefore, with the expected low level of Project-related mortality, no local or regional population-level effects are anticipated for any of these species.

Invertebrates could be injured or killed during Project operations due to collisions with equipment and vehicles. However, given that onsite traffic would be infrequent in association with routine maintenance and onsite speed limits would be observed, the likelihood of Project-related impacts to invertebrates would be low.

Noise and Disturbance

To a much lesser extent than during construction, Project O&M activities would result in low levels of noise and disturbance at the wind farm site and along the generator-tie line from the WTGs and staff conducting regular operations activities. Given the temporary and localized nature of noise and disturbance, no long-term impacts to non-listed species breeding or foraging activities within the ROI would be anticipated.

Hawai‘i State Species of Concern

Short-eared Owl

Data from operating wind farms in North America suggest that short-eared owls are not generally susceptible to collisions with WTGs (Kingsley and Whittman 2007). At the existing Kaheawa I wind farm on Maui, short-eared owls have been observed flying low over the ground over open pastures and grasslands, well below the rotor swept area. As of August 2010, three fatalities of short-eared owls have been documented at the Kaheawa I site during 3.5 years of operation, including one along an access road, presumably due to a collision with a vehicle, and two due to collisions with WTGs (Hufana 2010). Thus at the proposed wind farm site, there is the potential that short-eared owls could collide with construction or maintenance vehicles while foraging, but the likelihood of this appears very low as only one individual was observed during surveys. Adherence to vehicle speed restrictions on Project roads, minimizing nighttime activities, and flagging met tower guy wires would reduce this likelihood even further. In addition, post-construction monitoring would be conducted to assess effects to the short-eared owl.

Pacific Golden-plover

It is possible that Pacific golden plovers could collide with the WTGs during periods of poor visibility. Similar species of night-migrating neotropical migrants have occasionally been killed in large numbers by collisions with lit communication towers if they become attracted to or disoriented by them (WWF 2006). Additionally, the Applicant would request a Federal Aviation Administration (FAA) endorsement of a minimal lighting plan to reduce the likelihood of attracting or disorienting migrating birds. Therefore, the potential for impacts to the Pacific golden plover resulting from collisions with WTGs or other project structures is expected to be low. Post-construction monitoring would be conducted to assess project-related effects to this species.

MBTA-protected Species

MBTA-protected species that fly through the proposed Project have the potential to collide with WTGs or other project structures. At the existing Kaheawa I Wind Farm on Maui, as of August, 2010, one fatality of an MBTA-protected species was documented during the first 3.5 years of facility operations (Hufana 2010). Noise and disturbance would also occur during operations in association with routine O&M activities at the wind farm site and along the generator-tie line; however, due to the temporary and localized nature of these impacts, no long-term disturbance of MBTA-protected species breeding or foraging activities within the ROI would be anticipated. As noted above, the Applicant would request an FAA endorsement of a minimal lighting plan to reduce the likelihood of attracting or disorienting birds. Additionally, the Applicant has committed to implementing a post-construction monitoring program, as recommended by the Wind Turbine Guidelines Advisory Committee (2010), to assess Project-related impacts to avian species.

3.7.2.4 Construction and Operations and Maintenance Impacts—ESA-listed Species and Species under Consideration for Listing

The five state and federally listed wildlife species and species under consideration for federal listing have the potential to be affected by construction or operations of the proposed Project. Therefore, in compliance with Section 10 of the ESA and HRS § 195D-4(g), Auwahi Wind is preparing an HCP to apply for an ITP/ITL issued by the USFWS and DOFAW, respectively.

The issuance of an ITP/ITL requires establishing the number of individuals or amount of habitat impacted for each covered species authorized for incidental take during a defined period. An estimate of potential take for each of the covered species was developed based on survey data and associated risk of collision modeling efforts (seabirds); information on the potential occurrence of each species in the ROI; input from the USFWS and DOFAW; and initial post-construction monitoring data from the operating Kaheawa I wind project. The risk of collision model incorporated passage rates of petrel/shearwater-type targets and flight height data derived from the radar surveys, avoidance rates, and the proposed Project layout. Indirect take, or the take of eggs or dependent young when a parent is killed, was also taken into account.

Potential direct and indirect construction and operations-related impacts to ESA-listed species and species under consideration for listing are described below. Discussion of construction and O&M is combined because sources of mortality during both proposed Project phases were incorporated into Project-related take estimates and associated requested ITP/ITL take authorizations. A proposed mitigation strategy for estimated take is presented in Section 3.7.2.6, which is still under development and will be finalized in coordination with DOFAW and USFWS and may be revised from the proposed measures identified in this document.

For the Hawaiian hoary bat and Hawaiian petrel, the species most likely to be affected by the proposed Project, a three-tiered approach to take and mitigation has been developed based on the best available scientific information. Each tier represents a level of take and associated compensatory mitigation measures. Reaching Tier 1 levels of take for a species initiates implementation of Tier 2 mitigation, and so on. For the Newell's shearwater, nēnē, yellow-faced bee, and Blackburn's sphinx moth, the likelihood of Project-related effects is low given the absence of the species from the proposed Project (shearwater and nēnē) or due to measures that would avoid or minimize take (moth and bees). Thus, in consultation with the USFWS and DOFAW, a maximum take limit has been established for the Newell's shearwater and nēnē over the 25-year period of the HCP/ITP/ITL The requested HCP term is 25 years to cover construction, operations, and potential decommissioning of the Project. Direct impacts to Blackburn's sphinx moth and the yellow-faced bee are anticipated to be largely avoided, although it is recognized that some potential impacts could occur to habitat and would be mitigated.

Table 3.7-3 summarizes the requested take levels for each of the covered species. The following subsections describe the potential direct and indirect effects of the Project on the covered species and the basis for the take estimates and requested authorizations under the ITP/ITL for each species.

Table 3.7-3.
Requested ITP/ITL Authorization for ESA-listed Species and Species under Consideration for Listing for the Auwahi Wind Project

Species	Requested Take Over the 25-year HCP Period
Hawaiian Petrel	
Tier 1	29 adults; 11 chicks
Tier 2	45 adults; 16 chicks
Tier 3	90 adults; 32 chicks
Hawaiian hoary bat	
Tier 1	9 adults; 4 young
Tier 2	17 adults; 7 young
Tier 3	35 adults; 14 young
Newell's shearwater	5 adults
Nēnē	5 adults
Blackburn's sphinx moth	3.2 acres
Yellow-faced bee	Unquantifiable[1/]

1/ Impacts to habitat would be mitigated.

Hawaiian Hoary Bat

Direct and Indirect Effects

Across the United States, the hoary bats account for the majority of wind farm fatalities (Arnett et al. 2008). It is unknown whether the Hawaiian hoary bat exhibits the same propensity to collide with WTGs as its North American relative, because the subspecies is not known to migrate long distances. However, there is the potential for Hawaiian hoary bats to collide with WTGs or succumb to barotrauma while foraging. This species forages for insects in open areas such as grasslands and shrublands, habitats which exist in the proposed Project. However, roosting habitat occur in very limited amounts within the proposed Project. It is not known how far Hawaiian hoary bats forage from roost sites in forested areas.

Bat activity is anticipated to be low at the Project given the absence of roosting habitat and the limited detections during radar surveys. Furthermore, after 3.5 years of operations, only one Hawaiian hoary bat fatality has been reported at Kaheawa. Acoustic monitoring surveys conducted at Kaheawa have indicated low bat activity as well. Although the topography of the Kaheawa and Auwahi sites are similar, Kaheawa contains more forest habitat suitable for roosting, and therefore bat use would be expected to be greater there than at Auwahi.

Hawaiian hoary bats roost in exotic and native woody vegetation at heights greater than 4.5 meters (15 feet). If trees suitable for bat roosting are cleared during the bat breeding season (April to August), there is a risk that breeding bats could inadvertently be harmed or killed. Young bats, which are incapable of flight, are particularly vulnerable during the bat birthing and pup rearing season (May 15 through August 15). To minimize potential impacts to the Hawaiian hoary bat, woody plants greater than 4.5 meters (15 feet) tall would not be removed or trimmed between May 15 and August 15 throughout the installation and ongoing maintenance of the Project structures. The primary area of concern for the Project is the portion of the generator-tie line in the area between the Kanaio NAR and Auwahi Forest Restoration Project.

Direct Take

There are four potential sources of direct bat mortality within the proposed Project. The first is collisions with vehicles. This source of mortality is considered negligible given the limited nighttime traffic expected at the proposed Project and low posted speed limits on Project roads. The second is collisions with stationary (e.g., met towers, generator-tie lines) and near-stationary (e.g., crane booms) objects. These sources of mortality are also considered negligible given the general ability of bats to avoid colliding with stationary objects. The third is associated with construction-related and maintenance-related clearing or trimming of woody vegetation taller than 4.5 meters (15 feet) during the bat breeding season. Potential mortality is negligible because such vegetation only occurs along a short portion of the new generator tie-line, and Auwahi Wind would not remove or trim such vegetation during the April to August breeding season. The fourth, and most likely, potential source of direct bat mortality, used as the basis for quantifying direct take, is collisions or other negative interactions with operational WTGs.

Given the similarities in landscape features (e.g., slope, aspect) and the number and type of WTGs (GE 1.5-MW) between Kaheawa I and II and the proposed Project, it is reasonable to use the Kaheawa I data to estimate potential direct take resulting from turbine collisions at the proposed Project site. A single fatality was observed at the Kaheawa I site (KWP 2009), which translates to an estimate of bat mortality at 0.023 bat per turbine per year. Thus, transferring the Kaheawa I per turbine estimate to the proposed Project for the 15-turbine GE array results in an estimated direct bat mortality of 0.345 bat per year. This annual mortality rate is considered to be the maximum rate expected at site given the lack of suitable habitat in the proposed Project.

Indirect Take

The take of a bat during the breeding season may result in the indirect loss or take of a dependent offspring. Several variables are needed to assess both the potential for and magnitude of this indirect take: the proportion of take assumed to be adult, the proportion of the take that is assumed to be female because only female bats care for young, the proportion of the year that is the breeding period, the likelihood that the loss of a reproductively active female results in the loss of its offspring, and average reproductive success (Table 3.7-4).

Table 3.7-4.
Annual Indirect Take Estimate for Hawaiian Hoary Bat

Component	Description/Rationale	Estimate
A. Annual Direct Take (bats/year)	Estimate annual direct take	0.345
B. Proportion of take that is adult	As a conservative estimate, it was assumed that all take would be of adult bats, despite the potential for newly volant young (i.e., young of the year) to pass through the Project a during the fall.	1.00
C. Proportion of take that is female	Hawaiian hoary bats are assumed to have an adult sex ratio of 1:1 and no sex-based differential susceptibility to turbine collisions. Therefore, female bats should comprise 50% of total take.	0.50
D. Proportion of "year" that is breeding period (5 of 12 months)	Adult hoary bats potentially occur at the Project throughout the year. However, as the breeding season only spans April through August (Menard 2001, cited in Cooper and Day 2009), it is only the loss of adult bats during this 5-month period that may result in the indirect loss of dependent young.	0.42
E. Proportion of taken breeding adults with dependent young	Until weaning, young of the year are completely dependent on the female for survival. Therefore, all female mortality during the breeding season results in the loss of her young.	1.00
F. Average offspring/pair	Data are limited, average reproductive success in terms of young/year based on Bogan (1972) and Koehler and Barclay (2000).	1.83
G. Annual Indirect Take (young/year)	Multiplying lines A through F results in an indirect take estimate.	0.133

Total Take and Population-Level Impacts

The maximum estimated annual take resulting from the Project construction and operations is 0.345 adult bat/year and 0.133 young/year, or 0.478 bat/year combined. In recognition that bat fatalities are significantly more difficult to detect than avian fatalities, it is assumed that for every recorded adult fatality, an additional three adult fatalities have gone undetected (Arnett 2005; Jain et al. 2007; Fiedler et al. 2007).

Recent population estimates for Hawaiian hoary bat have ranged from several hundred to several thousand (Menard 2001; Bunacoso 2010). Although the greatest overall numbers of this species are known on the island of Hawai‘i and Kaua‘i (Menard 2001), systematic monitoring has not been conducted on Maui to understand the size of its local population. It is difficult to assess the effect that take of Hawaiian hoary bats resulting from the proposed Project may have on the local population of this species because the size of this population is not known. However, the levels of bat activity are expected to be low onsite, so Project-related take is anticipated to be relatively low and unlikely to result in a significant impact on the overall population of the Hawaiian hoary bat.

Based on the assumptions and analysis above, the maximum estimated annual take resulting from the Project construction and operations is 0.478 bat per year (adults and young combined). In recognition that bat fatalities are significantly more difficult to detect than avian fatalities, it is assumed that for every recorded adult fatality, an additional three adult fatalities may have gone undetected (Arnett 2005; Jain et al. 2007; Fiedler et al. 2007).

A tiered approach was taken for determining the requested authorized take levels for the Hawaiian hoary bat. Given the limited bat habitat present within the proposed Project site and expected low levels of activity, the calculated maximum level of take is not expected to occur. Because there is no obvious biological justification for a tier, the three tiers were created relevant to the maximum estimated take. Tier 1 take level assumes that the average annual take would be less than 25 percent of estimated maximum values. The requested Tier 2 take levels assume that average annual take would be 50 percent of the estimated maximum values. The requested Tier 3 take levels assume maximum annual take over the life of the proposed Project. The take limits for each tier were derived by extrapolating the annual estimated take (0.086 adult/year for Tier 1, 0.17 adult/year for Tier 2, and 0.345 adult/year for Tier 3) over the 25-year Project life span, multiplying by 4 to account for unobserved take of adults, and rounding up to the nearest whole number. Indirect take was calculated based on the adjusted number of adult fatalities. The three tiers are as follows:

- Tier 1—9 adults and 4 young (total take of 13 bats) over the 25-year O&M period;
- Tier 2—17 adults and 7 young (total take of 24 bats) over the 25-year O&M period; and
- Tier 3—35 adults and 14 young (total take of 49 bats) over the 25-year O&M period.

<u>Hawaiian Petrel</u>

Direct and Indirect Effects

The Haleakalā Hawaiian petrel colony is located approximately 8 kilometers (5 miles) northeast of the Project. Potential direct impacts could occur to petrels when flying to and from the colony because they could collide with turbines or other Project facilities. As Haleakalā is an active petrel breeding colony, the potential for indirect take of petrels exists if an adult is killed while incubating an egg or rearing a chick. However, not all losses of an adult during the nesting season would result in the loss of that year's young because not all adults are successful breeders. During the spring season, a large number of non-breeding individuals (both adults and juveniles) may also be present on the island; these individuals typically exit the colony by late August (Warham 1990; Ainley et al. 1997; Simons and Hodges 1998).

Seabird and waterfowl species have been documented detecting and avoiding WTGs and other human-made structures (e.g., transmission lines) in low-light conditions (Winkleman 1995; Dirksen et al. 1998; Desholm and Kahlert 2005; Desholm et al. 2006; Tetra Tech 2008). Petrels are adept at flying through forests to and from their nests during low-light conditions and variable weather conditions and may exhibit strong avoidance behaviors when approaching WTGs or other structures. Petrels have been observed exhibiting avoidance behaviors at communication towers on Lānaʻi (Tetra Tech 2008) by adjusting flight directions away from the tower or by approaching the tower and turning away from the structure to avoid it. Only one petrel fatality has been reported at Kaheawa I wind farm during almost 4 years of operations and monitoring (KWP 2010). Therefore, it is reasonable to assume that (1) petrels have the behavioral and physical capabilities to avoid towers and Project components, and (2) a high proportion of petrels would detect and avoid large structures.

Complete avoidance of risk to the Hawaiian petrel is not possible for the proposed Project. Therefore, the Applicant plans to minimize the risk of collision as much as possible by performing construction during daylight as much as feasible and minimizing lighting during night-time construction; increasing visibility of the permanent met tower and generator-tie line to reduce collision risk; periodically curtailing WTG operations at night during periods of high wind; and minimizing onsite lighting during Project operations to avoid attracting seabirds. A detailed list of mitigation measures is provided in Section 3.7.2.6.

Direct Take

Sources of direct mortality of petrels at the Project include collisions with WTGs, met towers, construction cranes, and collection/generator-tie lines. Passage rates of petrels through the proposed Project, as determined by the fall 2006 and spring 2010 radar surveys, were used as the basis for estimating direct take due to collisions with WTGs, which are the most likely source of collision. Evidence suggests that petrels are capable of high levels of avoidance of vertical structures (Cooper and Day 1998; Tetra Tech 2008; KWP 2009 and 2010). In the context of wind energy facilities, avoidance rate is defined as the probability that an individual bird that nears the airspace of a turbine is able to avoid colliding with the turbine. A high level of turbine avoidance is supported by mortality data collected during Kaheawa I post-construction monitoring (KWP 2010), which suggest that the avoidance rate is at least 97 percent. To be conservative, Hamer Environmental (2010b) applied a range of avoidance rates (90, 95, and 99 percent) in their model to calculate annual direct take estimates. Hamer Environmental (2010b) estimated annual direct take of Hawaiian petrels resulting from collision with the GE 1.5-MW WTGs at the Project to range from 1.008 to 3.450 petrels per year, at avoidance rates of 99 and 95 percent, respectively (Table 3.7-5). Take estimation based on the GE 1.5 MW WTGs represents the worst-case scenario of the three WTG models being considered and modeled by Hamer Environmental. The GE WTGs would require 15 WTGs to be constructed in two strings. Impacts to petrels would be less if Siemens 2.3 MW or 3.0 MW WTGs were selected, because these scenarios would require the installation of only 10 or 8 WTGs, respectively.

Table 3.7-5.
Direct Take Estimates for Hawaiian Petrel

Avoidance Rate	95%	99%
Annual Direct Take from GE Turbines[1/]	3.450	1.008
Annual Direct Take from Met Tower	0.040	0.040
Annual Direct Take from Generator-tie	0.100	0.100
Annual Direct Take	3.590	1.148

1/ From Hamer Environmental 2010b

In addition to collisions with operational WTGs, petrels may also collide with met towers. For Kaheawa II, the avoidance rate for collisions with a met tower was estimated at 95 percent, resulting in an annual take estimate of 0.04 petrel per year per tower, which has been applied to the proposed

Project's single guyed-met tower (Table 3.7-5) (Cooper and Day 2009). The met tower would also be marked with flagging and bird diverters to increase visibility as was done at Kaheawa II. However, this may be an overestimate because after 3 years of monitoring six met towers on Lānaʻi, no take of petrels has been documented (Standley 2010). Given the limited time period during which cranes would be onsite (during only a portion of which they would be vertical or in operation), the potential for petrel-crane collisions is assumed to be negligible and is not further considered.

The construction of the proposed Project would necessitate the construction of approximately 14.5 kilometers (9 miles) of generator-tie lines. Although there is some potential for petrels to collide with the generator-tie line, based on discussions with USFWS, DOFAW and the Endangered Species Review Committee, the area identified as being of primary concern was the approximate 2.6-kilometer (1.6-mile) segment of the generator-tie line that runs perpendicular to the ridge running south west of the Haleakalā crater. This area would stand in starkest relief to the surrounding landscape and, as a result, should present the highest collision risk. The highest component of this line (i.e., top of pole) would be approximately at or below 20 meters (65.5 feet) above ground level in this segment depending on terrain features. To minimize collision risk, lines would be marked with bird diverters. Observations of petrels on Kauaʻi (Day et al. in review, cited in Cooper and Day 2009) suggest that petrels are highly capable of avoiding transmission lines. As a result, take resulting from collisions with the generator-tie line is assumed to be very small (0.1 petrel per year, following Cooper and Day 2009; Table 3.7-3).

Collisions between construction and maintenance vehicles and healthy, free-flying petrels are highly unlikely due to the temporal disconnect between bird activity and construction activity periods; their probability would be further minimized by the implementation of strict speed limits (40 kph [25 mph] during daytime and 16 kph [10 mph] at night) on Project roads. Project vehicles do have the potential to collide with petrels that have been injured by collisions with WTGs, met towers, or collection systems. Because these collisions involve birds already accounted for in the preceding calculations, no additional take estimates are warranted. In addition, an environmental monitor would be onsite during any periods of night construction to assist with any downed birds that may be attracted to the lights, thereby minimizing the potential for mortality associated with the grounding of birds.

Indirect Take

The incidental take of a petrel during the breeding season may result in the indirect loss or take of a dependent chick. Several variables are needed to assess both the potential for and magnitude of this indirect take: the proportion of take assumed to be adult, the proportion of the activity period (i.e., period during which adults are visiting the colony) during which adults may be expected to have eggs or chicks, the likelihood that a given adult is reproductively active, the likelihood that the loss of a reproductively active adult results in the loss of its chick, and average reproductive success (Table 3.7-6).

Table 3.7-6.
Indirect Take Estimate for Hawaiian Petrel

Component	Rationale/Description	Avoidance Rate	
		95%	99%
A. Annual Direct Take (adults/year)	Annual direct take from Table 3.7-4.	3.59	1.14
B. Proportion of take that is adult	Assumed that 100% of direct take was of adult birds because juveniles (i.e., non-breeders under the age of six) rarely visit the breeding colony during the breeding season (Simons and Hodges 1998).	1.00	1.00
C. Proportion of "year" that is breeding period (6 of 8 months)	Although adult birds may be present at the colony over an 8-month period (March-October), only six of these months represent the breeding period (Simons and Hodges 1998).	0.75	0.75
D. Proportion of adults that breed	The proportion of adults attending the breeding colony that attempt to breed in a given year (Simons and Hodges 1998).	0.89	0.89
E. Proportion of taken breeding adults with dependent young	The impact of the loss of a single parent on a dependent chick varies within the breeding season: During May to September, both parents are deemed critical to chick survival. During May-August, only 89 % of adults are breeding (89 % breeding * 1 chick/pair * 100 % parental contribution). By September, only reproductively active adults are present on the colony (100 % breeding * 1 chick/pair * 100 % parental contribution). In October, the chick is no longer dependent on both parents (100 % breeding * 1 chick/pair * 50 % parental contribution). The proportion of taken breeding adults with dependent young was calculated as: ((0.89*1*1*4 months) + (1.00*1*1*1 month) + (0.5*1*1*1 month))/6 months = 0.84.	0.84	0.84
F. Average chicks/pair	Average reproductive success for petrels on Maui (Simons and Hodges 1998).	0.63	0.63
G. Annual Indirect Take (chicks/year)	Multiplying Lines A through F.	1.268	0.406

Total Take, Population Level Impacts, and Requested ITP/ITL Authorization (25 years)

Combining the direct and indirect take estimates for each level of avoidance provides a range of Project total take of adults and juveniles (Table 3.7-7).

Table 3.7-7.
Total Take Estimate for Hawaiian Petrels

Tier	Adults	Juveniles
99% avoidance		
Annual average	1.148	0.406
Over 25 years	28.70	10.15
95% avoidance (maximum)		
Annual average	3.590	1.268
Over 25 years	89.750	31.700

The population size of the Haleakalā colony is estimated at 475 to 650 breeding pairs, or 950 to 1,300 adult individuals. Annual take of adults predicted at 99 percent and 95 percent avoidance represents an additive mortality equivalent to 0.12 and 0.38 percent of the low end of the population estimate, respectively. Thus, any additive mortality resulting from the construction and operations of the proposed Project is unlikely to have population-level impacts to the local breeding colony.

A tiered approach was taken for determining the requested authorized take levels for the Hawaiian petrel, providing assurance that if actual take levels (as determined by post-construction monitoring) are higher than anticipated, additional specific mitigation would automatically be triggered. This approach ensures that site-specific data would be used to guide adaptive management. Three tiers are specified, based on extrapolating the annual modeled estimate of annual take for adults and juveniles over the 25-year Project time frame and rounding up to the nearest whole number. The requested Tier 1 and Tier 3 were based on anticipated annual adjusted take levels assuming 99 percent and 95 percent avoidance, respectively (Table 3.7-5). Tier 2 was based on 50 percent of the Tier 3 (or maximum) take level. Each tier represents the total take requested and is not additive among levels. The following is the requested ITP/ITL authorization:

- Tier 1—29 adults and 11 chicks;
- Tier 2—45 adults and 16 chicks; and
- Tier 3—90 adults and 32 chicks.

Newell's Shearwater

Direct and Indirect Effects

Recent radar surveys suggest, but have not confirmed, that Newell's shearwater may also be nesting on Maui (Cooper and Day 2003); however, as previously discussed, the species is considered highly unlikely to cross the Project. Therefore, the likelihood of collision with WTGs or other proposed Project facilities such as the generator-tie line is considered extremely low. Mitigation measures described above for the petrel, and listed in Section 3.7.2.6, would also minimize potential effects to Newell's shearwaters.

Total Take and Population-Level Impacts

On the slight chance that a Newell's shearwater would fly across the proposed Project and collide with one of the WTGs, the generator-tie line, or a crane (as described above for the Hawaiian petrel), the Newell's shearwater has been included as a covered species in the HCP, though only one level of take is requested. The take limit request for the 25-year period of the HCP is five adult Newell's shearwaters. Any mortality resulting from Project construction and operations is unlikely to have population-level impacts to the Maui population.

Nēnē

Direct and Indirect Effects

Nēnē are known to occur on Maui but, as previously discussed, considered highly unlikely to fly over or visit the proposed Project vicinity with much frequency. Therefore, the likelihood of collision with WTGs or other proposed Project facilities such as the generator-tie line is considered extremely low.

Total Take and Population-Level Effects

Given the slight chance that a nēnē would fly across the proposed Project and collide with one of the WTGs, the generator-tie line, or a crane (as described above for the Hawaiian petrel), the nēnē has been included as a covered species in the HCP, though only one level of take is requested. The take limit request for the 25-year period of the HCP is five adult nēnē. Any mortality resulting from Project construction and operations is unlikely to have population-level impacts to the Maui population over the 25-year period.

Blackburn's sphinx moth

Direct and Indirect Effects

The proposed Project is situated in a region where adjacent and nearby parcels of land support stands of the native *Nothocestrum* species (host plant) and where the Blackburn's sphinx moth is known to occur. Host plants in the remaining undeveloped portions of the proposed Project would be unaffected by Project construction and operations and would continue to provide habitat for the moth.

The Applicant anticipates that direct impacts to Blackburn's sphinx moth and larvae can be avoided by conducting the pre-construction surveys for moths and larvae by a qualified entomologist according to the DOFAW- and USFWS-based protocol. By ultimately clearing nonnative host plants and relocating any remaining moths or larvae prior to construction, direct impacts to the Blackburn's sphinx moth would be avoided.

In general, all life stages of Blackburn's sphinx moth generally remain on or in proximity to their host plants. The adults would most likely not fly high enough to occur within the rotor swept area of the WTGs because they tend to stay close to the host plants (Montgomery 2011). The proposed generator-tie line is located adjacent to the Kanaio NAR, one of two regional populations of the moth that are regarded as a possible source area for dispersing or colonizing moth adults. Therefore, there is the possibility that individual adult moths could wander into work areas as they disperse, and thus would be at risk of collision with construction equipment or vehicles. Given that construction would be temporary and spatially localized, as equipment and vehicles would move along the corridor, the Project would result in negligible effects to the species.

Total Take and Population-Level Effects

There are no estimates of the numbers of Blackburn's sphinx moths that reside in or near the Project site; therefore, it is not possible to quantify the exact number of individuals that could be taken by the removal of its host plant during Project construction or harmed as a result of collision with construction equipment or vehicles. The pre-construction clearance survey to be conducted would identify the number of moths or larvae located near host plants, if any. Once these individuals are removed and relocated to the nearest appropriate habitat in the vicinity of where they are found, it is anticipated that direct impact from clearing and construction activities would largely be avoided with the exception of an unknown number of eggs or larvae not observed or removed from the soil surrounding larval host plants during the pre-construction surveys. There is also very minor potential for incidental take from collision with construction equipment because known habitat occurs adjacent to the proposed Project, and the dispersal capabilities of the species includes flights of up to 10 kilometers (6.2 miles). Based on recommendations provided by USFWS and DOFAW, impacts to the Blackburn's sphinx moth were quantified by establishing a 10-meter (33-foot) buffer around each native and non-native host plant that would be impacted by the Project to determine the acreage of potentially occupied habitat impacted. This buffer is the maximum distance from a larval host plant that pupating larvae are thought to occur. To be conservative, adult nectar plants were also included in this estimate. Based on the results of the botanical surveys conducted in 2010, 68 tree tobacco plants (located primarily along the west turbine string) and two maiapilo (along Pāpaka Road) occur within the area of Project disturbance. This equates to 3.2 acres of potentially occupied habitat impacted as a result of the proposed Project. This estimate is also conservative because it accounts for all potential host plants, including those where feeding damage (evidence of moth occupancy) may not be observed during pre-construction surveys, and therefore includes potentially unoccupied habitat. There is also one *Nothocestrum* located in an area of temporary disturbance along the generator-tie line corridor; however, as noted in Section 3.6 – Vegetation, because there is some flexibility in the finalization of generator-tie line pole locations it is assumed that this individual would be fenced and avoided during construction. Impact calculations will be updated for the Final EIS based on additional surveys conducted in February or March 2011. The minor level of take of Blackburn's sphinx moth at the proposed Project site is expected to have negligible effects on the regional population occurring in the Kanaio NAR on Maui. Any incidental take of Blackburn's sphinx moth individuals or habitat during Project construction and operations would be minor and not exceed 3.2 acres. Mitigation for these Project effects is described in Section 3.7.2.6.

Yellow-faced Bee

Direct and Indirect Effects

Hawaiian yellow-faced bees and their host plants, such as ‘iliahialo‘e, ohia, ‘ilim, and naio, have been documented in and adjacent to the proposed Project. Although Montgomery (2008) observed 40 individuals in a day, the exact location within the proposed Project was not identified. Most likely this occurred where ‘ilima was present along the generator-tie line. Individual yellow-faced bees could be directly affected by the proposed Project if they collide with construction equipment or vehicles, if ground nests are crushed or vegetation used for nesting is removed, or if plants used for nectar and pollen collection are removed.

The Applicant anticipates the Project-related impacts to yellow-faced bees can largely be avoided. Project construction would not impact coastal strand or dryland forest habitat, two important habitats for yellow-faced bees, with the exception of a small area within the generator-tie line corridor between the Kanaio NAR and the Auwahi Forest Restoration Project. As habitat loss is one of the bees' greatest threats, standard BMPs would be implemented to minimize the spread of invasive plants species and disturbed areas would be replanted with approved native or pasture grass species. Implementation of the Project FMP (Appendix A) would prevent fire from impacting bee native habitat in the vicinity of the Project. These measures would minimize the potential for Project-related reductions in habitat suitability for yellow-faced bees.

Total Take and Population-Level Effects

There are no estimates of the numbers of yellow-faced bees that reside in or near the proposed Project; therefore, it is not possible to quantify the exact number of bees that could be taken as a result of collisions with construction equipment or vehicles or removal of potential nectar plants. As noted above, native nectar plants were documented in the area of Project disturbance. These plants would be avoided to the extent possible during construction and O&M. Any take of habitat for individuals should be very low (i.e., consisting of individual plants). Given the minimization measures listed above, population-level effects to yellow-faced bees are not anticipated. However, take authorization is requested, should the yellow-faced bee be listed, for any minor incidental take of individuals or native host plants during Project construction and operations. Mitigation for these Project effects is described in Section 3.7.2.6.

3.7.2.5 No Action Alternative

Under the No Action Alternative, no wind farm, generator-tie line, interconnection substation, or modifications to Pāpaka Road would be constructed. This alternative would, therefore, have no new adverse direct or indirect effects on any non-listed wildlife species, MBTA-protected species, Hawai‘i State species of concern, ESA-listed species, or species under consideration for federal listing. However, under the No Action Alternative there would be no contribution to restoration efforts in the vicinity of the proposed Project. Thus, under the No Action Alternative the continuation of current land uses within the ROI (grazing) without the benefit of habitat restoration would result in continued degradation of wildlife habitats over time.

3.7.2.6 Avoidance, Minimization, and Mitigation Measures

In addition to the BMPs listed in Table 2-4, including the FMP and invasive species management, Auwahi Wind has identified measures that will be implemented under the proposed Project to avoid and minimize impacts to wildlife, which include timing considerations, required pre-construction surveys, selection of Project components, and facility siting considerations.

General

- By implementing the relevant and appropriate portions of the Wind Turbine Advisory Committee Guidelines (2010) for site development of a wind farm, the Applicant would avoid or minimize impacts to MBTA-protected species to the maximum extent possible.
- Auwahi Wind will develop a wildlife education program to instruct all individuals involved in construction activities about the presence and status of the covered species, the importance of minimizing adverse impacts to these species, and the measures required to minimize adverse impacts to these species.
- A daytime speed limit of 40 kph (25 mph) and a nighttime speed limit of 16 kph (10 mph) will be observed on Project roads to minimize the potential for collision of listed species with vehicles.
- All truck and heavy-equipment traffic will be limited to existing disturbed areas where possible.
- A post-construction monitoring plan will be implemented to document Project-related bird and bat fatalities.
- The spread of invasive, non-native species caused by Project construction will be minimized through standard BMPs, such as cleaning and inspecting equipment coming to the site, and by replanting disturbed areas with approved native species or pasture grasses.
- A Project biologist will be on staff during operations to conduct post-construction monitoring surveys, assist with mitigation measures, and address any potential wildlife issues that may arise during Project operations.
- Trash, especially food, will be removed from the construction area on a regular basis to avoid attraction of ants and other animals such as mongoose, cats, and rats that may negatively affect native wildlife species.

Pre-construction Surveys and Timing Considerations

- A survey and relocation plan, based on USFWS and DOFAW protocol, will be implemented by a qualified entomologist. Pre-construction clearance surveys will be conducted 1 year prior to the start of construction and then again before initiation of construction for Blackburn's sphinx moth adults and larvae. The two pre-construction surveys conducted 1 year apart will help to reduce the density of Blackburn's sphinx moth and ultimately potential direct take prior to ground disturbance and construction in the proposed Project. These surveys will identify and map *Nothocestrum* species (the plant species Blackburn's sphinx moths are most commonly associated with) and tree tobacco host plants with Blackburn's sphinx moth or larvae within the proposed Project. Should any larvae or moths be found just prior to construction, the larvae and moths will be removed and relocated to an approved nearby preserve containing suitable moth habitat by the authorized entomologist to avoid direct take. These occupied areas will be flagged and avoided during construction until the moth or larvae can be relocated.

- Construction activity will occur almost entirely during daylight hours during the seabird breeding season to minimize the use of nighttime lighting that could be an attraction to seabirds. Construction during nighttime hours will only be necessary during a small period of time in the event that high winds (above 40 kph [25 mph]) during daytime hours prohibit turbine erection. However, construction during nighttime hours will likely be infrequent and restricted to the period of September to December, and will likely only require a few hours per night. In such instances where nighttime construction is unavoidable, lighting will be minimized by limiting lighting to one tower at a time. Some Project equipment may be transported at night as well. Additionally, an environmental monitor will be on site during those periods of night construction. If the monitor observes that any seabird species are being attracted to the construction lighting, such lighting will be turned off as soon as it is safe to do so. In the unlikely event that construction lighting results in the grounding of seabirds, the monitor will immediately retrieve and assist with such birds in accordance with Project downed wildlife protocols.

- Hawaiian hoary bats roost in exotic and native woody vegetation at heights greater than 4.5 meters (15 feet). If trees or shrubs suitable for bat roosting are cleared during the bat breeding season (April to August), there is a risk that breeding bats could inadvertently be harmed or killed. Young bats, which are incapable of flight, are particularly vulnerable during the bat birthing and pup rearing season (May 15 through August 15). To minimize potential impacts to the Hawaiian hoary bat, woody plants greater than 4.5 meters (15 feet) tall that are of species known to be potential roost trees will not be removed or trimmed between May 15 and August 15 throughout the installation and ongoing maintenance of the Project structures. The primary area of concern for the Project is the portion of the generator-tie line in the area between the Kanaio NAR and Auwahi Forest Restoration Project.

Project Components and Siting Considerations

- At the time of installation, guy wires fitted with bird flight diverters and white 2.5-centimeter (1-inch) poly tape will be attached to the permanent met tower to increase visibility and subsequently increase the likelihood of avoidance by the seabirds and bats. This tape has proved effective in minimizing petrel collisions with fences on other projects within the Hawaiian Islands when wrapped on the guy wires (Hodges and Nagata 2001; Tetra Tech 2008).

- Turbines will use rotors with a significantly slower rotational speed (6 to 20 rpm, depending on turbine model) compared to older designs (28.5 to 34 rpm). This increases the visibility of turbine blades during operations and decreases collision risk (Thelander et al. 2003).
- An FAA endorsement of a minimal lighting plan will be requested to reduce the likelihood of nighttime lighting attracting or disorienting seabirds.
- To minimize impacts to wildlife, onsite lighting will be minimized at the O&M building, collector switchyard, and interconnection substation by using fixtures that will be shielded and/or directed downward and utilized only on infrequent occasions when workers are at the site at night.
- The proposed substation and interconnect to MECO's transmission lines will be designed and installed using industry-standard measures to reduce the possibility of wildlife collisions by fitting bird flight diverters on the generator-tie line. The height of the generator-tie lines will generally be lower than 18 meters (60 feet) above ground level where permissible by terrain features, which should reduce the potential for collision by seabirds.

Mitigation for Potential Impacts to the Hawaiian Hoary Bat

Auwahi Wind will implement mitigation measures as described and required in the HCP and ITP/ITL. The HCP is being developed in cooperation with the USFWS and DOFAW. The mitigation measures will be commensurate for the level of take and provide a net conservation benefit to the Hawaiian hoary bat. As part of the state and federal HCP approval process, the draft HCP will be available for public comment in 2011.

The recovery plan for the Hawaiian hoary bat (USFWS 1998) states that bat populations can be threatened by habitat loss, pesticides, predation, and roost disturbance. In general, availability of roosting sites (rather than food availability, predation, or other factors) is believed to be the primary limitation in the distribution and abundance of many bat species. The recovery criteria identify protecting and managing key roosting and foraging areas and control predators.

Furthermore, research is identified as key to the Hawaiian hoary bat recovery because there is still much to be learned about the bat's ecology that will help identify management actions that will benefit the subspecies. Developing standardized survey and monitoring techniques and continuing to collect basic ecology information on Hawaiian hoary bat populations on the island of Maui based on research conducted to date on the island of Hawai'i, will assist in understanding bat abundance and distribution and provide additional information on specific roosting habitat associations and food habits across seasons on a local and regional scale.

Consistent with goals of the Hawaiian hoary bat recovery plan, the mitigation strategy to compensate for potential Hawaiian hoary bat impacts focuses on (1) the contribution of funds to the LHWRP to assist with the implementation of bat management measures that benefit bats in a management and conservation area such as dryland forest restoration in the Auwahi Forest Restoration Project or Kahikinui Forest Project, and (2) funding an ongoing bat monitoring and/or research program. Both the Auwahi Forest Restoration and the Kahikinui Forest Project are long-term efforts that seek to reestablish naturally regenerating native forests on Maui, which provide suitable foraging and roosting habitat for Hawaiian hoary bats. These projects would create, protect, and enhance suitable habitat for the Hawaiian hoary bat over the long term, beyond the lifespan of the proposed Project and any potential effects of the project on these species. Additionally, as identified in the recovery plan, standardized survey protocol for Hawaiian hoary bat monitoring is essential to its recovery and understanding population size.

Mitigation for Potential Impacts to the Hawaiian Petrel

Auwahi Wind will implement mitigation measures as described and required in the HCP and ITP/ITL. The HCP is being developed in cooperation with the USFWS and DOFAW. The mitigation measures will be commensurate for the level of take and provide a net conservation benefit to the Hawaiian petrel. As part of the state and federal HCP approval process, the draft HCP will be available for public comment in 2011.

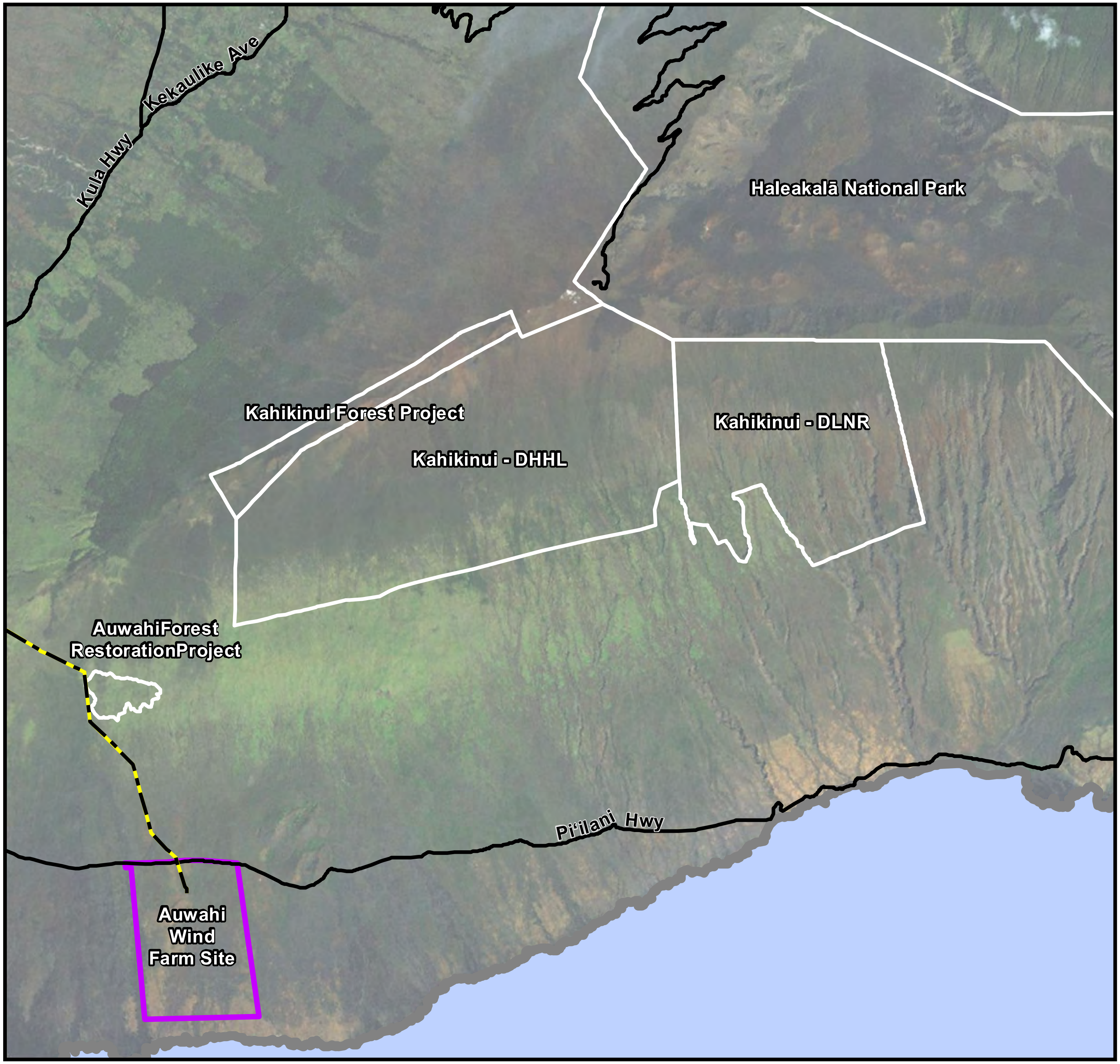
Introduced ungulates, including feral goats, pigs, axis deer, and cattle, browse on native vegetation and groundcover within petrel colonies and trample and collapse burrows causing nest abandonment. The soil disturbance caused by ungulates also facilitates the introduction and spread of invasive plants, which further reduces habitat suitability for this species (Reeser and Harry 2005). Ungulates also create trails in the colony that increase access for predators to active burrows. Annual monitoring of nests at Haleakalā National Park has shown that predation by cats and mongooses causes more than 60 percent of all egg and chick mortality in some years (Simons 1998, as cited in Carlile et al. 2003). Rats also prey upon Hawaiian petrels, but to a lesser extent. Even an individual predator, such as a small Indian mongoose, can be extremely destructive to a population of colony-nesting seabirds (Hodges and Nagata 2001).

Given the need to both protect petrel breeding colony habitat and reduce predation on nests and adults, the mitigation approach being considered for the Project is to contribute funding to the Kahikinui Forest Project or similar petrel management area that proposes to or is implementing management measures that protect and restore remnant native communities. The Kahikinui Forest Project, located along the southern slope of Haleakala, is bordered by Haleakalā National Park to the north and by state and private lands to the east and west (Figure 3.7-1). The higher elevations within the Kahikinui Forest Project support suitable habitat for the Hawaiian petrel. Active burrows are known to occur in the adjacent lands of Haleakalā National Park and the state-owned Advanced Technology Solar Telescope petrel mitigation site. Thus, based on the similarity of habitat and proximity of these areas to the Kahikinui Forest Project, it is expected that petrels are actively using the Kahikinui Forest Project as well.

The Leeward Haleakalā Watershed Restoration Partnership (LHWRP), is a coalition that was formed in June 2003 by 11 private and public landowners and supporting agencies, is partnering with the Hawai'i State Department of Hawaiian Homelands (DHHL) and DLNR to implement this overall program on all their lands which encompasses approximately 3,237 hectares (8,000 acres; Medeiros 2010), but is currently focused on the DHHL parcel. The LHWRP proposes to manage and restore the native ecosystem including dryland forest within this portion of DHHL land in three phases: (1) the installation of new fencing and reconstruction of existing inadequate fencing to protect the area from non-native ungulates, (2) the removal of ungulates and predators from within the fence line, and (3) elimination of invasive weeds and reforestation with native plant species. The LHWRP also intends to conduct a baseline survey within the parcel for flora and fauna and to determine the baseline number of active burrows. These measures are intended to increase Hawaiian petrel adult survival and nesting success on Maui by reducing predation and habitat destruction. These measures have been shown to improve petrel breeding success on Maui in Haleakalā National Park (Hodges and Nagata 2001; Natividad-Bailey 2009) and elsewhere in the subtropics (Carlile et al. 2003); as such, they will contribute to the benefits provided by ongoing recovery efforts on Maui.

FIGURE 3.7-1

AUWAHI WIND PROJECT POTENTIAL MITIGATION SITES



Auwahi Wind Farm Site

Potential Mitigation Site

Generator-Tie Line

Road

DATA SOURCES:

Potential Mitigation Sites:
Leeward Haleakala- Watershed Restoration Partnership / Hawaii StateWide GIS Program
Project Infrastructure:
Sempra Generation Energy
City/Road:
ESRI Streetmap 2007

N

0 0.5 1 2
Miles

1:100,000
NAD 1983 UTM 4

MAUI, HI
JANUARY 25, 2011

TETRA TECH EC,INC

P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXDs\EIS\Sempra_Auwahi_EIS_Fig3_7-1_MitigationSites_85i11_012511 - Last Accessed: 1/25/2011 - Map Scale correct at: ANSI A (11" x 8.5")

Auwahi Wind's mitigation strategy for petrels, although still being developed in cooperation with the USFWS and DOFAW, is anticipated to include the contribution of funds toward fence construction, baseline burrow monitoring, ungulate removal, predator control, or a combination thereof to be implemented by the LHWRP or other cooperating entities. The mitigation activities and associated level of funding will be applied so that they are commensurate with each of the three tiers of take. By increasing adult survival and nesting success or conducting research or monitoring, all of the options being considered and presented below will result in a net benefit to the species as required under Hawai'i state law.

Mitigation for Newell's Shearwater and Nēnē

Auwahi Wind will implement mitigation measures as described and required in the HCP and ITP/ITL. The HCP is being developed in cooperation with the USFWS and DOFAW. The mitigation measures will be commensurate for the level of take for each species and provide a net conservation benefit to each species. As part of the state and federal HCP approval process, the draft HCP will be available for public comment in 2011.

The recovery plan for the Newell's shearwater lists reducing losses due to fallout associated with light attraction (i.e., through the establishment and funding of aid-station/salvage projects); increasing knowledge of population status and distribution; establishing additional nesting colonies; and increasing public awareness as tools for achieving recovery of the species (USFWS 1983). The recovery plan for nēnē (USFWS 2004) lists protection and management of habitat, research, establishment of additional populations, captive breeding, and outreach and education as recovery actions needed to address these limiting factors. Therefore, Auwahi Wind will contribute funding for each species to an appropriate wildlife research, monitoring, or management program in Hawai'i recommended by DOFAW and USFWS. The selected program may involve the treatment of injured birds (i.e., rescue, recovery, and rehabilitation), research or management of nēnē and Newell's shearwater, training, science education, and/or cultural programs. The services provided by the selected program will contribute to reversing trends in declining Newell's shearwater and nēnē populations, and therefore will provide a net benefit to these species.

Mitigation for Potential Impacts to the Blackburn's Sphinx Moth and Yellow-faced Bee

Auwahi Wind will implement mitigation measures as described and required in the HCP and ITP/ITL. The HCP is being developed in cooperation with the USFWS and DOFAW. The mitigation measures will be commensurate for the level of take and provide a net conservation benefit to each species. As part of the state and federal HCP approval process, the draft HCP will be available for public comment in 2011.

Dryland forests on Maui, and within the Auwahi Forest Restoration Project specifically, also provide habitat for the Blackburn's sphinx moth (USGS 2006) and Hawaiian yellow-faced bee (USFWS 2010). The Blackburn's sphinx moth inhabits the Auwahi Forest Restoration Project, where its native host plants 'aiea (*Nothocestrum latifolium*) occurs (USGS 2006). Similarly, all Hawaiian yellow-faced bee species strongly depend on an intact community of native vegetation, like that found within the dryland forests on the leeward side of Haleakalā. The loss of native plant diversity from dryland forests is one of the primary causes of the decline of Hawaiian *Hylaeus* yellow-faced bee species. Therefore, funding the restoration of dryland forest by the Auwahi Forest Restoration Project, will benefit the Blackburn's sphinx moth and Hawaiian yellow-faced bees by protecting and enhancing suitable habitat and mitigate any potential direct or indirect impacts.

The Auwahi Forest Restoration Project is a long-term effort that seeks to create, protect, and enhance suitable habitat for the Blackburn's sphinx moth and Hawaiian yellow-faced bee over the long term, beyond the lifespan of the Auwahi Wind Project and any potential effects of the Project on these species. The LHWRP would target restoration to enhance fitness for Blackburn's sphinx moth by planting the obligate native larval host plant ‘aiea grown from seeds collected near the restoration site. The restoration would also include outplantings of regional native species with open flower syndromes that provide the yellow-faced bees with abundant access to pollen and nectar resources. Therefore, the habitat restoration within the Auwahi Forest Restoration that is in conservation for perpetuity, will benefit both species and should occur beyond the lifespan of this Project.

3.7.2.7 Summary of Impacts

Table 3.7.-8 summarizes potential impacts to wildlife.

Table 3.7-8.
Summary of Potential Wildlife Impacts

Impact Issues	Proposed Project	No Action Alternative
Loss of wildlife habitat/fragmentation	⊙, +	⊙
Direct mortality of non-listed wildlife and State Species of Concern	⊙	○
Compliance with MBTA	○	○
Noise and disturbance	⊙	○
Take of listed species	⦸, +	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⦸= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A=Not applicable
○= No impact

3.8 ARCHAEOLOGICAL AND CULTURAL RESOURCES

3.8.1 Definition of Resource

Cultural resources include archaeological sites, standing structures, objects, districts, traditional cultural properties, and other properties that illustrate important aspects of prehistory or history or have important and long-standing cultural associations with established communities or social groups. Cultural resources surveys were conducted in 2007 and 2010 pursuant to Section 106 of the National Historic Preservation Act (NHPA), 1966 (as amended) and HAR § 13-276-4. The ROI for archaeological and cultural resources consists of the proposed Project including the wind farm site, the generator-tie line, construction access route, and interconnection substation, as well as the surrounding area. This summary of the archaeological and cultural assessment work conducted for the Auwahi Wind Project relies heavily on information and data provided in detail in Pacific Legacy's *Final Archaeological Inventory Survey for the Proposed Auwahi Wind Farm Ahupuaʻa of Auwahi, District of Kahikinui, Island of Maui, Hawaiʻi* (Appendix E) and CKM Resources' Cultural Impact Assessment (CIA; Appendix F). The Archaeological Inventory Survey (AIS) documents the field and laboratory results.

3.8.1.1 Federal Regulatory Setting

Site significance may be assessed by applying the criteria of significance as defined in 36 Code of Federal Regulations (CFR) Part 60.4, criteria for listing a property in the National Register of Historic Places (NRHP), a listing of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture, created under the NHPA. Sites that qualify for listing in the NRHP, referred to as historic properties, meet the evaluation criteria enumerated in 36 CFR Part 60.4:

> *The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and*
>
> *(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *(b) that are associated with the lives of persons significant in our past; or*
>
> *(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *(d) that have yielded, or may be likely to yield, information important in prehistory or history.*

Criteria Considerations

Ordinarily cemeteries, birthplaces, or graves of historical figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; properties primarily commemorative in nature; and properties that have achieved significance within the past 50 years are not considered eligible for the

NRHP. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

(a) A religious property deriving primary significance from architectural or artistic distinction or historical importance;

(b) A building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event;

(c) A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life;

(d) A cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events;

(e) A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived;

(f) A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or

(g) A property achieving significance within the past 50 years if it is of exceptional importance.

3.8.1.2 State Regulatory Setting

HRS Chapter 6E, Historic Preservation, requires the identification, evaluation, and assessment of adverse effects of state and local undertakings on cultural resources. Implementation of these requirements is accomplished by HAR § 13-198, the Hawai‘i Register of Historic Places (HRHP) and NRHP programs, and HAR § 13-276, Rules Governing Standards for Archaeological Inventory Surveys and Reports. The conduct of this proposed Project has followed these procedures.

Criteria Considerations

Identified archaeological and cultural resources are evaluated for eligibility for inclusion on the HRHP with reference to the evaluation criteria enumerated in HAR § 13-198-8, as follows:

In deciding whether a property should be entered and ordered into the HRHP, the review board shall evaluate whether the property meets or possesses, individually or in combination, the following criteria or characteristics:

(1) The quality of significance in Hawaiian history, architecture, archaeology, and culture, which is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

(a) That are associated with events that have made a significant contribution to broad patterns of our American or Hawaiian history;

(b) That are associated with the lives of persons significant in our past;

(c) *That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*

(d) *That have yielded, or may be likely to yield, information important in prehistory or history;*

The State of Hawaiʻi recognizes the above criteria under HRS §13-275-6 and has also added a fifth HRHP significance criterion to the evaluation process:

(e) *That have an important value to the Native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts – these associations being important to the group's history and cultural identity.*

(2) *Environmental impact, i.e., whether the preservation of the building, site, structure, district, or object significantly enhances the environmental quality of the State;*

(3) *The social, cultural, educational, and recreational value of the building, site, structure, district, or object, when preserved, presented, or interpreted, contributes significantly to the understanding and enjoyment of the history and culture of Hawaiʻi, the pacific area, or the nation.*

HAR §§ 13-276-7 and -8 require that significance evaluations be included in all survey reports as well as recommendations such as mitigation commitments. It is required that the significance evaluations and mitigation recommendations are presented in a summary table listing all sites in order to carry out the mandates of HRS § 6E.

3.8.2 Existing Conditions

This section presents the environmental and cultural setting of the ROI as described in Pacific Legacy's Final AIS (Appendix E) and CKM Resources' CIA (Appendix F).

3.8.2.1 Environmental Setting

Kahikinui District lies over the southwestern flanks of East Maui, surmounted by the 3,055-meter (10,023-foot)-high summit of Haleakalā. In Hawaiian tradition, the great culture hero Maui climbed to the peak of Haleakalā to snare the sun and slow its path across the heavens so that people could grow their crops (Beckwith 1970:226 passim). Because Haleakalā creates a rain shadow effect, the leeward lands of Kahikinui are quite arid. They typify what the Hawaiian scholar David Malo called the "dry lands," the ʻāina maloʻo (Malo 1951:204). In such areas the sweet potato was the principal crop of the Hawaiian inhabitants, although dryland taro might also be grown in the higher elevations. In Malo's words, farming such a ʻāina maloʻo "was a laborious occupation and called for great patience, being attended with many drawbacks" (1951:204).

The steep southern slope of the Haleakalā consists of two major volcanic series, the older Kula Volcanic Series and the younger Hāna Volcanic Series (Stearns and Macdonald 1942). The Hāna Volcanic Series consists largely of undissected lava flows derived from the southwest rift of Haleakalā, dotted in a few places with pyroclastic vents such as the Puʻu Hōkūkano cinder cone complex in Auwahi, and the Lualaʻilua cinder cones to the east (Stearns and Macdonald 1942; Macdonald and Abbott 1970:318-36). The Hāna lavas are made up of alkalic olivine basalts, basaltic hawaiites, and ankaramites. The young age of the Hāna lavas is indicated by their lack of weathering, especially the absence of any deep stream dissection. The ahupuaʻa of Auwahi is covered entirely in these young Hāna lava flows.

Because the landscape of western Kahikinui, including Auwahi, is geologically youthful, it has hardly been modified by erosion. The slopes are traversed only by intermittent, shallow stream channels ranging from 2 to 8 meters (7 to 26 feet) in width; scoured and smoothed channel floors and small quantities of waterworn gravel indicate flowing water at times of heavy rains. Most channel erosion occurs during occasional Kona storms, which can result in several inches of rain falling within less than 24 hours. None of the small water channels flows regularly today, but it is possible that there was more frequent discharge in pre-Contact times when the forest line was significantly lower (and the water table higher as a result of dew drip precipitation), prior to the late nineteenth and twentieth century depredations of cattle and goats. Stock et al. (2003) present evidence that greater levels of fog-drip precipitation on the higher elevation slopes of Kahikinui in pre-Contact times may have fed perched springs and other water sources. Such springs and intermittent watercourses would have provided the main sources of surface water to the pre-Contact Hawaiian population of Kahikinui. In the eastern portion of Kahikinui moku, slightly more deeply incised stream channels are found. However, because these reflect the older Kula Volcanic Series landscape that has had a longer time for water erosion to occur, they do not necessarily indicate a greater amount of surface water flow relative to the western part of the moku. East of the Kīpapa-Nakaohu survey area, for example, is Kepuni Gulch, where the USGS maintained a gauging station; from May 1963 to September 1965, the Kepuni stream had measurable discharge on only 4 days (USGS 1971).

Within the proposed Project where the majority of archaeological survey work was conducted, the geological substrate is dominated by a few major lava flows of the Hāna Volcanic Series. The Puʻu Hōkūkano cinder cone complex visually dominates the landscape, with its orange-red colored slopes. This cinder cone, the result of a late flank eruption, dates to between 30,000 and 50,000 years (30 and 50 kiloyears [kyr]) old. To the east of Puʻu Hōkūkano is a large massive flow of aphyric basalt, designated by Sherrod et al. (2007) as the "Chiefly Homes" flow; this dates to between 10 and 30 kyr. Farther east and straddling the Auwahi-Lualaʻilua boundary is the Kīpapa-2 ankaramite flow, also between 10 and 30 kyr in age. Mauka of Puʻu Hōkūkano and slightly to the east is the Auwahi ankaramite flow, much younger in age, only 3 to 5 kyr. This flow is covered with a high density of archaeological features. Immediately mauka of the cinder cone is a deposition basin filled with in-washed sediments. This basin was evidently a major agricultural zone for the pre-Contact and early post-Contact Hawaiian population of Auwahi. Remnants of a formal agricultural field system were identified by the field team on the upper slopes of this basin. Finally, on the western side of Puʻu Hōkūkano is the large Kealakapu Basanite flow, between 10 and 30 kyr in age.

The relatively young age (geologically) of the lava flows in the Auwahi area is important in terms of the way in which this landscape was used by the Hawaiian population for subsistence farming. As Vitousek et al. (2004) have shown for Hawaiian landscapes in general, and Kirch et al. (2004) demonstrated specifically for the Kahikinui region, the ability of substrates to support intensive dryland farming was dependent primarily on the interaction between substrate age and rainfall. Substrates that are only a few thousand years old generally lack soil development whereas those that are several hundred thousand years old often have significant depletion of nutrients through leaching (especially if rainfall is high). Most of the lava flows in the Auwahi area are between 10,000 and 30,000 years old, which is old enough for them to have developed a workable soil horizon on top of the lava base, but not too old for nutrients to be depleted. In short, given adequate rainfall, the Auwahi soils were probably quite fertile and productive for Hawaiian subsistence crops such as sweet potato.

The rainfall gradient between the Haleakalā summit and the coast is steep. Rainfall in the archaeological survey area of Auwahi (makai of the highway) is estimated to be between 500 and 750 millimeters (20 to 30 inches) annually, with the lower elevations receiving less rain. The majority of this rainfall comes during the periodic kona storms in the winter months. From the viewpoint of traditional Hawaiian cultivators, annual rainfall in the range of 500 to 750 millimeters (20 to 30 inches) would have been minimally adequate for growing an annual crop of sweet potato. However, this amount would presumably have been too marginal for dryland taro, which would have to have been planted at a higher elevation to receive adequate rainfall.

The upland portions of Kahikinui and particularly Auwahi still support the remnants of dryland forest, with a diversity of endemic trees and shrubs, including halapepe (*Pleomele auwahiensis*), alaheʻe (*Canthium odoratum*), hao (*Rauvolfia sandwicensis*), ʻākia (*Wikstroemia monticola*), olopua (*Nestegis sandwicensis*), ʻūlei (*Osteomeles anthyllidifolia*), ʻōhiʻa lehua (*Metrosideros polymorpha*), and others. This endemic forest has been degraded through the effects of feral pigs and goats, and especially by cattle (Medeiros et al. 1986). In Auwahi, the area of archaeological survey is today dominated by a mix of exotic and invasive species, including lantana (*Lantana camara*) and koa haole (*Leucaena glauca*). However, significant numbers of native species such as wiliwili (*Erythrina sandwicensis*), naio (*Myoporum sandwicense*), and ʻaʻaliʻi (*Dodonea eriocarpa*) also persist. The lower elevations and coastal region are more barren, although scattered wiliwili and ʻaʻaliʻi grow to within a few hundred meters of the coast.

The coastal resources available to the pre-Contact and early historic inhabitants of Kahikinui were more restricted than in other parts of Maui. The coastline is dominated by sea cliffs ranging from a few meters to 30 to 50 meters (98 to 164 feet) high, making access difficult except in scattered locations where there are small bays with cobble or gravel beaches. Not surprisingly, such bays are marked by concentrations of archaeological sites, indicating that Native Hawaiians focused their coastal activities around them. There is no fringing reef along the Kahikinui coastline. The ʻAlenuihāhā Channel between Maui and Hawaiʻi is noted for its strong currents and rough seas, making fishing from small canoes hazardous. Surge-zone mollusks such as the prized ʻopihi (*Cellana exarata*), small cowries or leho (*Cypraea caputserpentis*), nerites or pipipi (*Nerita picea*), drupes or pūpū-ʻawa (*Drupa ricinus*), and sea urchins (wana, *Centrechinus paucispinus*; hāʻukeʻuke, *Podophora atrata*) can be gathered from the sea cliffs and lava rock benches, and octopus (heʻe) inhabit the shallower waters immediately offshore. Cowry-shell lures and "coffee-bean" type sinkers of the lūheʻe fishing gear have been commonly found on the surface of Kahikinui archaeological sites.

In an ʻāina maloʻo such as Kahikinui, the Native Hawaiian population had to develop special methods and techniques for creating a viable subsistence economy. In wetter regions, Hawaiian agriculture depended first and foremost upon cultivation of the taro or kalo (*Colocasia esculenta*), both in irrigated pondfields (loʻi) and in non-irrigated (rain-fed) plots. In Kahikinui, however, the main crop was the ʻuala or sweet potato (*Ipomoea batatas*) because it required far less rainfall, was more tolerant of periodic droughts, and produced high yields. Edward S. C. Handy, who made a study of traditional Hawaiian agricultural practices as they survived into the 1930s, called the region from Kaupō "through Kahikinui, Honuaʻula, and Kula . . . the greatest continuous dry planting area [for sweet potatoes] in the Hawaiian Islands" (1940:161). Taro was not unknown in Kahikinui, however, and Handy also reported:

> *I am told by an old informant, born at Kanaio in the next moku, that the Hawaiians formerly living along the coast of Kahikinui had their plantations of dry taro and other edibles inland in the forest zone, where the forest along the southern wall of Haleakalā came much lower and where rainfall was more plentiful than it is today* (1940:113).

Thus, it is likely that there was some vertical zonation of agriculture according to elevation, with sweet potatoes dominant in the mid-elevation range and taro becoming more plentiful at the higher elevations and forest margins.

The dearth of kuleana land claims from Kahikinui during the Māhele unfortunately deprives researchers of direct information on crops that were being cultivated at this time, such as are available for other regions. However, a few claims do exist for the adjacent district of Honuaʻula (which has a similar climate and soil regime to Kahikinui). These claims, made by the makaʻāinana of Honuaʻula before the Lands Commission, speak of gardens (māla) often situated within moku mauʻu (literally, "islands of grassland"), the latter presumably being patches of deeper soil. Aside from sweet potatoes, these claimants mentioned sugar cane, dryland taro, and Irish potatoes (which had been introduced after Contact) as crops being grown on their lands in 1947-48 (see L.C.A. 2405, 3676, 5331, 5455 and others [Native Register n.d. and Native Testimony n.d.]).

3.8.2.2 Cultural Setting

<u>Archival Research</u>

Before the initiation of field studies, published literature and archival sources were reviewed to determine if any previously known prehistoric, historic, or ethnographic resources were documented within the proposed Project site. As reported by Pacific Legacy (2008; see also Appendix E), this research revealed that although many studies had been done to the east and west of the proposed Project, little work had been done in the Auwahi ahupuaʻa. Winslow Walker recorded a heiau (a Hawaiian temple) in the coastal village of Walker (1931). In 1997, Patrick Kirch completed the detailed mapping and limited test excavation of a large habitation and ritual complex on the Auwahi coast at "Ranch Beach." To the east of the proposed Project, Hammett and Folk (1994) completed a helicopter survey of 15 areas throughout Kahikinui and recorded of 41 numbered sites and site complexes. Far more extensive work was completed by Dixon et al. (2000), Kirch (1997), Coil (2004), and Holm (2006) in the ahupuaʻa of Lualaʻilua, Alena, Kipapa, Nakaʻohu, Nakaʻaha, Mahamenui, and Manawainui. To the west of the proposed Project, much work was done in the Kanaio ahupuaʻa. This included studies by Eblé et al. (1997), Eblé and Tolleson (1999), Jackson (1997), Major (1993), Nees and Williams (1996), and Parks (2003). The archival research indicated that the proposed Project Area of Potential Effect (APE) has the potential to contain an abundance of archaeological resources, some of which may qualify as eligible for listing on the NRHP and may be significant in accordance with HAR § 13-276-3. The proposed Project APE for archaeology includes areas of surface and subsurface disturbance within the wind farm site, the generator-tie line corridor, Pāpaka Road, and all other associated areas that may withstand disturbance as a result of construction, operation and decommissioning of the proposed Project.

<u>Pedestrian Survey</u>

Pacific Legacy conducted the Phase 1 AIS of approximately 587 hectares (1,450 acres) in 2007 that consisted of a 100 percent pedestrian survey of the proposed Project. The survey identified 169 archaeological sites comprising more than 1,053 features. Pacific Legacy prepared a technical report to document the survey findings. Using data provided by this survey, engineers designed the proposed Project to avoid as many of the archaeological resources as possible, especially avoiding those that were thought to be most sensitive (i.e., ceremonial/religious structures and possible human burials).

For the pedestrian survey, the concept of archaeological feature was used as the basic unit of recording. An archaeological feature is defined as 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 multichambered 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, which are usually assumed to be temporally or functionally related, are referred to as feature complexes.

The most common feature types observed in the proposed Project include the following:

- Stone mound: a heap or mound of artificially placed stones, often size-sorted, and typically ranging between 0.5 and 2.0 meters (1.6 and 6.6 feet) in diameter. The functions of such mounds are difficult to determine based on surface survey alone, but many of these could indicate the presence of human burials. Information from a CKM report indicates mounds could also be associated with former residences and may be remnants of features from which people sent visual signals to fellow community members (e.g., waving a flag) to communicate a need for help (CKM 2010).
- Free-standing wall: a stacked or core-filled wall not otherwise part of a structure, often extending some distance over the landscape. Many such walls were constructed during the cattle-ranching period beginning in the post-Contact period during 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: A shelter 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.

The features of the 169 sites represent a variety of resource types that may be grouped into the following functional categories:

- Traditional ceremonial or religious,
- Burial,
- Habitation,
- Agricultural,
- Transportation,
- Contact/historic period habitation,
- Historic agricultural, and
- Cattle ranching.

Many of the larger site complexes contain features that reflect more than one function (e.g., a single site may contain habitation, agricultural, and ceremonial features).

Site Recordation and Test Excavations

In 2010, a Phase 2 AIS, a detailed recording and testing phase, was conducted at a sample of 24 archaeological sites. Testing consisted of the excavation of 37 test units placed within 37 different features. Testing was conducted at 16 archaeological sites located in the wind farm (27 features excavated), 3 archaeological sites located along the generator-tie line corridor (4 features were excavated), and 5 archaeological sites along the Pāpaka Road corridor (6 features were excavated). Test excavations were conducted to obtain dateable material to establish chronological parameters for the archaeological resources in the area and to identify sites that would qualify as potentially eligible to the NRHP and to the HRHP. Due to revisions in the Project design, only 12 of the 24 sites remain in the APE for the Project, including 8 sites within the wind farm, 1 site along the generator-tie line corridor, and 3 sites along Pāpaka Road.

Feature types excavated within the APE included U-shaped enclosures; C-shaped enclosures; other enclosures (shape not specified); stone-filled terraces; soil-filled terraces; and other terraces (some with overhands or natural windbreaks). In some cases, these yielded sufficient charcoal and ash deposits for special studies including wood identification, radiocarbon dating, and flotation. Associated dates ranged from fifteenth century to mid-twentieth century. In addition, 409 artifacts, including both pre-Contact period and Historic period artifacts, were recovered from the test excavations within the APE.

Preliminary significance assessments of the archaeological and cultural resources recorded in the APE were made. All of the archaeological and cultural resources recorded in the APE are recommended as potentially eligible for listing in the NRHP under NRHP Criterion (d) because they have either yielded or have the potential to yield information important to the history of Auwahi specifically and more generally for the moku of Kahikinui and the entire island of Maui. In addition, one site is also recommended as eligible under NRHP Criterion (c) because of the high degree of workmanship it exhibits in its construction. Two of the resources are also recommended as significant to the HRHP under HAR § 13-198-8 significance criteria because they contain human burials or are suspected to contain human burials.

3.8.2.3 Cultural Resources of Hawaiian Cultural Value from Oral Histories

Oral history interviews were conducted to identify archaeological and cultural resources of Hawaiian cultural value. Oral history interviews were conducted during April 2007 (Kailihiwa and Cleghorn 2008) and September and November 2010 (Appendix F). To gather information about the proposed Project and the surrounding area, background research was collected and reviewed, and interviews were conducted with people knowledgeable about the area that contains the proposed Project, including cultural practitioners, residents, and former residents of the area (CKM 2010).

The oral histories indicated that no one was living in Auwahi by the 1930s. The residents of Kanaio 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 has been limited to ʻUlupalakua Ranch employees, many of whom hunted, fished, and collected shellfish from this area. Most people who knew the area first hand are dead (CKM 2010). It was reported that many of the cowboys who worked on the ʻUlupalakua Ranch were superstitious about the area that contains the proposed Project because of the supposed large number of burials in lava tubes there. Elders, cultural practitioners, and other informants familiar with the proposed Project reported that the area has historical and great spiritual significance as demonstrated by its many heiau and burial caves. It is believed that, in the past, the climate was more favorable (i.e., less dry) allowing for cultivation of sweet potatoes. During dry seasons, local populations fished. They also cultivated taro and used that for trade with other groups in nearby areas.

Pre-contact populations within the area that contains the proposed Project may have been quite large. One elder spoke of the "Red Light District" and the trails that the fisherman used to negotiate with the farmers. The fishermen would dry the fish and, when the negotiation was complete, would burn a red fire, bundle up the fish, and walk up the trails to trade. He mentioned that some of the trails still exist today. This elder also believed that many of the pre-Contact inhabitants divided their time seasonally between two hale, one mauka and one makai. His interpretation of the meaning of Auwahi is the presence of "The Heat Raising" (CKM 2010).

One ʻUlupalakua Ranch employee reported seeing a grass shack that was in the middle of the lava flow. He reported that the shack remained until 1956 (CKM 2010).

Another local informant from Auwahi reported that he had discovered evidence that suggests that the pre-Contact community in Auwahi had developed a series of aqueducts that allowed them to slow down, store, and use the water during flash floods. These extensive rock walls that run all the way up the mountain appear to be dam-like structures to diffuse the water. He suggested that the manpower that it would have taken just to maintain this water system would have been extensive, requiring a large full-time workforce to manage it year-round. Based on this theory and the extensive rock foundations in the area, he believes that the population of the community was large, possibly in the thousands. This informant also commented on the unique style of notching that appears on the corners of the many heiau in the area. Although he did not know the reason for this technique, he thinks that the heiau are most likely agricultural ones. This informant also reported observing what appear to be ancient terraces and he believes that the community survived by fishing as well as by farming sweet potatoes (CKM 2010).

3.8.3 Potential Impacts and Mitigation Measures

3.8.3.1 Impact Methodology and Factors Considered for Impacts Analysis

During consultation with the State Historic Preservation Division (SHPD) on February 13, 2007, SWE (the previous project developer) and their consultants CH2M Hill and Pacific Legacy, met with the SHPD Maui Lead Archaeologist to discuss the proposed Project. They discussed with SHPD plans for the AIS. Pacific Legacy proposed to conduct the archaeological investigations in two phases. The first phase would be to conduct a survey of a larger study area based on SWE's conceptual design at the time. The information gathered during the initial survey would be incorporated into the project design as avoidance of resources, which was the preferred outcome. The second phase, consisting of two tasks (detailed recording and evaluation), would be completed after the locations of specific Project components could be determined (e.g., roads, WTG pads, and staging areas). Therefore, not all resources within the proposed Project would be subject to further study. Only those resources found to be within the APE would be subject to detailed recording and evaluation. In accordance with this proposal, it was agreed that the first phase of the study could begin. The SHPD requested a written plan for the conduct of the archaeological study, which was submitted on April 11, 2007.

Archaeological and cultural resources have been identified in the proposed Project. All 12 sites recorded in the APE are recommended as potentially eligible to the NRHP under NRHP Criterion (d). One of these sites is also recommended as eligible under NRHP Criterion (c). Two of the resources are also recommended as potentially eligible to the HRHP under HAR § 13-198-8 significance criteria. Although the Applicant is attempting to avoid impacts to the greatest extent practicable, development of appropriate mitigation measures is currently under consideration in consultation with SHPD. Some of the features located within the APE have been fully documented and no additional treatment is recommended for them. Detailed mapping and complete excavation has been recommended for Site AWF-190/310 and detailed mapping has been recommended for Site AWF-216, both located within the wind farm area Within the generator-tie line corridor, it has been recommended that the terrace identified as Feature D should be preserved. No treatment has been recommended for the three sites located along the Pāpaka Road corridor. Some treatment recommendations have been made for other significant sites that are not located within the current Project APE. Once mitigation is agreed upon, the mitigation would be implemented prior to or in coordination with Project construction and operations.

3.8.3.2 Construction Impacts

Construction could have direct impacts on 12 historic properties located in the APE that would be considered adverse effects to historic properties by the lead federal agency, SHPD, and consulting parties. The proposed Project was designed to avoid impacts to sites to the greatest degree practicable.

The Applicant will support the lead agency in its ongoing consultation with SHPD and consulting parties. The Applicant will develop mitigation plans for review by the lead agency, SHPD, and interested parties that would be proposed to mitigate adverse effects to historic properties. The Applicant would ensure that approved mitigation plans would be implemented prior to construction.

3.8.3.3 Operations and Maintenance Impacts

The construction of access roads for O&M of the proposed Project could have an indirect adverse effect on archaeological and cultural resources during Project operation by providing access to resources that were previously difficult to reach. This could allow increasing vandalism and theft of eligible resources that have been avoided by construction. However, the wind farm site access roads would be gated and locked, thereby impeding access to the wind farm.

3.8.3.4 No Action Alternative

The implementation of the No Action Alternative would have no adverse effect on the historic properties and other archaeological and cultural resources in the proposed Project. Current use of the proposed Project does not pose a risk of destruction of archaeological and cultural resources present there.

3.8.3.5 Avoidance, Minimization, and Mitigation Measures

This section describes the design features, BMPs, and mitigation measures that the Applicant has committed to implement for the proposed Project to minimize impacts to archaeological and cultural resources known to occur within all Project components to the extent practicable. These design features, BMPs, and mitigation measures are presented in Pacific Legacy's technical report (Appendix E) that is currently under review by the SHPD; as noted above, the Applicant will continue to work with the agencies to prepare appropriate mitigation plans.

Construction – Avoidance and Minimization

The Applicant will avoid impacts to historic properties when practicable. The Applicant's design engineers continue to consider construction methods and design modifications that can be adopted to avoid and minimize direct construction impacts to historic properties. Some design modifications considered to avoid direct impacts to historic properties include the following:

1. The original location of WTG Pad No. 2 was relocated to avoid two large pre-Contact sites with high status residences and ceremonial features. The relocation area contains one site that may be significant, but that will either be avoided or mitigated as appropriate.
2. Because the access roads connecting WTG pads were rerouted, several sites originally recorded as being in the APE are no longer in the APE. Fifteen new sites identified in 2010 are in the revised APE and engineers are working to avoid these sites to the extent feasible. If avoidance is not possible, these sites will be mitigated as appropriate.
3. The Project will consider design modifications that would entail the use of some temporary spanners and some permanent bridges to avoid direct impacts to lava tubes that may contain archaeological and cultural resources assessed as historic properties.

The construction contractor will follow measures outlined in the Burial Treatment Plan to properly handle known or suspected burial sites. The focus of the Burial Treatment Plan is on the protection of three locations where four burials containing human remains have been identified. In addition to these burial sites, several possible burial mounds have been identified and should be treated as burials.

Sites with evidence of human remains and burials are of significance to Native Hawaiians. Burial sites and all sites described as containing evidence of human remains, as well as sites of any type that would be eligible, are to be assessed for inclusion into the national and state registers of historic places.

In the matter of preserving ancient Hawaiian remains, the Burial Treatment Plan is intended to facilitate the best method of caring for the iwi kūpuna (ancestral remains) identified in the proposed Project area. Following two preliminary meetings with the Maui Lāna‘i Island Burial Council (June 24 and September 30, 2010), it was determined that preservation-in-place of the human burials is the preferred treatment. The Applicant concurs with this determination.

The cultural resources containing human remains identified within the proposed Project site will be avoided, protected, and preserved in place.

The draft Burial Treatment Plan developed for this Project includes steps that will be implemented to ensure that the archaeological resources described above are protected. These steps include consideration of design modifications such as temporary spanner and permanent bridges that would avoid ceremonial and burial sites. The plan will be submitted to SHPD and the Burial Council for approval.

The final approved Burial Treatment Plan developed by Pacific Legacy and approved by the SHPD and the Burial Council will specify the steps that Auwahi Wind will be required to take to protect identified burial sites and ceremonial sites if the proposed Project is constructed and operated.

The following preservation plans are identified in the Burial Treatment Plan:

Interim Preservation. Interim preservation consists of measures to protect the cultural resources during construction activities. These measures will be specified in construction contracts for work in this area, and construction crews need to be briefed on the sensitivity of the area and the interim protection parameters.

The interim preservation buffer zone will be a minimum of 10 feet around confirmed burial sites AWF-384, Feature A; AWF-167/557, Feature B; AWF-167/557, Feature G; and AWF-2010 A; and around possible burial sites AWF-106/108, AWF-584, AWF-2010 C, and AWF-2010 D. The following interim protection measures will be implemented:

1. The sites and boundaries of the interim protection zone buffer will be accurately plotted on all grading plans and construction plans prior to the start of any land-altering activities in the area.
2. The proposed buffer zone of at least 10 feet from the locations of the remains will be mapped and plotted. The interim protection buffer will be staked and marked with brightly colored plastic construction fencing. No construction activity will be allowed to occur within the buffer zone.
3. Prior to initiating any construction activities, all construction supervisors and crew members will be instructed as to the nature and location of the archaeological sites, the significance of the buffer zones, the meaning of the brightly colored plastic construction fencing, and that the area within the fence is off-limits to any activities.
4. There will be onsite archaeological monitoring of all ground-disturbing activities. In addition, care needs to be exercised in traversing over the lava tubes containing remains. Access roads will be placed at least 10 feet away from the locations of the remains and engineered spanning bridges will be constructed so that there is no likelihood of collapsing lava tubes containing remains.

Long-Term Preservation. The goals of long-term preservation are to secure the site and protect the remains from vandalism or damage. The most effective way to accomplish these goals is to seal the openings of the lava tubes, preserve the windbreak wall and cleared area in place, and preserve the complex of probable burial mounds in place. Each of the lava tube openings will be sealed with locally available basalt rock and mortar. Excellent examples of sealing lava tube openings can be found in the Kohanaiki development in Kona on Hawai'i Island. A masonry company from Maui with experience with constructing mortared lava rock walls will be contracted to provide the needed masonry services.

A small Plexiglas plaque will be placed at each sealing wall or gate. This plaque will have text in Hawaiian and English (the Hawaiian translation will be made after the English version is agreed upon). The purpose of this sign is to warn any explorer of the area that this area is kapu.

The buffer areas surrounding the preserved sites will be left as is. There will be no landscaping around the perimeters of the preserved sites or the area within the buffers. The reason for the lack of landscaping is that the preserve areas should not stand out from the surrounding area. If these areas contrast with the natural surroundings, this contrast may actually invite or lure curiosity seekers. The inhospitable nature of the terrain combined with the sealing of the tube openings will adequately protect the remains within the lava tubes.

Inadvertent Discoveries of Human Remains. There is the possibility that inadvertent discoveries of human remains could be made during construction activities. Because of this possibility, an archaeological monitor will be present during all ground-disturbing activities. If human remains are discovered, all construction activity in the immediate vicinity of the find will cease and SHPD staff will be notified as per HAR §13-300-40.

Appropriate treatment of the remains will be decided in consultation with SHPD staff. Potential treatments include preservation-in-place (the preferred alternative) and disinterment with reburial adjacent to the find spot.

<u>Construction – Mitigation</u>

The proposed Project would adversely affect a number of archaeological resources. While this is inevitable in any type of development project, considerable effort has been exercised to minimize the impact the proposed Project will have on the archaeological resources present in the wind farm site. The purpose of archaeological investigations is not only to inventory what archaeological resources are present and evaluate their significance, but to mitigate the adverse effects caused by development through archaeological investigations. Some of the archaeological resources present within the Project APE have been fully documented and will not require any further archaeological work; others will require further archaeological investigations in the form of mapping and excavations. The discussion presented below outlines the proposed approach that will be used to fully mitigate the impacts to resources that require additional investigation.

The inventory survey produced detailed plan maps of a number of cultural resource features; however, to fully investigate and interpret these features will require not only additional mapping but subsurface investigations as well. Additional detailed mapping and selected subsurface testing will occur within several site types including hydrological features, habitation sites, and field system terrace sites, as discussed in the AIS (Appendix E). The following sections reproduce much of the relevant text from Section 8 of Pacific Legacy's AIS.

Hydrological Features

From the broader perspective of Hawaiian archaeology, the discovery of a range of features indicative of sophisticated water control in Auwahi is a major new contribution to our knowledge of Hawaiian land use practices. This evidence is especially noteworthy because it occurs in the context of one of the most arid environments in the Hawaiian Islands, the leeward slopes of southeast Maui in the rain-shadow of Haleakalā. This environment was extremely marginal to the classic Polynesian horticultural system based on tropical root crops, yet the pre-Contact Hawaiian population in this region managed to achieve a high population density (Kirch 2007, 2010). The inventory survey revealed numerous instances of intermittent stream channels that had various forms of artificial modification, ranging from check dams (barrages), to stone filled-terraces that appear to be designed to filter water underground, to earth-filled terraces that were probably planting surfaces. Discovery of these features was greatly enhanced by the unusually good surface visibility in Auwahi in 2010 due to extreme drought conditions.

The working hypothesis is that with water a scarce and critical resource in Kahikinui, the Native Hawaiian population in this location developed technology that allowed them to capture and manipulate water to enhance the agricultural productivity of this marginal environment. Because storm events are infrequent, it is likely that the emphasis was not on irrigation in the usual sense of maintaining a steady flow of water to fields, but rather efforts to slow down intermittent stream flow, to divert such water into small basins and terraces that could be cultivated, and even to force the water to percolate into temporary aquifers (such as breccia deposits), which could then release water slowly over a period of days or even weeks.

This detailed mapping and subsurface testing work will be undertaken in collaboration with a professional geomorphologist/geoarchaeologist who has the technical expertise to assist in interpreting geomorphological and sedimentary evidence for past water flow patterns. Pacific Legacy recommends that this research topic be addressed through the following specific approaches:

a. Detailed mapping of representative water control features. Such mapping cannot be limited to a two-dimensional plan view, but must include elevation and slope variables, as these will be critical to understanding waterflow patterns. Such mapping must pay attention not only to the artificially constructed aspects of these systems (e.g., walls, terraces), but to the geomorphological features such as water-worn flow channels or sedimentary lag deposits which will provide the evidence for intensity and frequency of hydrologic events. Winter (*kona*) storms were presumably the main sources of water which was being manipulated in these systems, and extreme storm events could have been very difficult to control and manage. Thus the investigations must be attuned to these attempts to control extreme flood events.

   Detailed mapping of Site AWF-180/546, Feature D, terrace Site AWF-359/488 Features GGG and HHH, terraces; and Site AWF-2010 RRR, Features A, B, and D, which are earthen berms. Site AWF-180/546, Feature D is located in a gulch with extensive agricultural terracing and is at the confluence of two draws. Site AWF- 359/488 Features GGG and HHH are small agricultural terraces associated with nearby habitation structures. Site AWF-216, Feature D is a rock filled terrace which may have been used for habitation but is also located in a draw and could also have functioned to slow down rapid water flow. Site AWF-

2010 RRR, Features A, B, and D that represent earthen berms, which are likely remnants of water control features for an agricultural field system.

b. Excavation within constructed features such as earthen terraces and rock-fill filtration terraces. While detailed mapping will be critical, it is also essential to obtain subsurface evidence in order to understand how these water control features were constructed, the chronology of their construction, and details of their function. For example, a number of rock-filled terraces in some of the intermittent stream channels appear to have been designed to check water flow and drive water underground in a kind of filtration process. Excavating through these features would provide evidence of how they were constructed, and of whether percolating water left depositional traces. This kind of investigation, which has rarely if ever been undertaken in Hawai'i in the past, must involve interdisciplinary collaboration between archaeology and geomorphology/hydrology, because neither discipline in and of itself controls all of the methods necessary to interpret such complex features.

   In an attempt to gather additional information to address these hydrological questions, the work will require the excavation of Site AWF-180/546, Feature D, terrace; Site AWF-359/488 Features GGG and HHH, terraces; and AWF-2010 RRR, Features A, B, and D.

Formal Field System Features

Until recently no formal agricultural field systems had been identified on Maui Island, although extensive reticulate grids of field embankments and cross-cutting walls on Hawai'i Island (in Kohala, Kona, and Ka'ū districts) have been known since the late 1960s. The identification of a formal field system in Kaupō by Kirch et al. (2009) showed that Maui Island farmers were also engaged in this kind of highly intensive agricultural activity. Now, with the identification of remnant portions of such a regularized field system on the fringes of the sedimentary basin inland of the Pu'u Hōkū Kano cinder cone, it is clear that such field systems must have been more widespread on Maui than has been previously realized.

These kinds of formalized field systems with reticulate grids of planting areas are of interest not only because they reflect a kind of intensive agricultural production upon which the late pre-Contact Hawaiian archaic states depended for their economic basis, but because they imply a level of formal control and management above what would be required strictly for agronomic reasons. That is to say, the regular spacing of field embankments, cross-cut by trails or other boundary divisions, appears to reflect the imposition of social and political controls on production and, more importantly, on the extraction of surplus.

The remnants of this field system will be carefully recorded and investigated, following essentially the same methods proposed, including a combined archaeological-geomorphological methodology. The various surface features making up this system are subtle, as the inventory team was well aware—often they can only be clearly discerned in the low-angle light of late afternoon. Thus high-precision three-dimensional mapping will again be important to thorough document these features.

A subsurface investigation will also be required to address the critical questions of when this system was constructed, and of how it functioned. Linear trenching will be conducted across the apparent field embankments and intervening cultivation plots, as has been carried out in similar investigations of field systems on Hawai'i Island by the Hawai'i Biocomplexity Project (Vitousek et al. 2004; Kirch, ed. 2010). It is likely that remnant original soil horizons should be preserved under the field embankments, which will need to be carefully sampled. Such remnant soil horizons could provide carbonized organic materials with which to date the time of initial field system construction, and may also contain plant and other organic remains (such as endemic terrestrial gastropods) that could yield important evidence of initial environmental conditions prior to field system construction. Moreover, following methods developed by the Hawai'i Biocomplexity Project, it may be possible to compare the nutrient status of original soils preserved within field embankments with cultivated soils in the intervening plots, in order to achieve a quantitative estimate of the extent to which intensive cultivation over an extended period had an effect on nutrient availability. Such data would be extremely important to the ongoing efforts to understand how surplus production and extraction was affecting the rise of archaic states in late pre-Contact Hawai'i.

Detailed mapping and selective excavation of the field system terraces at Site AWF-423 through 430, Features B, C, D, R, T, and U will be conducted to address these research issues. These represent the most intact remnants of the field system including bermed terraces and water channeling features.

Settlement Features

In any mitigation plan that is developed for the proposed Project, it will be critical to allocate resources to sample and date a sufficient number of residential features so that sample size effects can be controlled. At this point, other parts of Kahikinui district are represented by more than 160 radiocarbon dates, whereas Auwahi proper has only 14 such dates. A target of 50 radiocarbon samples from individual residential features will be obtained and dated by high-precision AMS dating in order to address this question. In any such chronological investigation, it is essential that the following methodological protocols be followed: (1) Wherever possible samples should be obtained from discrete subsurface features, such as hearths or earth ovens; (2) To avoid the notorious problem of old wood and "in-built age" the charcoal samples need to be identified by a qualified archaeobotanist as to botanical taxon, and whenever possible short-lived species selected as dating samples; and, (3) samples need to be dated by AMS with d13C corrections for isotopic fractionation. The third step is critical because many Hawaiian dryland plants have C4 photosynthetic pathways that will yield erroneous ages if not corrected for isotopic fractionation. Pacific Legacy followed these protocols in their dating of features in the inventory survey, and stress how important it is to continue to apply the same protocols if the resulting data sets are to have integrity.

To obtain radiocarbon dates, the excavation of the following habitation features within the wind farm site will be required:

- Site AWF-180/546 Feature C, terrace;
- Site AWF-182/184 Feature G, L-shaped wall; Feature H, C-shaped wall; Feature I, C-shaped wall;
- Site AWF-307 Feature B, terrace; Feature C, U-shaped wall;
- Site AWF-329 Feature A, enclosure; Feature B, terrace;

- Site AWF-359/488 Feature B, terrace; Feature FF, enclosure; Feature JJ, dark stained soil deposit; Feature OO,U-shaped wall with hearth; Feature PP, terrace; Feature YY, terrace with hearth features;
- Site AWF-423 thru 430 Feature A, enclosure; Feature E, enclosure and terrace; Feature F, enclosure; Feature I, lava blister with hearth; Feature J, terrace with midden; Feature O, terrace with hearth;
- Site AWF-495 Feature E, terrace;
- Site AWF-2010 KK Feature E, C-shaped wall and enclosure;
- Site AWF-2010 MMM Feature H, U-shaped wall; Feature O, terrace;
- Site AWF-2010 NNN Feature A, terrace;
- Site AWF-2010 QQQ Feature C, modified outcrop with hearth;
- Site AWF-2010 SSS Feature F, enclosure with nearby hearth feature; and
- Site AWF-332 Feature A, platform; Feature G, hearth.

Household Features

Ethnohistoric accounts such as those of Malo (1951) and Kamakau (1961) inform us in general terms about the organization of daily life in traditional Hawaiian households, but they paint a monolithic portrait that does not allow for variation either between regions, or between social classes. Yet prior archaeological research in Kahikinui has already demonstrated certain kinds of household practices not previously known from either ethnohistoric or archaeological sources (Van Gilder and Kirch 1997). The extensive remains of residential features identified in the Auwahi inventory survey make it clear that there is much potential to gain further insights into Hawaiian household organization and structure in this area. Because Kahikinui was a kuaʻāina or "back country" region, the daily lives of its people were unlikely to have been the same as those dwelling near the royal centers such as Wailuku or Hāna. With the Auwahi sites, there is an opportunity to investigate the traditional lifeways of a true rural hinterland in ancient Hawaiʻi.

Household archaeology as a sub-discipline has developed greatly over the past two to three decades, but unfortunately many of its advances have not been applied in Hawaiian Cultural Resources Management (CRM) work. The continued emphasis, in much CRM mitigation in Hawaiʻi, on single $1m^2$ test units in residential sites has generally failed to add new knowledge about Hawaiian household organization and structure. What is required is more emphasis on horizontal exposure of living surfaces by which larger activity areas can be discerned, and spatial patterns of organization identified. This approach should be applied in future mitigation efforts in Auwahi. It would be far more productive to fully excavate three or four residential features than to dig random test pits in a larger sample of structures.

In addition to horizontal excavation, such investigation of ancient Auwahi residential sites will require careful analysis of the cultural content of these sites. Prior experience shows that Kahikinui residential sites are relatively poor in portable artifacts such as adzes or fishhooks. The most common remains recovered are macrobotanical remains (especially charcoal), basalt and volcanic glass lithics, and shell and vertebrate remains. These materials will need to be studied by appropriate specialists if their information potential is to be realized. The lithic materials in particular should prove interesting, in terms of tracing links between Kahikinui households and those in adjacent districts or even other islands. X-ray fluorescence sourcing of basalt lithics from sites in Kīpapa and Nakaohu (Kirch, unpublished data) has shown that while most of the basalt being worked in Kahikinui sites is of local origin, some derives from at least one adz quarry in Kaupō district, and a small number of specimens were imported from other islands including Hawaiʻi, Molokaʻi, and even Oʻahu. Since Auwahi is putatively the most important ahupuaʻa within Kahikinui, Pacific Legacy hypothesizes that it may have had a higher degree of external connections (especially through its resident konohiki), and that more imported lithics would appear in its residential sites. This hypothesis can be tested through further analysis of lithics from excavated sites in Auwahi.

Zooarchaeological analyses of faunal remains from household sites can also yield vital clues as to rank differences between the occupants of various social units. Higher ranked individuals in ancient Hawaiʻi had preferential access to status foods, especially pig and dog, but also pelagic fish and even to certain birds. Analysis of the faunal remains from a priest's residence in Nakaohu (Kirch et al. 2010) have shown that the individuals residing there had access to a wide variety of status foods. It should be informative to compare a sample of Auwahi households with these prior results from other sites in Kahikinui.

To meet this research objective, complete excavations of the following features will be conducted:

- Site AWF-359/488 Feature OO, U shaped wall with hearth; and
- Site AWF-329 Feature A, enclosure with midden.

Post-Contact Features

Following Captain Cook's "discovery" of Hawai'i in 1778-79 and the subsequent opening up of the Hawaiian Islands to the expanding European World System, Hawaiian society (which had been entirely cloistered for at least four centuries) was subjected to devastating external influences. Foremost among these was the exposure of the Hawaiian population to a range of diseases to which they had not inherent resistance, leading to massive population decreases. It appears that the indigenous Hawaiian population shrank from a pre-Contact high of at least 400,000 (and possibly considerably more) to about 140,000 in a mere four decades. But demographic collapse was not the only effect of European contact. Missionization and conversion of the Hawaiian people to Christianity, introduction of foreign ideas about everything from marriage to land rights, introduction of new crops and animals, all of these played significant roles in changing the lifeways of the Hawaiian people from the late 18th into the 19th centuries.

While documentary sources tell us a great deal about these major transformations of Hawaiian economy, society, and politics in the post-contact era, there is still a great deal to be learned from the evidence of archaeology. This is especially true for the most rural or kuaʻāina (literally "back country") regions, such as Kahikinui. Most of the extant documentary sources used by historians refer to the historical transformations taking place in trading centers like Kailua (Hawaiʻi Island) or Honolulu, where the White missionaries, merchants, and others were located. But the historical processes unfolding in these rapidly urbanizing centers may have been quite different from what was going on in the rural hinterlands, even as the two were linked as shown in the classic analysis of Anahulu Valley on Oʻahu by Kirch and Sahlins (1992). The rural areas were simultaneously both more resistant—and more vulnerable—to these foreign agents of change. They were more resistant in being farther from the sources of foreign influence or points of introduction of new disease vectors. But at the same time these rural areas had always been at the environmental and economic margins of traditional Hawaiian society. They were thus the most fragile, and the most susceptible to collapse under the devastation of disease and depopulation. There was as well simply the lure of new possibilities and opportunities in the centers of emerging trade and commence such as Lāhainā and Honolulu that inevitably drew people from the rural hinterlands to the new port towns.

The archaeological landscape of Auwahi not only incorporates a diversity of features from the pre-Contact period, but also many features that appear to date to the late 18th and 19th centuries. In particular, a series of features situated on ʻaʻā ridges to the east and west of the sedimentary basin inland of Puʻu Hōkū Kano are suggestive of a substantial community of Native Hawaiians who persisted into the nineteenth century. Site AWF 359/488, located on the massive ʻaʻā ridge on the east side of this basin, appears on the basis of survey data to have been a significant 19th century settlement, indicated by a diversity of artifacts such as glass bottles and iron artifacts, including a horse bridle, flat iron, and flensing tool probably used as a farming tool (Hawaiian ʻōʻō). It is in some respects not surprising that this area should have remained as a final refuge for rural Hawaiian commoners attempting to cling to their traditional lifeways in the face of seemingly insurmountable obstacles. These features are adjacent to what is probably the most productive garden land in the ahupuaʻa, and it is only natural that such a prized resource would have been the last to have been abandoned.

Careful and detailed investigation of these post-contact archaeological features has the potential to reveal much about the transformation of Hawaiian lifeways in the nineteenth century. How, for example, did residential patterns change over time? Was the traditional kauhale pattern of separate activity areas abandoned for a more "western" living style of a single combined multifunction hale? This would be predicted following the abolition of the kapu system (with its mandated separate cooking and eating facilities) after 1819, but has rarely been tested archaeologically (but see Kirch and Sahlins 1992). How much access did these rural households have to foreign material culture, and how did they integrate such material objects into their lifestyles? To what extent did they continue to utilize traditional, pre-Contact material culture, such as expedient lithic technology? And, how did their subsistence patterns and foodways change with the introduction of new crops, new animals, and new culinary concepts?

All of these questions can be addressed through more detailed investigation of the Auwahi sites dating to the post-contact era. Larger areal exposures of a selected few post-contact residential structures will be conducted, in order to be able to obtain fine-grained spatial data on activity patterns which can then be compared with similar data from pre-Contact sites in Auwahi, elsewhere in Kahikinui, and in Hawai'i. Horizontal excavation or exposure of entire house floors will be undertaken in two or three post-Contact residential features to provide the kinds of spatial data necessary to answer the questions posed above.

Features recommended for aerial excavation to address these research questions include:

- Site AWF-2010 KK Feature E, an enclosure and C-shaped wall with historic artifacts.

Land Use of the Dryland Forest Region

The leeward slopes of southeast Maui, because of their combination of relatively young lava substrates and low rainfall, were the ecological setting in which a distinctive natural biotic community evolved over the course of several hundred thousand years—the Hawaiian dryland forest (Ziegler 2002, and Wagner et al 1999). This dryland forest had a far greater diversity of plant species than the wet forests which were typically dominated by a few trees such as *Metrosideros polymorpha* and *Acacia koa*. While both ʻōhiʼa and koa were present as well in the dry forests, many other species were found in abundance, such as ʻliahi (sandalwood, *Santalum* spp.), naia (false sandalwood, *Myoporum sandwicense*), *hala pepe (Dracaena* spp.), *mâmane* (*Sophora chrysophylla*), *lama* (*Diospyros sandwicensis*), nīoi (Eugenia *spp.)*. In somewhat lower elevations, thick stands of the distinctive wiliwili (*Erythrina sandwicensis*) with its deciduous habit unusual in the tropics covered the landscape, along with such shrubs as ʻaʻaliʻi (*Dodonaea* sp.) and ʻakia (*Wikstroema* sp.). In the late 19th century, the pioneering botanist Joseph Rock was struck by the remarkable biodiversity of leeward Maui—and of Auwahi in particular. Rock made a number of collecting expeditions to Auwahi to try to capture what he could of this unique environment, even though it was already under tremendous pressure from cattle grazing and other inroads.

What Rock witnessed at the end of the nineteenth century in the uplands of Auwahi was, however, merely the endpoint of several centuries of intensive human exploitation of this land, exploitation that began with pioneering Polynesian settlement, continued with a phase of high population density and intensive farming, and which was succeeded by the introduction of ungulates and cattle ranching. An important part of the historical record of Auwahi is how this unique dryland forest environment was transformed as a result of these successive phases of human land use and resource exploitation.

Investigating this critical aspect of the Auwahi record will require the application of the multidisciplinary perspective of "historical ecology" (Kirch and Hunt, eds., 1997). Much of the necessary data can be obtained through the various kinds of field and laboratory investigations already outlined for topics 3, 4, and 5 above [note: see AIS in Appendix E for further discussion of these topics]. For example, charcoal samples obtained from hearths and earth ovens in residential sites can provide important data on the kinds of plants formerly growing on the Auwahi landscape, and being exploited by the Hawaiians. Likewise, zooarchaeological analysis of faunal assemblages will provide data on wild food resources such as native birds.

It is anticipated that the materials recovered from the proposed feature excavations outlined above will yield the data to help address these questions regarding changes to the environment resulting from land use and resource exploitation.

Operations and Maintenance

The Applicant's contractor, Pacific Legacy, will develop a plan that would minimize the potential for theft and vandalism at recorded historic properties. The plan will include measures such as fencing of sites, development and presentation of a Worker Environmental Awareness Program, and possible regularly scheduled monitoring and patrolling of significant resources. This plan will be provided to the lead federal agency, SHPD, and consulting parties for comment and review.

The Applicant will provide worker cultural resources sensitivity training for its O&M team workers. They would be educated about the sensitivity of the cultural resources in the proposed Project and would be made familiar with the plans and procedures that are to be followed if an unanticipated cultural resource, including human remains, are discovered during the course of Project O&M..

3.8.3.6 Summary of Impacts

Table 3.8-1 summarizes potential impacts to archaeological and cultural resources associated with the proposed Project.

Table 3.8-1.
Summary of Potential Archaeological and Cultural Resources Impacts

Impact Issues	Proposed Project	No Action Alternative
Direct impacts to significant archaeological sites	⃠	○
Modifications to cultural landscape	⃠	○
Viewshed effects from significant sites	⃠	○
Increased vulnerability of sites to theft and vandalism	⃠	○
Inadvertent impacts to sites during construction, O&M, and decommissioning	⃠	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:
⊗= Significant impact
⃠= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A = Not applicable
○= No impact

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3.9 TRANSPORTATION AND TRAFFIC

3.9.1 Definition of Resource

This section addresses public and privately owned transportation infrastructure, including harbors, airports, highways, and roadways. A discussion of transportation and traffic not only includes the movement of motor vehicles, but also considers the movement of ships, barges, airplanes, pedestrians, and bicyclists.

The ROI for transportation and traffic is defined as the proposed Project, which includes the wind farm site, the generator-tie line corridor, and the construction access route (Pāpaka Road) as defined in Chapter 2, as well as the surrounding areas that could affect or be affected by the proposed Project, and the routes of travel to and from the proposed Project.

3.9.2 Existing Conditions

3.9.2.1 Harbors

Essentially all of Hawai'i's overseas cargo must clear Honolulu Harbor, because it is the hub of the islands' harbor system. Hawai'i imports 80 percent of its required goods, more than 98 percent of which is shipped by water. Cargo bound for Maui would be transported to Kahului Harbor, Maui's only commercial harbor and the only harbor large enough to accommodate the equipment and materials required for a wind farm. Kahului Harbor is at the eastern end of Kahului Bay, and is generally bordered by the east breakwater, Hobron Avenue, Ka'ahumanu Avenue, and Pu'unēnē Avenue. Congestion within the commercial harbor is localized and dependent on vessel arrival timing, and the type and volume of cargo or passengers. The major areas of congestion are at Pier 1 because of cruise ship traffic and unloading of overseas cargo vessels, and at Pier 2 during loading and unloading of the inter-island barge.

The east side of the harbor currently encompasses approximately 20 hectares (50 acres) of land. It is the operational portion of the harbor that includes three major berthing structures with storage areas, warehouses, harbor offices, and tenant buildings. All of the commercial maritime activities occur on the east side. Wind turbine component storage and handling space needs at the harbor are discussed later in Section 3.8.3.2.

3.9.2.2 Airports

The proposed Project is approximately 32 kilometers (20 miles) southeast of Kahului International Airport, 35 kilometers (22 miles) southwest of the Hāna Airport, and 51 kilometers (32 miles) southwest of Kapalua West Maui Airport. There are no other private or publicly owned runways on Maui.

3.9.2.3 Highways and Roadways

State, county, and privately owned highways and roadways as described in Section 2.1.3 comprise the proposed construction access route from Kahului Harbor to the proposed Project. These roads range from paved multi-lane highways to privately owned dirt pastoral roads. For this discussion, the proposed construction access route has been divided into nine distinct segments listed in Table 3.9-1 and shown on Figure 2-9.

Table 3.9-1.
Construction Access Route from Kahului Harbor to Proposed Project

Segment Number	Route	Ownership/ Jurisdiction	Approximate Distance
1	Ala Luina Street/Hobron Avenue	County of Maui DPW	0.6 km (0.4 mile)
2	Hāna Highway (State Highway 36)	HDOT	1.1 km (0.7 mile)
3	Dairy Road (State Highway 380)	HDOT	1.3 km (0.8 mile)
4	Puʻunēnē Avenue/Mokulele Highway (State Highway 311)	HDOT	10.3 km (6.4 miles)
5	Piʻilani Highway (State Highway 31)	HDOT	11.6 km (7.2 miles)
6	Wailea Ike Drive	County of Maui DPW	1 km (0.6 mile)
7	Wailea Alanui Drive / Mākena Alanui Drive/Mākena Golf Road	County of Maui DPW	4.5 km (2.8 miles)
8	Pāpaka Road (series of privately owned pastoral roads)	Private (privately owned)	7.6 km (4.7 miles)
9	Upcountry Piʻilani Highway (east of Pāpaka Road entrance)	HDOT / County of Maui DPW	6.4 km (4.0 miles)
	Total Distance		**44.4 km (27.6 miles)**

DPW = Department of Public Works
HDOT = Hawaiʻi State Department of Transportation
km = kilometer

The most recent Hawaiʻi State Department of Transportation (HDOT) traffic counts on the affected roadways were done in 2007 (HDOT 2008). The station locations and traffic count data are included as Appendix G.

3.9.2.4 Transit System

The County of Maui's "Maui Bus" transit system, operated by Roberts Hawaiʻi, consists of 12 bus routes and 4 commuter service routes that serve the island's transit needs 7 days a week, including holidays. Routes 5, 6, 10, and 40 all run along portions of the proposed Project's construction access route from the Harbor to the proposed wind farm site.

3.9.2.5 Pedestrians and Bicyclists

In addition to vehicular traffic, some of the roadways along the proposed Project's construction access route receive an unquantifiable amount of use by pedestrians and bicyclists. These uses primarily occur on sidewalks and bike lanes along Pāpaka Road.

3.9.3 Potential Impacts and Mitigation Measures

3.9.3.1 Impact Methodology and Factors Considered for Impacts Analysis

The proposed Project was evaluated for potential adverse effects on transportation routes and traffic movement. Direct and indirect factors considered in determining whether the proposed Project would have a significant impact on transportation and traffic include the extent to which the proposed Project would result in:

- Increases in traffic exceeding a level of service established by HDOT or the County of Maui Department of Public Works (DPW);

- Creation of road dust or severe road damage at levels that create hazardous situations for motorists, pedestrians, or bicyclists;
- Long-term major traffic delays for a substantial number of motorists; and/or
- Changes in air or marine traffic patterns, including either an increase in traffic or a change in location that would cause substantial safety risks.

A traffic study conducted in 2007 by Black & Veatch forms the basis for much of the analysis presented below. Prior to construction, an updated traffic study will be conducted to account for changes in the road system that have occurred since 2007 and to determine the need for Project-related roadway improvements or modifications.

3.9.3.2 Construction Impacts

Construction of the proposed Project would require increased use of the harbor, highways, and roadways along the construction access route. To facilitate the transport of superloads, modifications of overhead transmission lines or traffic lights could be necessary along the construction access route. At nine locations identified along Upcountry Pi'ilani Highway, just west of the proposed Project, road improvements (to include horizontal realignment or vertical re-profiling) would be necessary to accommodate the transport of oversized and heavy equipment (Figure 2-10 in Chapter 2).

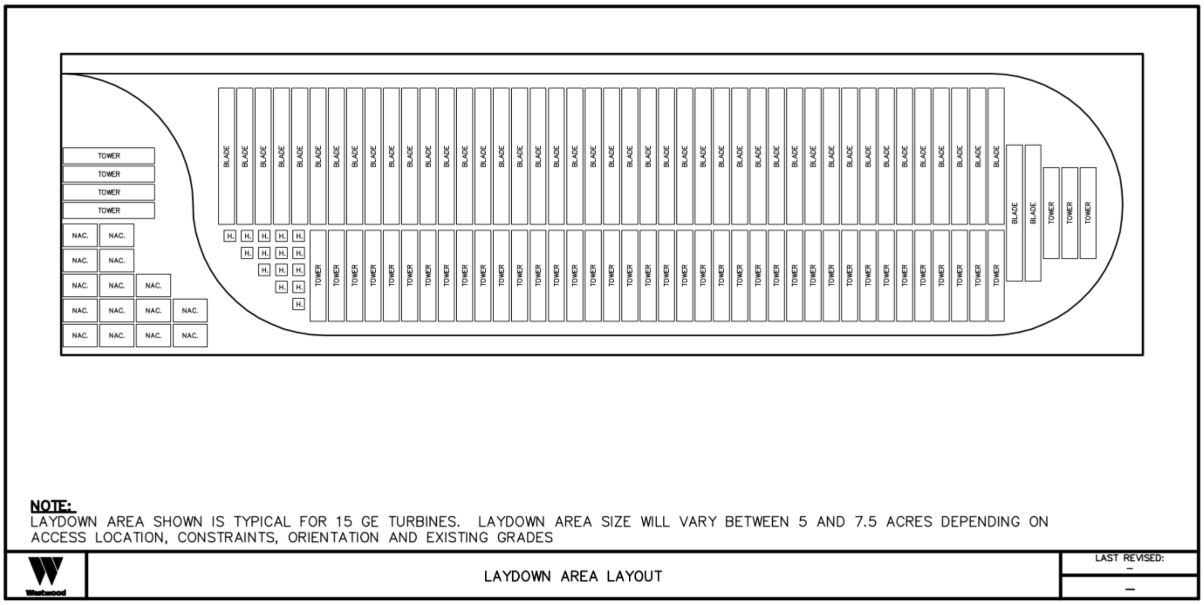
Impacts to the transportation infrastructure could occur during equipment and supply deliveries during construction of the proposed Project. Implementation of a Project-specific traffic management plan would be necessary. Major deliveries would be scheduled during off-peak times (as discussed in Section 3.9.2.3) to the extent practicable. Any roads or infrastructure damaged from the proposed Project activities would be repaired and restored to existing conditions or better. The traffic management plan would identify measures to avoid hazards from the increased truck traffic and to minimize impact to traffic flow on local public roads and highways. The Applicant or its construction contractor would secure permits for the superloads from the HDOT or DPW prior to construction.

Harbor

Exact shipping routes and port stops have not yet been identified. Equipment supply contracts have not been awarded so both the originating sources of the components and the transportation routes are unknown. Major WTG components would most likely be shipped directly to Kahului. However, there is the possibility they would be transshipped through Honolulu Harbor. Other equipment (batteries, transformers, generator-tie line, and generator-tie line poles) could also be transshipped through Honolulu. The transport, staging, and storage of the WTG components have the potential to impact both Honolulu and Kahului harbor facilities and operations in the short term. Early planning and continued coordination with HDOT Harbors Division-Honolulu and Maui District offices would serve to avoid or minimize traffic congestion and delays in the harbor.

Materials and equipment for the proposed Project would be offloaded from cargo ships and either loaded directly into waiting trucks or placed in a designated temporary staging area within the harbor. Because there is limited staging area available at the harbor, it is likely that the shipments of WTG components would be staggered to minimize congestion. It could be necessary to have an offsite temporary storage yard for the WTG components at or near the Harbor at Kahului. The need for a construction staging area and its location has yet to be determined. Areas under consideration include a few locations along Mokulele Highway including five to eight acres adjacent to the Kahului Harbor at the Coral Landfill and an area south of Pāpaka Road. Figure 3.9-1 presents a typical laydown area for GE WTGs.

Figure 3.9-1. Typical Detail for a General Electric Turbine Laydown Area



Source: Mortensen Construction (2010)

A preliminary container yard analysis, based on a standardized container size reported in 20-foot equivalent units, provides an indication of the area potentially available for temporary offloading and storage of Project materials at the Harbor. Locations include Pier 1, which has a current container storage area of 6.4 hectares (15.9 acres), and Pier 2, which has a current container storage area of 7.1 hectares (17.6 acres). An additional 1.5-hectare (3.7-acre) overflow storage yard is at the corner of Hobron Avenue and Ka‘ahumanu Avenue that is typically used for automobile storage; however, the Black & Veatch (2007) study indicates that some of this area could be available for use as a temporary staging area. The final solution to avoid congestion within the harbor or the need for an additional crane could depend on the components. For lighter components like blades, ship-mounted cranes could be sufficient to offload them onto waiting trucks. Heavier components could need to be left on semi-trailers when loaded onto the ships and then driven off the barges using semi-tractors already on Maui. Either approach would require a large number of trucks available on the island to completely unload a ship and avoid tying up the harbor. At least one transport company indicated they could provide the number of trucks and trailers necessary, and when a transportation request for qualifications for the proposed Project is issued, this would be discussed with all bidders. This approach was used for the recent construction of the Kaheawa Pastures Wind Farm Project on Maui and was assumed for the transport study completed for the proposed Project (Black & Veatch 2007). Pictures of the ship arrangements from the Kaheawa Pastures Wind Farm Project on Maui are shown on Figure 3.9-2.

Figure 3.9-2. Kaheawa Pastures Tower and Blade Transport Ships

Source: Black & Veatch (2007)

The major streets in the vicinity of the harbor are Ka‘ahumanu Avenue, Pu‘unēnē Avenue, Hobron Avenue, and Hāna Highway. Other streets include Wharf Street, Ala Luina Street, and Second Street. Hāna Highway and Ka‘ahumanu Avenue, the major roadways in the vicinity of Kahalui Harbor, serve local and regional traffic. Table 3.9-2 lists the intersections in the vicinity of the harbor and identifies the traffic controls in place at the time of site inspection.

Table 3.9-2.
Kahului Harbor Vicinity Traffic Control

Intersection	Control Device
Hobron Avenue / Ala Luina Street	Stop sign
Hobron Avenue / Amala Street	Stop sign
Hobron Avenue / Ka‘ahumanu Avenue	Signalized
Ka‘ahumanu Avenue / Wharf Street	Signalized
Ka‘ahumanu Avenue / Pu‘unēnē Avenue	Signalized
Ka‘ahumanu Avenue / Maui Beach Hotel & Maui Palms Hotel / Lone Ave.	Signalized

Source: Black & Veatch (2007)

The internal roadway, Ala Luina Street, links the internal traffic to Hobron Avenue and to Wharf Street. Congestion within the commercial harbor is localized and dependent on the vessel arrival, type of cargo or passengers, and volume. The major congestion areas are at Pier 1, where there is frequent cruise ship traffic and unloading of the overseas cargo vessels, and at Pier 2, where regular unloading and loading of the inter-island barge occurs.

<u>Airports</u>

Delivery of equipment and construction traffic will not adversely impact operations of any of the four Maui airports because traffic would be limited to water and ground transportation. The Applicant would submit a Notice for Proposed Construction or Alteration and would coordinate with the Federal Aviation Administration (FAA). This notice would be filed at least 6 months prior to the anticipated start of construction to allow adequate time for consultation with the FAA; it would be filed at least 30 days prior to applying for construction permits. Temporary or permanent structures higher than 200 feet above mean sea level or exceeding any obstruction standards contained in 14 CFR 77 should normally be marked or lighted. In some cases, after an FAA aeronautical study, marking or lighting may not be required if the structure does not impair aviation safety. This review process would ensure that there are no adverse impacts to air traffic and would determine the lighting plan that would be required at the proposed Project.

Highways and Roadways

Component Transportation

One of the construction issues is how the WTG components and other materials would be transported to the wind farm site. The WTGs being considered for the proposed Project are GE and Siemens commercial WTGs. Wind turbine components include the steel tower sections (typically three or four sections per tower, each transported separately), nacelles, rotor hub, and three blades (shipped either singularly or in pairs, depending on manufacturer or shipper's requirements). Other components such as WTG transformers, substation transformer, generator-tie line poles and cable, batteries, and switchgear are smaller and would not drive the transport feasibility because they do not require special equipment to facilitate their safe transport. In addition to the WTG components, it is assumed that a 500-ton crawler crane required to erect the WTGs would be transported to the wind farm site (Black & Veatch 2007).

Transportation Equipment

Most major WTG components are considered superloads requiring special equipment and permits for their safe transport. Typical transport methods for these components are discussed below; however, the actual methods used may vary slightly depending on the transporter (Black & Veatch 2007).

Nacelle

As shown in Figure 3.9-3, transport of the nacelles would likely require the use of a 13-axle transport combination with sufficient bridge spacing compatible with H-20 and HS-20 bridge designs (Black & Veatch 2007). During the transport permitting process, the condition of the bridges on the construction access route would need to be reviewed to verify they meet the expected design parameters. In many cases, the extreme height of the nacelles would require using a perimeter bed (a type of trailer) to minimize the vertical clearance required at any underpass. However, the proposed construction access route has no overpasses, so only overhead cables and traffic signal mast arms would need to be reviewed and temporarily moved or raised if required (Black & Veatch 2007).

Figure 3.9-3. Typical Nacelle 13-Axle Combination Transport

Source: Black & Veatch 2007

<u>Tower Sections</u>

The tower sections (three or four sections for each tower, depending on which manufacturer and model is ultimately chosen) would require special transport, although they would not pose the same level of difficulty as the nacelle because they are not as high. The tower sections would be moved on a combination of trailers because the lengths and weights vary. Typical equipment types would be 13-axle combinations with deck extensions, Schnabel-type fittings, or steered dollies (see Figure 3.9-4 below). The overall dimension and weight of these loaded units would be under the shipping envelope of the nacelle and therefore could follow the same route (Black & Veatch 2007).

Figure 3.9-4. Typical WTG Tower Transport

Source: Black & Veatch (2007)

<u>Blades</u>

Transporting the blades would require extendable trailers with two pivot points and rear steering capability (see Figure 3.9-5). The overall dimensions and additional steering capability would allow the blades to be transported along the same route as the nacelles and tower sections (Black & Veatch 2007).

Figure 3.9-5. Typical Blade Transport

Source: Sempra (2010)

Black & Veatch consulted with a local transport firm experienced with transport of components for other wind energy projects in Hawai'i. The transport company confirmed that the proposed construction access route analyzed here is feasible for component delivery and that no significant issues are anticipated (Black & Veatch 2007).

Construction Access Route

Potential Road Modifications

Transporting WTG components to the wind farm site would require temporary or permanent roadway modifications. Some temporary relocations or adjustments to the overhead telephone lines, power lines, and traffic signal mast arms could also be necessary. As shown on Figure 2-10, there are several locations on Upcountry Pi'ilani Highway between Pāpaka Road and the proposed entrance to the wind farm site that would need to be reprofiled to accommodate the low ground clearance requirements for transporting superloads. In addition, several areas may require vertical recontouring of the road profile. The affected zones of construction could be 61 to 192 meters (200 to 400 feet) long and would typically be limited to the existing width of the road including the shoulders. Curve widening could be required in one of two locations. These affected zones could be 61 to 192 meters (200 to 400 feet) long and could extend 12 to 15 meters (40 to 50 feet) onto the inside shoulder of the curve. Any temporary or permanent road modifications proposed by the construction contractor would be coordinated with and permitted by HDOT or DPW, as appropriate.

A section of unimproved Pāpaka Road would need to be improved (potentially including horizontal realignments, vertical re-profiling, curve widening). All of these accommodations would be funded by the Applicant.

The proposed construction access route on which WTG components, crane components, and other large items from Kahului Harbor would be trucked to the proposed Project is detailed in Table 3.9-3 and discussed below. This route is believed to be the most practical. Another route would be necessary only if HDOT or DPW denies a transport permit for currently unforeseen reasons.

Table 3.9-3.
Transport Route from Kahului Harbor to the Auwahi Wind Project

Route Section	Route Segment	Length
0	Leave Kahului Harbor on Ala Luina Street.	0.0 km (0.0 mile)
1	Ala Luina Street becomes Hobron Avenue, continue to Hāna Highway (HI Hwy 36 E) and turn left.	0.6 km (0.4 mile)
2	Go SE on Hāna Highway to Dairy Road (HI Hwy 380 S), and turn right.	1.1 km (0.7 mile)
3	Go SW on HI Hwy 380 S to Pu'unēnēAvenue (HI Hwy 311), and turn left.	1.3 km (0.8 mile)
4	Go south on HI Hwy 311 (which becomes Mokulele Highway) to Pi'ilani Highway (HI 31 S), and turn left.	10.3 km (6.4 miles)
5	Go south on Pi'ilani Highway to Wailea Ike Drive, and turn right.	11.6 km (7.2 miles)
6	Go west on Wailea Ike Drive to Wailea Alanui Drive, and turn left.	1.0 km (0.6 miles)
7	Go south on Wailea Alanui Drive (which becomes Mākena Alanui Drive) to the Mākena Golf Road gate and turn left.	4.5 km (2.8 miles)
8	Follow the gated series of privately owned roads, collectively referred to as Pāpaka Road, to Kula Highway (State Road 37), and turn right.	7.6 km (4.7 miles)
9	Follow Kula Highway (which becomes Pi'ilani Highway, referred to as Upcountry Pi'ilani Highway) to wind farm site entrance.	6.4 km (4.0 miles)
TOTAL DISTANCE		**44.4 km (27.6 miles)**

km = kilometer
Source: Black & Veatch (2007)

Black & Veatch's traffic study noted four locations along the proposed construction access route where there are small concrete bridges. Each of these bridges was found to be designed to either the H-20 or HS-20 rating (Black & Veatch 2007). A rating of H-20 indicates a bridge designed to accommodate a truck with up to 16 tons on the drive axle and 4 tons on the steering axle (for a total load of 20 tons). A rating of HS-20 is for a semi-trailer configuration, with an additional 16 tons on that axle (for a total load of 32 tons). For heavier loads, trailers with additional axles are used to distribute the weight so they do not violate the HS-20 rating. For example, the nacelle trailer for a GE or Siemens turbine typically has 13 axles to meet the HS-20 rating. These two ratings are the most common for modern U.S. bridge design, and WTG transport equipment commonly used in the U.S. can pass over an HS-20 bridge (Black & Veatch 2007). Once a specific turbine manufacturer and model has been selected, a more detailed site routing study will be performed. These studies are typically done within 30 days prior to issuing transport permits (Black & Veatch 2007).

Route Section 0: Leaving Kahului Harbor

The ships carrying components for the proposed Project would be offloaded at Kahului Harbor where a temporary staging area may be established. Ships generally have a 4-day window between scheduled barge service and the Port is willing to temporarily store cargo onsite for another 4 days unless a lease is arranged for longer term storage. Other options include potential location(s) along Mokulele Highway or at the site south of Pāpaka Road. Given the limited amount of land available for staging, it might be necessary for WTG components to be shipped in multiple shipments (Black & Veatch 2007). Figure 3.9-6 depicts the typical scene at Pier #1.

Figure 3.9-6. Pier #1

Source: Black & Veatch (2007)

Route Section 1: Ala Luina Street / Hobron Avenue

While there are a few options for leaving the harbor, Ala Luina Street and Hobron Avenue have radii sufficient to accommodate the superloads. Some overhead telephone lines may need to be raised or moved to facilitate nacelle and tower transport. This route section is less than 1 mile long, and its use should not impact traffic conditions (Black & Veatch 2007).

Route Section 2: Hāna Highway

This section of Hāna Highway is relatively wide and in good condition and is a well-used highway for traffic into and out of Kahului. Figure 3.9-7 depicts a representative two-lane highway. The Applicant anticipates transportation of permitted loads on this road would be restricted to off-peak

Figure 3.9-7. Representative Two-lane Highway—Hāna Highway at Dairy Road

Source: Black & Veatch (2007)

times, and may face further restrictions because of tourist traffic. Some of the traffic lights at Dairy Road might have to be temporarily taken down to permit extra tall loads, such as nacelles (Black & Veatch 2007). Long loads (such as blades) would also need traffic control measures such as police escort or pilot cars, to manage traffic during transport through intersections.

Route Section 3: Highway 380 South

The third relatively short route section connects Highways 36 and 311, and is along the southeast boundary of Kahului. This is another heavily traveled road that would likely be restricted to off-peak-hour traffic times. There are also some trees that overhang portions of the road that could require trucks to travel in specific lanes.

Route Section 4: Highway 311 (Mokulele Highway) South

This first long section of the route would take trucks from Kahului to Kihei. The highway is a four-lane highway in most areas and may have to be closed to traffic when some loads are moved. Highway 311 (Mokulele Highway) has three bridges that trucks would need to cross, all of them rated to H-20 (rated to accommodate an axle load of 16 tons). These bridges would require further examination when the transport permits are applied for (such examinations are typically performed by HDOT). One of the traffic lights at the intersection with Piʻilani Highway could have to be moved (Black & Veatch 2007). Figure 3.9-8 depicts a representative four-lane highway.

Route Section 5: Piʻilani Highway

Piʻilani Highway is along the southwest shore of East Maui to Wailea. In most areas, Piʻilani Highway is a four-lane highway in good condition (see Figure 3.9-8), with only three traffic signals along the proposed route (Black & Veatch 2007).

Black & Veatch (2007) noted that there were four concrete bridges in this section. Each bridge has an HS-20 rating (see above) and a maximum span length of 50 feet or less. Temporary road improvements (such as widening or removal of a median) may be necessary at the intersection of Piʻilani Highway and Wailea Ike Drive.

Figure 3.9-8. Representative Four-lane Highway—Pi‘ilani Highway

Source: Black & Veatch (2007)

Route Section 6: Wailea Ike Drive

This short route section would need to be continued south far enough to reach Mākena Alanui Drive (discussed as Route Section 8). While 90-degree turns would be required, the road is relatively wide and free of obstructions. Local traffic would need to be temporarily stopped, thus requiring traffic control measures such flaggers, but the impact should be minimal (Black & Veatch 2007). Temporary road improvements (such as widening or removal of a median) may be necessary at the intersection of Wailea Ike Drive and Wailea Alanui Drive. Figure 3.9-9 depicts a representative paved local road.

Route Section 7: Wailea Alanui Drive

Wailea Alanui Drive turns into Mākena Alanui Drive and is taken farther south to reach the entrance to Mākena Golf Road, which turns into a series of private roads collectively referred to as Pāpaka Road. The road is wide and appears relatively new (Black & Veatch 2007). See Figure 3.9-9. Temporary road improvements (such as widening) may be necessary at the intersection of Mākena Alanui Drive and Mākena Golf Road.

Figure 3.9-9. Representative Paved Local Road—Wailea Alanui Drive

Source: Black & Veatch (2007)

Route Section 8: Pāpaka Road

Because Kula Highway has several points between Pukalani and ʻUlupalakua where turns are too sharp and slopes too steep for WTG component transport, Black & Veatch identified this Pāpaka Road alternative route as the preferred route (2007). Section 8 of the route is a series of private roads with gates at the entrance of Mākena Alanui Drive and at the exit of Upcountry Piʻilani Kula Highway. The eastern end connects with Upcountry Piʻilani Kula Highway about 2.4 kilometers (1.5 miles) southeast of the ʻUlupalakua Ranch store office. Figure 3.9-10 depicts a representative unpaved pastoral road.

Much of the western portion of the road is paved and in good condition. The surface of the road deteriorates in the eastern portion, but it could be repaired. There are some steep portions that may exceed design requirements and would require road fill, rerouting, or heavy equipment to assist trucks carrying heavy components. The road surface would deteriorate during construction of the proposed Project, and would require repair once all heavy hauls were completed (Black & Veatch 2007). Roads would be repaired to preconstruction conditions or better.

Because both ends of the road are gated, it could be necessary to place guards at both ends during use. Several landowners have access to the road including ʻUlupalakua Ranch. Coordination with these landowners is currently in progress and would continue through design and construction.

Section 8 is the only portion of the route with significant elevation changes, from near sea level at Mākena on the western end to near 549 meters (1,800 feet) ASL at ʻUlupalakua Ranch on the eastern end. While the average slope over the entire section is expected to be about 7.5 percent, preliminary calculations show some sections with slopes up to 24 percent. Typical transport providers' requirements for the WTG superloads require a grade no steeper than 10 percent, unless a special heavy-assist vehicles would be used. Final design for these road improvements would be completed to obtain required state and county permits.

Figure 3.9-10. Representative Unpaved Pastoral Road: Pāpaka Road, Eastern Portion

Route Section 9: Upcountry Piʻilani Highway

The last portion of the route is Upcountry Piʻilani Highway. This is a two-lane road that is relatively straight from the intersection with Section 8, has no obstructions, and does not get a great amount of traffic (see traffic data in Appendix G). It does have segments that would need to be leveled out to accommodate the WTG superloads. In addition, to improve the access road for the Interconnect

Substation, construction materials would be transported from this intersection with Upcountry Pi‘ilani Highway

Traffic Impacts along Construction Access Route

Table 3.9-4 shows an estimated monthly resource loaded traffic schedule for offsite construction traffic. The table presents the amount of estimated construction traffic during months 1 through 10 of the construction phase for the entire construction access route, conservatively assuming that the GE WTG is selected which would require 15 turbines be installed. The estimate assumes that concrete and aggregate would be trucked into the proposed Project (rather than produced or obtained onsite).

Table 3.9-4.
Number of Vehicles Per Month During Construction Phase

Type of Vehicle	Number of Vehicles per Month										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Passenger Vehicles	80	100	310	449	642	1,282	2,051	1,675	1,195	218	**8,000**
Concrete Trucks	0	0	68	138	169	304	901	89	36	2	**1,707**
Belly Dump Trucks	64	80	703	431	408	464	529	170	14	0	**2,862**
Regular Dump Trucks	16	20	60	40	48	120	86	39	5	0	**434**
Water Trucks	16	20	142	122	125	208	501	296	188	0	**1,617**
Typical Semi-Trucks	0	0	40	38	48	65	104	62	31	8	**395**
Superloads	0	0	0	0	0	6	114	0	0	0	**120**
TOTAL	**176**	**220**	**1,323**	**1,218**	**1,440**	**2,449**	**4,286**	**2,331**	**1,469**	**228**	**15,135**

Source: Mortensen Construction (2010)

Most of the construction traffic would use Pāpaka Road to access the proposed Project. At this time it has not been determined whether Kula Highway would be used for deliveries. This would likely be dependent on the final selection of suppliers/subcontractors. During the peak month of construction (month 7), a total of 4,286 vehicle trips are anticipated (see Table 3.9-4), or 10 additional trips per hour, excluding worker’s trips, assuming 10-hour work days and 5-day work weeks. The workers’ trips would add approximately 45 trips in the morning and evening, but the work hours would probably be somewhat staggered and may not coincide with the roadways’ peak hours given the typical long days common in the construction industry. As indicated in Appendix G, HDOT traffic count data collected at locations along the affected roadways indicate typical peak hour volumes of 400 to 2,300 vehicles per hour, with the exception of the Pi‘ilani Highway segment measured between Keoke Park and Keawa Place, where only 6 to 22 vehicles were counted during peak hours.

Increased traffic would not be expected to exceed an acceptable level of service established by HDOT or DPW for more than short periods during construction. The proposed Project’s additional 55 peak-hour vehicle trips would not be expected to have an adverse affect on the operation of state highways or county roads during construction. During transport of the superloads, short-term congestion could result from slow-moving loads being escorted by police through urban intersections; however, traffic-disrupting deliveries would be scheduled during off-peak times and coordinated with HDOT and DPW to minimize inconvenience to the public.

To minimize impacts to traffic, Auwahi Wind, or its construction contractor, will prepare a traffic management plan for the major transport activities and for road improvements that could cause traffic delays. At a minimum, the traffic management plan will include identified areas to pull over and allow backed up traffic to pass safely; traffic control at intersections and flag persons (or flaggers) to manage traffic flow to accommodate turning of superloads; modification of overhead lines and traffic lights; police escorts or pilot cars during superload transport; traffic control during roadway improvements and repairs; and scheduling superloads and deliveries during off-peak traffic hours (e.g., before 5 a.m., after 8 p.m., or during weekends) when possible. To further minimize traffic impacts, construction workers will be encouraged to carpool.

Additional impacts to motorists include exposure to construction dust as well as temporary damage to roadways from construction equipment. Dust will be monitored and controlled with a watering truck. The Applicant will be responsible for repairing any road damage caused by the Project activities. Still or video photography will be used to document roadway conditions prior to the beginning of construction to ensure that roads are restored to preexisting conditions or better.

Depending on which WTG model is selected, the WTG access roads may be modified based on engineering considerations by reducing the length and increasing the grade up to 15 percent. The impacts to transportation and traffic from construction of this straightened road alignment would be similar to those from construction of the proposed WTG access road alignment discussed above.

Generator-tie Line Access

A gravel access road would be built along portions of the proposed generator-tie line, where needed due to terrain, following the existing field road as much as practicable. With the exceptions of short-term delays along the road, no traffic-related impacts are anticipated during construction.

Transit System Impacts

The "Maui Bus" system operates 12 bus routes and 4 commuter routes around the island, and 4 routes are coincident with the proposed construction access route for the Project. Bus routes 5 and 6, the "Kahului Loop," run along a portion of Hāna Highway and Dairy Road, and Route 10, the "Kihei Islander," turns around at the south end at the intersection of Wailea Ike Drive and Pi'ilani Highway. Route 40, the "Upcountry Islander," operates over a portion of Hāna Highway.

Along with other vehicle traffic at these locations, buses could be temporarily delayed from some level of congestion associated with transporting the superloads in an urban area. Transport of the superloads is expected to occur during off-peak travel times, so no significant impact is expected from these relatively short delays.

Pedestrian and Bicyclist Impacts

While the intensity of pedestrian and bicyclist use and the extent of sidewalks and bike lanes are unknown along the proposed construction access route, it is anticipated that the delivery of superloads would have a relatively minor impact to pedestrians and bicyclists. Short-term delays might occur as over-length equipment and components are transported along the corridor, especially near urban intersections. Police escorts for the WTG superload transport would help to warn pedestrians and bicyclists to pause and allow these loads to pass safely. No impact to the sidewalks or bike lanes is anticipated.

Additionally, dust from construction activities as well as road damage from construction equipment could impact pedestrians and bicyclists using the construction access route. During construction, road dust would be controlled with watering trucks. Any severe road damage would be expeditiously repaired to prevent hazardous situations for pedestrians, bicyclists, and others using the roads.

3.9.3.3 Operations and Maintenance Impacts

Operations of the wind farm are not expected to require frequent use of the harbor to deliver replacement equipment over the operational lifetime of the proposed Project. In addition, based on the location of the known runways, the proposed Project would not result in an obstruction of airspace. In accordance with FAA regulations, a Notice of Proposed Construction or Alteration would be filed with the FAA prior to construction. Therefore, O&M activities would have negligible effects on the harbor and would have no effect on airport infrastructure or services.

Five regular O&M staff are expected to be needed during the O&M phase. During this phase, the number of regular daily trips is expected to be no more than five inbound and five outbound, with occasional additional trips associated with infrequent maintenance activities. The existing state highways and county roads would be used on a regular basis for O&M personnel traveling to the wind farm site or accessing the generator-tie line. Pāpaka Road would not be used during operations, except for infrequent delivery of replacement equipment. Thus, deliveries to the wind farm site and other maintenance traffic would be infrequent and result in a negligible increase in traffic.

There would be long-term beneficial impacts to the transportation system because the proposed Project would improve some roads, such as smoothing out bumps in Upcountry Pi‘ilani Highway, and would provide ‘Ulupalakua Ranch employees and private landowners along Pāpaka Road with improved access on the property. Based on this information, operations of the proposed Project are not expected to significantly impact the harbor, airport, or roadway infrastructure.

3.9.3.4 No Action Alternative

No impacts to transportation and traffic are expected under the No Action Alternative because traffic conditions would remain unchanged.

3.9.3.5 Avoidance, Minimization, and Mitigation Measures

As described above, the Applicant will implement design features and industry-standard BMPs, which are discussed in Table 2-4, resulting in most of the impacts of the proposed Project related to transportation and traffic being less than significant. Impacts related to roadway and intersection operations during construction would be mitigated to less than significant by implementing the following measures:

- A Project-specific traffic management plan will be developed in coordination with HDOT and DPW.
- Any severe road damage will be expeditiously repaired to prevent hazardous situations for motorists, pedestrians, or bicyclists. Still or video photography will be used to document roadway conditions prior to the beginning of construction to ensure that roads are restored to preexisting conditions or better.
- Traffic-disrupting deliveries will be scheduled during off-peak times and coordinated with HDOT and DPW to minimize inconvenience to the public.

3.9.3.6 Summary of Impacts

Table 3.9-5 provides a summary of potential Project-related impacts to transportation and traffic.

Table 3.9-5.
Summary of Potential Traffic Impacts

Impact Issues	Proposed Project	No Action Alternative
Highway/roadway operations during the construction phase	⃠	○
Intersection operations during the construction phase	⃠	○
Dust construction phase	⊙	○
Highway/roadway operations during the O&M phase	○	○
Highway/roadway conditions	⊙, +	
Intersection operations during the O&M phase	○	○
Parking, pedestrian and bicycle facilities	○	○
Marine traffic or harbor operations	⊙	○
Air traffic	○	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:
⊗= Significant impact
⃠= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A = Not applicable
○ = No impact

3.10 HAZARDOUS AND REGULATED MATERIALS AND WASTES

3.10.1 Definition of Resource

In this section, 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 (Institute of Hazardous Materials Management 2010). The term may also have specific definitions for certain purposes, such as the definitions used by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA).

Hazardous materials and wastes are subject to many regulations at the federal, state, and local levels. The primary federal agencies responsible for regulating hazardous materials and wastes are the EPA, the Occupational Safety and Health Administration (OSHA), and the U.S. Department of Transportation.

Solid waste and petroleum products are included in this section. Solid waste is generally defined as discarded material. The EPA defines solid waste as "any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities" (EPA 2010). Common petroleum products include gasoline and diesel fuel.

The ROI for hazardous and regulated materials and wastes is defined as the proposed Project, surrounding areas that could affect or be affected by conditions at the proposed Project site, and the routes of travel to and from the proposed Project.

3.10.2 Existing Conditions

3.10.2.1 Wind Farm Site

A Phase I Environmental Site Assessment (Tetra Tech 2008) of the proposed Project site was done in 2008 to assess the potential presence of hazardous materials on the site. The Phase I was conducted in accordance with ASTM International Standard E1527-05, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process,* and included a visual site inspection, interviews with persons familiar with the property, and a review of current and historical property records.

The Phase I assessment did not find evidence that hazardous materials, solid waste, or petroleum products have been released to the environment in or around the proposed Project. There was no evidence of the presence of underground storage tanks; storage of hazardous materials; improper disposal of hazardous wastes, dumping, or landfilling; or wastewater such as pits, ponds, or lagoons. There were no structures such as houses or sheds or evidence of utilities such as transmission lines or transformers on the property. Several aboveground storage tanks (ASTs) to supply water to cattle on drier portions of the property were observed (Tetra Tech 2008).

3.10.2.2 Other Project Areas

The proposed Project site is currently used for cattle ranching and has historically been used for cattle ranching and limited agricultural activities since its initial development more than 100 years ago. More information about land use is provided in Section 3.14 – Surrounding Land Use and

Agriculture. There is no evidence that these activities have contaminated the property. The possibility that there is undiscovered contamination, such as from illegal dumping, is low because the majority of the area is remote and not easily accessible due to terrain, vegetation, and lack of roads.

3.10.3 Potential Impacts and Mitigation Measures

3.10.3.1 Impact Methodology and Factors Considered for Impacts Analysis

Impacts from the use of hazardous materials, solid waste, and petroleum products were assessed based on whether or not construction and operations of the proposed Project alternatives could:

- Increase significant hazard to the public or the environment through the routine transport, storage, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Expose workers or the public to hazardous materials at levels in excess of those permitted by OSHA in 29 CFR Part 1910;
- Increase exposure of humans or the environment to potentially hazardous levels of chemicals from the disturbance of existing contamination or from the improper discharge or disposal of hazardous materials;
- Expose people to significant hazards or structures to loss as a result of intentionally destructive acts (i.e., vandalism).

3.10.3.2 Construction Impacts

The Applicant would comply with all applicable federal, state, and local laws, ordinances, and regulations; prepare and implement the necessary management plans; and implement standard industry BMPs, as described below. The Applicant would also obtain any permits or authorizations related to hazardous materials prior to starting construction. Hence, construction impacts of the proposed Project would be less than significant.

Routine Use, Storage, and Transport of Hazardous Materials

Construction of the proposed Project involves the routine transport, use, storage, and disposal of hazardous materials. Construction requires the operation of heavy equipment and construction vehicles. Hazardous materials required for construction equipment include antifreeze, diesel fuel, gasoline, hydraulic oil, lube oil, and grease. It would not be practical to remove construction equipment from the site for refueling and general maintenance such as changing fluids and lubricating parts; therefore, these activities would take place onsite. Other hazardous or regulated materials that would be used during construction include paints, adhesives, curing compounds, concrete, bentonite, and fertilizer. Construction equipment used to mix and pour concrete would be washed onsite because it would not be practical to remove this equipment from the site for washing. There would be waste disposal and collection receptacles and sanitary facilities on site during construction.

The Applicant would prepare and implement a Hazardous Materials and Waste Management Plan (HMWMP) that details proper procedures for storing and using hazardous materials and storing and disposing of hazardous waste. The plan would be Project-specific and would contain sufficient detail to address the purpose of the plan and to readily translate into the actions necessary to comply with relevant regulations. The plan would include information about site activities, site contacts, worker training procedures, and a hazardous materials inventory in accordance with Article 80 of the Uniform Fire Code. A qualified hazardous materials management professional, such as a Certified Hazardous Materials Manager, would prepare and oversee implementation of the plan.

The HMWMP would include emergency response procedures. The plan would be provided to local emergency responders so they could properly respond to an emergency at the site. All workers would be trained to understand the established emergency response procedures. Emergency response equipment such as fire extinguishers onsite and first aid kits would be onsite at all times. In addition, water tanks would be onsite for dust suppression and would be available in the event of a fire (see Appendix A).

The Applicant would implement regulatory requirements and standard industry BMPs for managing the routine transport, use, storage, and disposal of hazardous materials, petroleum products, and solid waste. These requirements and BMPs include the following:

- Keep materials in their original containers with the original manufacturer's label.
- Seal containers whenever they are not in use.
- Procure and store only the amount of chemicals needed for the job.
- Follow the manufacturer's recommendation for proper handling and disposal.
- Store smaller hazardous materials containers in a secure cabinet designed for storage of such materials.
- Conduct routine inspections to ensure that all chemicals are being stored, used, and disposed of appropriately.
- Place construction debris and trash into a dumpster to prevent it from being wind-blown or left on the ground.

Table 3.10-1 presents a list of pollutants that can be used during construction, a brief description of their storage and use, and a brief description of control measures that would be implemented to ensure they are properly stored. Implementation of these control measures and BMPs would ensure that impacts from routine transport, use, storage, and disposal of hazardous materials would be less than significant.

Table 3.10-1.
Potential Pollutants and Control Measures

Potential Pollutant	Storage or Use	Control Measures
Antifreeze	Vehicles, Equipment	Secure secondary containment; drip pan
Diesel Fuel	Vehicles, Equipment, AST	Secure secondary containment; drip pan
Gasoline	Vehicles, Equipment, AST	Secure secondary containment; drip pan
Hydraulic Oils/Fluids	Vehicles, Equipment	Secure secondary containment; drip pan
Grease	Vehicles, Equipment	Secure secondary containment; drip pan

Table 3.10-1.
Potential Pollutants and Control Measures

Potential Pollutant	Storage or Use	Control Measures
Sanitary Waste Restrooms	Various	Service provider would secure units to prevent tipping
Trash And Construction Debris	Various	Dumpster
Paints	Contractor	Secure secondary containment; secure, covered storage
Glue, Adhesives, Curing Compounds	Contractor	Secure secondary containment; secure, covered storage
Soil Amendments	Various	Secure secondary containment; secure, covered storage
Landscaping Materials Fertilizer	Various	Secure secondary containment; secure, covered storage
Concrete Mortar	Mobile Mixer	Secure secondary containment; washout area; secure, covered storage
Concrete	Trucks, Washout	Secure secondary containment; washout area
Bentonite	Directional boring equipment	Secure secondary containment; sump

Source: Mortenson Construction (2010)

Accidental Spills and Releases

There could be accidental releases or spills from the routine transport, use, storage, and disposal of hazardous materials. The Applicant would prepare and implement an SPCC Plan, in accordance with 40 CFR Part 112. The SPCC Plan would be reviewed and certified by a Professional Engineer to ensure its adequacy. The SPCC Plan would detail spill prevention, response, containment, reporting, and cleanup measures; and include worker training requirements, inspection protocols, and emergency procedures.

The Applicant would implement regulatory requirements and BMPs designed to prevent and respond to spills and releases, including:

- Maintain spill containment and cleanup kits in all areas where hazardous materials would be used or stored.
- Fuel and maintain vehicles and equipment in areas protected from releases onto the ground.
- Provide secure secondary containment with a volume of at least 150 percent of the tank volume for all fuel tanks.
- Place drip pans under vehicles to prevent fluids from dripping onto the ground.
- Perform timely maintenance on vehicles and equipment that leaks oil or other fluids.
- Wash equipment and vehicles used for concrete in a designated area where wash water would be properly contained. Pump wash water into trucks and remove it from the site for proper disposal.

- Construct a sump to contain the waste product of bentonite during drilling operations.

There is the potential for accidental releases or spills from the routine transport, use, storage, and disposal of hazardous materials during construction. Implementation of the control measures and BMPs described above that are designed to prevent and respond to spills and releases would ensure that impacts remain less than significant.

Worker Exposure to Chemicals Exceeding OSHA Limits

Construction workers could come into contact with hazardous materials in excess of the exposure limits defined by OSHA in 29 CFR Part 1910. To minimize this risk, the Applicant would prepare and implement a Site Safety Handbook in accordance with 29 CFR 1926.65(1). For more information on the Site Safety Handbook, see Section 3.15 – Public and Construction Safety. All persons entering the construction areas would be required to review and adhere to the plan.

The Applicant would implement regulatory requirements and BMPs to prevent harmful exposure of workers, including:

- Have Material Safety Data Sheets available to all workers for all hazardous materials stored and used onsite.
- Ensure that all personnel who handle or could come into contact with hazardous materials are sufficiently trained in the proper way to use and dispose of these materials.
- Ensure the proper use of personal protective equipment.

The potential for injury to workers from exposure to hazardous materials would be less than significant with the implementation of the Site Safety Handbook.

Disturbance of Existing Contamination or Improper Disposal

As described in Section 3.10.2.1, there is no known contamination at the proposed Project site; however, there is always some potential that existing contamination such as an illegal dump site could be found during construction. Even though the risk of encountering existing contamination is low, the Applicant would train workers to recognize signs of illegal dumping or subsurface contamination such as odors and soil discoloration. If contamination were discovered, the Applicant would work with the Hawaiʻi Department of Health to take appropriate action, including characterizing the type, extent, and concentration of the contamination and removing contaminated soil.

Construction activities would generate waste including construction debris, concrete wash water, used oil, and other vehicle fluids, and restroom waste. Proper procedures for temporary onsite storage of such wastes would be documented in the HMWMP. The Applicant would dispose of all waste, including non-hazardous waste, offsite at an appropriately permitted facility. Facilities where waste may be disposed of and the type of waste each facility accepts are discussed in Section 3.17 – Public Infrastructure and Services.

The impacts associated with disturbance of existing contamination or improper handling of waste generated during construction would be less than significant with implementation of the HMWMP.

Vandalism

Because most construction activities would be in remote areas not readily accessible to or visible by the public, the risk of vandalism would be low. Site security would be sufficient to prevent vandalism. Fencing already surrounds much of the proposed Project area. This fencing would be retained and improved if necessary. The step-up transformers at the individual WTGs would be on access roads that would be physically closed to the public. The transformers would be inside padlocked and wrench-locked cabinets to prevent access to the level gauges and valves that would result in oil discharge if tampered with. Security fencing and gates would be installed around the collector switchyard to prevent access to oil-containing transformers, the O&M building would be locked, and additional security measures such as alarms and security personnel could be used. The interconnection substation would also have security fencing. Impacts associated with vandalism would be less than significant and would be reduced further with the implementation of security measures at the site.

3.10.3.3 Operations and Maintenance Impacts

The O&M impacts of the proposed Project would be less than those described for construction. As during construction, the Applicant would ensure that O&M of the proposed Project complies with all applicable federal, state, and local laws, ordinances, and regulations. The Applicant would obtain any ongoing permits or authorizations related to hazardous materials as needed.

Routine Use, Storage, and Transport of Hazardous Materials

The amounts of hazardous materials required during O&M would be less than the amounts needed for construction and would be limited to designated storage areas on the site. The Applicant would update the HMWMP with information about hazardous materials pertaining to the O&M phase, implement BMPs for managing hazardous materials, and provide appropriate control measures such as secondary containment to contain leaks and spills.

Hazardous materials would be stored in the O&M building and used at each WTG and at the collector switchyard. Specific hazardous materials inventories, including quantities, would be documented in the HMWMP and updated annually or as required by regulation. Nonhazardous batteries would be stored at the interconnection substation. Inspections of each of these facilities for leaks and spills would be done at least monthly. Implementing these measures would ensure that impacts would be less than significant.

Operations and Maintenance Building

The O&M building would contain hazardous materials needed for routine O&M of the WTGs. These materials include mineral oil, hydraulic oil, grease, waste oil, cleaners, degreaser, and diesel fuel. These items would be stored on spill-absorbent materials and inspected routinely. There would likely be 55 gallons or less of each material onsite at any time.

Wind Turbine Generators

Each of the 15 WTG sites would have a gear box with 64 gallons of hydraulic and lubricating oils and a transformer with 522 gallons of mineral oil. The gear box would be in the nacelle on top of the tower and would have a catch basin capable of containing small oil leaks or spills. Larger spills could overflow the catch basin, but would be contained at the base of the tower, which is sealed at the foundation. A transformer would be mounted on a concrete pad adjacent to the base of each WTG. A sump would be constructed beneath each transformer to contain leaks and spills. Oil that entered the sump would be pumped out and disposed of offsite. Preventive maintenance would help prevent leaks and spills and ensure the proper and continuous functioning of the WTGs.

Collector Switchyard

The new collector switchyard would have three transformers that collectively contain approximately 15,140 liters (4,000 gallons) of mineral oil. The largest transformer would be surrounded by a containment dike. Appropriate control measures to contain leaks and spills for the other two transformers are still being determined and would be included in the final collector switchyard design.

Interconnection Substation

The interconnection substation would include a battery storage building with a footprint of approximately 26 meters by 26 meters (85 feet by 85 feet). The battery storage building would house a series of utility-scale batteries to provide smoothing capability for power generated from the wind farm. Either lithium cells or non-wet, non-spillable lead acid batteries would be used. Although the chemical composition of the batteries would depend on the manufacturer, neither type of battery would be classified as a hazardous material. The contents of the batteries would be sealed in the battery case. Many batteries are doubly encapsulated so that a leak would be contained in the battery case. The battery storage building would likely be a metal, pre-fabricated structure on a concrete slab.

Accidental Spills and Releases

Because hazardous materials would be used at the site, there would be a potential for accidental releases or spills. The Applicant would update the SPCC Plan with information pertaining to the O&M phase and implement BMPs for spill prevention, response, containment, and reporting. Implementation of these measures ensures that impacts would be less than significant.

Worker Exposure to Chemicals Exceeding OSHA Limits

Because hazardous materials would be used at the site, there would be a potential for worker exposure in excess of the exposure limits specified by OSHA in 29 CFR Part 1910. To minimize this risk, the Applicant would prepare and implement a Site Safety Handbook and implement BMPs for hazardous materials management. The HMWMP, updated to address O&M activities, would address proper hazardous materials management and worker training procedures to minimize the risk of worker exposure. The potential for injury to workers from exposure to hazardous materials would be less than significant with the implementation of the Site Safety Handbook.

Disturb Existing Contamination or Improper Disposal

The potential to encounter existing contamination is only relevant to ground-disturbing construction activities; therefore, there would be no impacts during O&M.

Hazardous waste would be generated—specifically, used oil from the WTGs. Used oil would temporarily be stored in the O&M building. It would be transported offsite and disposed of at an appropriately-permitted waste disposal facility. The HMWMP, updated to address O&M activities, would detail proper waste storage and disposal procedures. The impacts associated with disturbance of existing contamination or improper handling of waste generated during construction would be less than significant with implementation of the updated HMWMP.

Vandalism

The risk of vandalism would be low; however, there would be site security such as fencing, road closures, and locks. These measures are expected to be sufficient to prevent acts of vandalism; however, additional security measures could be implemented such as building alarms and security personnel. Impacts associated with vandalism would be less than significant and would be reduced further with the implementation of these security measures.

3.10.3.4 No Action Alternative

Under the No Action Alternative, there would be no new construction at the site and the area would continue to be undeveloped and used for cattle grazing. No hazardous materials would be transported, stored, used, or disposed of at the site; therefore, there would be no impacts.

3.10.3.5 Avoidance, Minimization, and Mitigation Measures

As described above, the Applicant will implement the design features, industry-standard BMPs, and Project plans (e.g., Site Safety Handbook, SPCC Plan, and HMWMP) listed in Table 2-4 related to hazardous and regulated materials and wastes resulting in less than significant impacts; therefore, no additional avoidance, minimization, or mitigation measures are required.

3.10.3.6 Summary of Impacts

Potential hazardous materials impacts are summarized in Table 3.10-2.

Table 3.10-2.
Summary of Potential Hazardous Materials Impacts

Impact Issues	Proposed Project	No Action Alternative
Routine use, storage, and transport of hazardous materials	⊙	○
Accidental spills and releases	⊙	○
Worker exposure to chemicals exceeding OSHA limits	⊙	○
Disturb existing contamination or improper disposal	⊙	○
Vandalism	⊙	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:
⊗= Significant impact
⊘= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A= Not applicable
○= No impact

3.11 NOISE

3.11.1 Definition of Resource

All sounds originate with a source whether it is a human voice, motor vehicles on a roadway, or a WTG. Sound levels are presented on a logarithmic scale to account for the large range of acoustic pressures that the human ear is exposed to. Sound levels are expressed in units of decibels (dB). A sound source is defined by a sound power level (L_w) that is independent of any external factors. A sound pressure level (L_p) at a given receiver location differs from a L_w as it can be obtained with a microphone or calculated from information about the source sound power level and the surrounding environment.

A decibel is the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (μPa). Sound power is referenced to 1 picowatt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is done to determine tonal characteristics. The unit of frequency is hertz (Hz), measuring the cycles per second of the sound pressure waves. Typically, the frequency analysis examines 11 octave (or 33 1/3 octave) bands ranging from 16 Hz (low) to 16,000 Hz (high), encompassing the entire human audible frequency range. Because the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. Sound can be expressed in terms of its frequency components or in terms of broadband sound levels, where the sound energy is summed across the frequency spectrum. For the proposed Project's acoustic analysis, sound levels are expressed in A-weighted decibels (dBA) that compensate for the frequency response of the human auditory system.

Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness, are in Table 3.11-1. The ROI for noise includes all of the potentially noise sensitive receptors (NSRs) within an approximate 6.4-kilometer (4-mile) radius of the wind farm site boundary. This area includes all receptors that may be potentially affected by Project-generated noise but is conservative because receptors that are 6.4 kilometers (4 miles) away would not likely be affected due to the significant separation distance from the proposed Project.

3.11.1.1 Regulatory Framework

A review of noise regulations and guideline criteria applicable to the proposed Project was done at the federal, state, and county levels. Details on federal guidelines and requirements are in the Noise Impact Assessment (Appendix H). The Noise Control Act of 1972, and its amendments (Quiet Communities Act of 1978 [42 U.S.C. §§ 4901-4918]) delegate the authority to regulate environmental noise to each state.

State: Hawai‘i Community Noise Regulations

The State of Hawai‘i regulates noise under HAR § 11-46, Community Noise Control, promulgated on September 11, 1996. It limits sound generated by new or expanded developments. HAR § 11-46 provides for the prevention, control, and abatement of noise pollution in the state. 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). Sound from routine ongoing maintenance activities is considered part of routine operation, and the combined total of the ongoing maintenance and routine operations are subject to the sound level limits. HAR § 11-46 is not applicable to most moving sources, i.e., transportation and vehicular movements. Sound from the proposed Project construction and the occasional, major equipment overhauls during O&M would be regulated as construction activity.

Table 3.11-1.
Sound Pressure Levels (L_p) and Relative Loudness of Typical Noise Sources and Acoustic Environments

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (perception of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-horsepower siren (100 feet)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal Food blender (2 feet) Pneumatic drill (50 feet)	80	Loud	Reference loudness
Vacuum cleaner (10 feet)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 feet)	65		
Large store air-conditioning unit (20 feet)	60		1/4 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Quiet rural residential area with no activity	45		
Bedroom or quiet living room Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, so whisper (15 feet)	30	Very quiet	1/32 as loud
Wilderness with no wind or animal activity	25	Extremely quiet	
High-quality recording studio	20		1/64 as loud
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	

Source: Adapted from Kurze and Beranek (1988) and EPA (1971)

The Hawaiʻi noise limits from stationary sources are determined by three receiving zoning class districts and time periods and are enforceable at the facility property boundaries. For mixed zoning districts, the primary land use designation is used to determine the applicable zoning district class and maximum permissible sound level. For this acoustic assessment, agricultural portions of the surrounding properties were considered Class C receivers and the residences considered Class A receivers. This approach is considered a conservative regulatory assessment approach.

Because wind energy generation projects may operate at anytime during the day or night, the more stringent nighttime permissible sound level will become the controlling limit. The daytime and nighttime maximum permissible noise limits are expressed in A-weighted decibels according to zoning districts in Table 3.11-2. The Hawaiʻi noise limits are assumed to be absolute and independent of the existing acoustic environment; therefore, no baseline sound survey is required to assess conformity.

Table 3.11-2.
Hawai'i Maximum Permissible Sound Levels by Zoning District

Receiving Zoning Class District	Maximum Permissible Sound Level (dBA)	
	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Class A zoning districts include all areas equivalent to land zoned residential, conservation, preservation, public space, or similar type.	55	45
Class B zoning districts include all areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type.	60	50
Class C zoning districts include all areas equivalent to lands zoned agriculture, county, industrial, or similar type.	70	70

dBA = A-weighted decibels
Source: HAR § 11-46

The maximum permissible sound levels are assessed at any point at or beyond (past) the property line of the facility. Noise levels may exceed the prescribed limits up to 10 percent of the time within any 20-minute period. Sound level for impulsive noise, as measured with a Fast meter response, is 10 dBA above the maximum permissible sound levels for the given receiving zoning class district. Pursuant to HAR §§ 11-46-7 and 11-48-8, a permit may be obtained for operation of an excessive noise source beyond the maximum permissible sound levels. Factors considered in granting permits include whether the activity is in the public interest and whether the best available noise control technology is being employed. The standard provides further exemptions to these limits and further guidance on application, compliance procedures, and penalties. The Hawai'i Department of Health (HDOH) is responsible for the implementation, administration, and enforcement of the statutes.

Maui County Code

Maui County does not have a noise regulation with numerical decibel limits that are directly applicable to project maintenance and operations. The Maui County Code (Title 19—Zoning) stipulates a noise nuisance clause and an accompanying complaint resolution procedure.

3.11.2 Existing Conditions

The proposed Project is located in a rural area with a low population density. Existing ambient sound levels are expected to be low, although they may be sporadically elevated in localized areas from roadway noise or periods of human activity. Background sound levels will vary both spatially and temporally depending on proximity to area sound sources, roadways and natural sounds. Diurnal effects result in sound levels that are typically quieter during the night than during the daytime, except during periods when evening and nighttime insect noise may dominate the soundscape. Sources of sound in the ROI would likely include passing vehicles on nearby roads, ranching activities (e.g., off-road vehicles), leaf or grass rustle during high wind conditions, wildlife, and insect noise. Closer to the coastline, waves breaking on the shore may also contribute to the overall existing soundscape.

New sound sources may be obscured through a mechanism referred to as acoustic masking. Seasonal factors such as insect noise, ranching activities, and wind-generated sound contributing to ambient levels as airflow interacts with foliage and grasslands, may increase masking effects. Wind farms, in comparison to conventional energy projects, are unique in that the sound generated by each individual WTG will increase as the wind speed across the site increases, up to a certain maximum sound level. As an offset, as wind speeds increase, the background ambient sound levels likely will continue to increase, providing a greater masking effect. Following review of the applicable noise limits, it was concluded that a baseline sound survey to further document the existing acoustic conditions was not required to provide a regulatory compliance determination, mainly due to the proposed setback distances to noise sensitive receptors (i.e., residential uses) and the largely rural surroundings.

3.11.3 Potential Impacts and Mitigation Measures

3.11.3.1 Impact Methodology and Factors Considered for Impacts Analysis

Noise during construction and operations was assessed. Noise from construction of the proposed Project was assessed in a semi-qualitative manner using information available at this stage of the design process and using representative equipment information. The operational acoustic assessment was done using DataKustik GmbH's CadnaA, the computer-aided noise abatement program (v 4.0.136).

CadnaA is a comprehensive three-dimensional acoustic software model that conforms to the Organization for International Standardization (ISO) standard ISO 9613-2, *Attenuation of Sound during Propagation Outdoors*. The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading from wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of sources and receptors, seasonal foliage effects, and meteorological conditions.

Atmospheric absorption depends on temperature and humidity and is most important at higher frequencies. Over short distances, the effects of atmospheric absorption are minimal. ISO 9613-2 calculates attenuation for meteorological conditions favorable to propagation, i.e., downwind sound propagation or what might occur typically during a moderate atmospheric ground-level inversion that is assumed to be regulatory worst case. An average temperature of 24° Celsius (75° Fahrenheit) and relative humidity of 67 percent was assumed, based on available yearly climate information for the area. While site-specific meteorological data were considered in the acoustic assessment, atmospheric attenuation is not strongly dependent on temperature. Though a physical impracticality, the ISO 9613-2 standard simulates omnidirectional downwind propagation and maximum WTG source directivities. For receivers located between discrete WTG locations or WTG groupings, the acoustic model may over-predict.

Topographical information was imported into the acoustic model using the official USGS digital elevation dataset to accurately represent terrain in three dimensions. Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. A mixed ground absorption rate was assumed with a semi-reflective value of G=0.4 to represent the average ground absorption of the area. Because of elevation variability near the proposed Project, additional conservative factors for sound propagation in complex terrain were taken into account. In addition to geometrical divergence, attenuation factors (A) include topographical features, terrain coverage, or other natural or anthropogenic obstacles that can affect sound attenuation and provide acoustical screening. Sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings were ignored under all acoustic modeling scenarios.

To assist project developers and acoustical engineers, WTG manufacturers report WTG sound power levels at integer wind speeds referenced to the effective hub height, ranging from cut-in to full rated power per IEC 61400-11 (IEC 2006). Table 3.11-3 summarizes sound power levels during normal mode operations including mechanical and aerodynamic source components. The GE and Siemens specifications have an expected warranty confidence interval of k=2 dB and k=1.5 dB, respectively, that was included in all acoustic modeling calculations. This confidence interval incorporates the uncertainty in independent sound power level measurements conducted, the applied probability level and standard deviation for test measurement reproducibility, and product variability.

Table 3.11-3.
Broadband Sound Power Levels (dBA) Reported in Accordance with IEC 61400-11

Wind Speed at Hub Height (AGL)	WTG Sound Power Level (L_W) at Reference Wind Speed						
	7 mph (3 m/s)	9 mph (4 m/s)	11.2 mph (5 m/s)	13.4 mph (6 m/s)	15.9 mph (7 m/s)	17.9 mph (8 m/s)	20.1 mph (9 m/s)
GE 1.xle	<96	<96	<96	98.8	102.3	≤104.0	≤104.0
Siemens SWT-2.3-101/SWT-3.0-101	<95.1	95.1	99.8	105.1	107.0	≤107.0	≤107.0

AGL = above ground level; m/s = meters per second; ≤= less than or equal to
mph = miles per hour; < = less than

The tower and the blades are the same on the Siemens 2.3-MW and the 3.0-MW WTGs and they are expected to have the same or very similar acoustic characteristics. The 2.3-MW WTG is gearbox driven while the 3.0-MW WTG has a gearless direct-drive that improves efficiency and power generating capacity. It is expected that installed GE or Siemens WTGs would have similar sound profiles to that used in the acoustic modeling analysis; however, it is possible that the final warranty sound data could vary slightly.

A summary of sound power levels during full rotation for 8 meters per second (17.9 mph) by octave band center frequency is in Table 3.11-4.

Table 3.11-4.
Representative Octave Band 1/1 Center Frequencies

Frequency (Hz)	Octave Band Sound Power Level (dBA)								Broadband (dBA)
	63	125	250	500	1000	2000	4000	8000	
GE 1.5 MW xle	83.4	92.2	97.8	99.4	97.7	93.4	86.6	84.8	104.0
Siemens SWT 2.3-101/ SWT-3.0-101	83.5	94.4	98.1	102.1	102.1	98.4	91.2	87.2	107.0

1/1 octave band spectra provided by equipment manufacturers for informational purposes only.

There would be a significant noise impact if an exceedance of the state noise regulation occurred at an NSR such as a residence. As described in detail in Section 3.11.2, HAR § 11-46 provides daytime and nighttime maximum permissible noise limits according to zoning districts that are considered the controlling criteria for the proposed Project. These criteria are absolute and independent of the existing acoustic environment; therefore, a baseline noise survey was not required to assess conformity for this proposed Project. The HDOH maximum permissible sound limits are based on zoning. Absent of zoning, land use mapping obtained from the Draft Maui Island Plan, December 2009, amended May 2010 (County of Maui 2010b) was used. Potential impacts are summarized in Table 3.11-5.

Table 3.11-5.
Summary of WTG Acoustic Model Output by Turbine Type (dBA)

Receptor ID	Receptor Status	HDOH Day/Night Limit	GE 1.5 xle Range of Sound Levels		Siemens SWT-2.3- 101 Range of Sound Levels		Siemens SWT-3.0-101 Range of Sound Levels	
			Cut-in1/	Maximum	Cut-in1/	Maximum	Cut-in1/	Maximum
1	Not Probable NSR	70/70	6	14	3	13	3	12
2	Not Probable NSR	70/70	8	16	3	15	3	14
3	Not Probable NSR	70/70	8	16	4	15	3	14
4	Not Probable NSR	70/70	10	18	5	17	5	16
5	Not Probable NSR	70/70	10	18	5	17	4	16
6	Probable NSR	50/45	11	19	6	17	5	16
7	Not Probable NSR	70/70	11	19	6	18	5	17
8	Not Probable NSR	70/70	12	20	7	19	5	17
9	Not Probable NSR	70/70	12	19	6	18	6	17
10	Not Probable NSR	70/70	11	19	6	18	5	17
11	Not Probable NSR	70/70	11	19	6	18	5	17
12	Not Probable NSR	70/70	12	19	6	18	6	17
13	Not Probable NSR	70/70	12	20	7	18	6	17
14	Not Probable NSR	70/70	12	20	7	19	6	18
15	Not Probable NSR	70/70	12	20	7	19	6	18
16	Not Probable NSR	70/70	12	20	7	19	6	18
17	Not Probable NSR	70/70	13	20	7	19	7	18
18	Not Probable NSR	70/70	13	21	8	19	7	18
19	Probable NSR	50/45	12	20	7	19	6	17
20	Probable NSR	50/45	12	20	7	19	6	18
21	Probable NSR	50/45	12	20	7	19	6	18
22	Not Probable NSR	70/70	15	23	11	23	10	22
23	Not Probable NSR	70/70	13	21	9	20	8	20
24	Not Probable NSR	70/70	12	20	7	18	6	17
25	Not Probable NSR	70/70	16	24	12	24	11	23
26	Not Probable NSR	70/70	28	36	25	34	24	34
27	Not Probable NSR	70/70	29	36	26	35	26	35
28	Not Probable NSR	70/70	14	22	9	20	8	19
29	Not Probable NSR	70/70	15	23	9	21	9	20
30	Not Probable NSR	70/70	14	22	9	20	8	19
31	Not Probable NSR	70/70	14	21	8	20	7	19
32	Not Probable NSR	70/70	13	21	8	20	7	18

Table 3.11-5.
Summary of WTG Acoustic Model Output by Turbine Type (dBA)

Receptor ID	Receptor Status	HDOH Day/Night Limit	GE 1.5 xle Range of Sound Levels		Siemens SWT-2.3- 101 Range of Sound Levels		Siemens SWT-3.0-101 Range of Sound Levels	
			Cut-in1/	Maximum	Cut-in1/	Maximum	Cut-in1/	Maximum
33	Probable NSR	50/45	13	21	8	19	7	18
34	Probable NSR	50/45	13	21	8	19	7	18
35	Not Probable NSR	70/70	12	20	7	18	6	17
36	Not Probable NSR	70/70	12	20	7	19	6	17
37	Not Probable NSR	70/70	13	20	7	19	6	18
38	Not Probable NSR	70/70	13	21	8	19	7	18
39	Not Probable NSR	70/70	13	21	8	19	7	18
40	Not Probable NSR	70/70	13	21	8	19	7	18
41	Not Probable NSR	70/70	13	20	7	19	6	18
42	Not Probable NSR	70/70	13	20	7	19	6	18
43	Not Probable NSR	70/70	11	19	6	18	5	17
44	Not Probable NSR	70/70	11	19	6	17	5	16
45	Not Probable NSR	70/70	11	19	6	18	5	17
46	Not Probable NSR	70/70	12	20	7	18	6	17
47	Not Probable NSR	70/70	11	19	6	18	5	17
48	Probable NSR	50/45	12	19	6	18	5	17
49	Not Probable NSR	70/70	12	20	7	18	6	17
50	Not Probable NSR	70/70	14	21	8	20	7	19
51	Probable NSR	50/45	14	22	9	20	8	19
52	Not Probable NSR	70/70	15	22	9	21	8	20
53	Not Probable NSR	70/70	14	22	9	20	8	19
54	Not Probable NSR	70/70	16	24	10	22	10	21
55	Probable NSR	50/45	30	38	27	38	27	38
56	Probable NSR	50/45	32	40	29	41	29	41
57	Not Probable NSR	70/70	35	43	32	44	32	44
58	Probable NSR	50/45	23	31	19	31	19	31
59	Not Probable NSR	70/70	17	25	13	25	13	25

1/ The cut-in wind speed at hub height is the lowest wind speed at which a WTG begins producing usable power.
dBA = A-weighted decibels HDOH = Hawai'i State Department of Health
GE = General Electric NSR = noise sensitive receptor

All of the NSRs near the proposed Project are within an area designated as Class C, a zoning district that includes all areas equivalent to lands zoned agriculture, county, industrial, or a similar type. The maximum permissible daytime and nighttime sound limit for Class C land use is 70 dBA. Therefore, an exceedance of the 70 dBA limit at any of the identified NSRs near the proposed Project would be considered a significant impact.

3.11.3.2 Construction Impacts

Project development would involve constructing access roads, excavating and forming WTG foundations, and preparing the site for crane-lifting and WTG assembly and commissioning. Work on large-scale wind farms is generally divided into four phases:

1. Site Clearing: The initial site mobilization phase would include the establishment of temporary site offices, workshops, storage, and other onsite facilities. Erosion and sedimentation control measures would be installed and initial haul routes would be prepared.
2. Excavation: This phase would entail the construction of access roads, preparation of laydown areas, and excavation for the concrete turbine foundations.
3. Foundation Work: This phase would consist of constructing the reinforced concrete turbine foundations and installation of the internal transmission network.
4. Wind Turbine Installation: The turbine components would be delivered, installed, and commissioned.

Work on these phases would probably overlap. It is likely that the WTGs would be erected in small groupings. Each grouping may undergo testing and commissioning prior to commencement of full commercial operation. Other construction activities include those for the supporting infrastructure including the collector switchyard, O&M building, and generator-tie line. The construction of the proposed Project may cause short-term but unavoidable noise impacts depending on the activity and the distance to receiver. The sound levels from construction vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacturer and model, the operations performed, and the overall condition of the equipment and exhaust system mufflers. The list of construction equipment that may be used on the proposed Project and estimates of near and far sound source levels are in Table 3.11-6.

Table 3.11-6.
Estimated L_{max} Sound Pressure Levels from Construction Equipment

Equipment	Estimated Sound Pressure Level at 50 feet (dBA)	Estimated Sound Pressure Level at 2000 feet (dBA)
Crane	85	53
Forklift	80	48
Backhoe	80	48
Grader	85	53
Man basket	85	53
Dozer	83–88	51–56
Loader	83–88	51–56
Scissor lift	85	53
Truck	84	52
Welder	73	41
Compressor	80	48
Concrete Pump	77	45
Blasting	94	64[2/]

1 The cut-in wind speed at hub height is the lowest wind speed at which a WTG begins producing usable power.
2/ Informational purposes only. Not specific to Project parameters and site conditions.
dBA = A-weighted decibels
Data compiled in part from: FHWA 1992 and 2006; Bolt, Beranek and Newman, Inc. 1977

Civil and electrical infrastructure constructed as part of the wind farm site underground includes WTG foundations, collector switchyard foundations, and electrical collector cables. Several methods may be used to excavate openings to install these infrastructure components including standard excavators, bulldozers, and hydraulic hammers. Where in situ rock engineering properties do not allow for efficient ripping and/or other bulk removal methods, blasting may be required. The blasting would be conducted by drilling pilot holes at or slightly below the required excavation depths and charging the holes with explosives. After the charges are set, the blast area would be covered with mats to control airborne material and the charge will be ignited. Following the blasting, the material would be excavated with the standard excavator to the required depth. Blasting may only be required on occasion during the early stages of construction and therefore have a limited noise impact.

Sounds generated by construction would likely require a permit from the HDOH to allow the operation of construction equipment that exceeds the maximum permissible level at property boundaries. While the permit and permitting procedures would not limit the generated sound level, time restrictions may be placed on periods when the loudest construction activities are likely to occur, i.e., between 7:00 a.m. and 6:00 p.m., Monday through Friday, and between 9:00 a.m. and 6:00 p.m. on Saturday. The HDOH would require reasonable and standard practices be employed to minimize the impact of noise from construction. Provisions to conduct noise monitoring and community meetings may also be required but would likely be deemed unnecessary given the remote location. The Applicant would proactively work with the surrounding community and attempt to resolve any complaints or concerns from construction noise by coordinating activities and informing the community of the timing of the expected construction noise at the closest NSRs to avoid conflicts. For example, if blasting for foundation or removal of ledge or other potentially noisy activities were required during the construction period, nearby residents would be notified in advance.

Construction would generate traffic having potential noise effects, such as trucks travelling to and from the site on public roads. Traffic noise is categorized into two categories: (1) the noise that would occur during the initial temporary traffic movements related to turbine delivery, hauling components and remaining construction; and (2) minor ongoing traffic from maintenance staff and contractors. The majority of the traffic would use Pāpaka Road and possibly some limited use of the Kula highway for deliveries, depending in part on the final selection of suppliers, construction subcontractors, and vehicle types. At the early stage of the construction phase, equipment and materials would be delivered to the site, such as hydraulic excavators and associated spreading and compacting equipment needed to build access roads and foundation platforms for each turbine. Once the access roads have been built, equipment for lifting the towers and turbine components would arrive. Concrete would be mixed offsite and delivered, rather than produced onsite.

Federal laws prohibit state and local governments from regulating offsite sound levels generated by trucks and automobiles operating on a private site or public roadways. This federal regulatory preemption is specified in the Federal Noise Control Act of 1972 and in the Surface Transportation Assistance Act of 1982, both of which prohibit states and local authorities from regulating the noise emitted by trucks engaged in interstate commerce, i.e., truck deliveries. A federal OSHA preemption also prohibits local and state governments from regulating safety signals on trucks and construction equipment. The proposed Project would coordinate with individual landowners regarding the operation of trucks, cars, and other vehicles on private site access roadways to prevent the unexpected noise from construction- and transport-related vehicles.

Depending on which WTG model is selected and the grading analysis to be conducted during the final design, the wind farm site access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Chapter 2 for additional details). Construction of the straightened road alignment would require less ground disturbance than the proposed WTG access road alignment, but would involve the same types of construction vehicles and equipment. The same measures to minimize noise impacts would be implemented for construction of both road alignments. Therefore, construction of the straightened road alignment would result in noise impacts comparable to those resulting from the proposed WTG access road alignment described above.

3.11.3.3 Operations and Maintenance Impacts

Wind Farm Site

Operational broadband (dBA) sound pressure levels were calculated assuming that all WTGs are operating continuously and concurrently at the maximum manufacturer-rated sound level at the given operational condition. The sound energy was then summed to determine the equivalent continuous A-weighted downwind sound pressure level at a point of reception (i.e., NSR). Calculations were done using a 15-meter by 15-meter (49.2-foot by 49.2-foot) grid with a receiver 1.5 meters (5 feet) above grade (the approximate height of ears of a standing person). This is also the standard height at which testing for compliance with the State Community Noise Control Rule is done. Table 3.11-6 has the receptors included in the analysis, their probable status (e.g., residence), and received sound level for the GE and Siemens WTG types.

Acoustic modeling for the final layout was completed for WTG cut-in and full rotational operating conditions, thereby describing sound pressure levels over the full range of future operational conditions. The cut-in wind speed at hub height is the lowest wind speed at which a WTG begins producing usable power. Though WTGs generate less noise under these conditions, there is the potential for increased audibility given the lower ambient levels and reduced masking as compared to sound levels generated under the maximum rotational operation condition and wind speeds. WTGs at maximum rotational operation is the assumed worst case condition in terms of noise generation by the WTGs and was used for comparisons with the applicable regulatory criteria. For time-varying sources such as WTGs, assessing sound levels generated during maximum rotational speeds will likely ensure compliance during all other WTG operational conditions. At wind speeds at hub height above maximum rotational speeds, the noise generated by the WTGs would be expected to remain constant according to the WTG manufacturer specifications. Sound contour isopleths for the maximum rotational operating condition are shown in Figures 3.11-1, 3.11-2, and 3.11-3 for the GE 1.5 xle, Siemens SWT-2.3-101, and Siemens SWT-3.0-101, respectively.

The tabulated results and contour plots are independent of the existing acoustic environment, i.e., are representative of expected Project-generated sound levels only. The results of the acoustic assessment demonstrate that the proposed Project has been adequately designed to operate within the applicable limits prescribed by the Hawai‘i Community Noise Regulations (HAR § 11-46) for Class C receivers at the site boundary. Results of the WTG acoustic modeling analysis show that sound levels would also attenuate to below the 45 dBA nighttime limit for Class A receivers and below thresholds identified by the EPA; therefore, sound levels are not expected produce a noise nuisance condition.

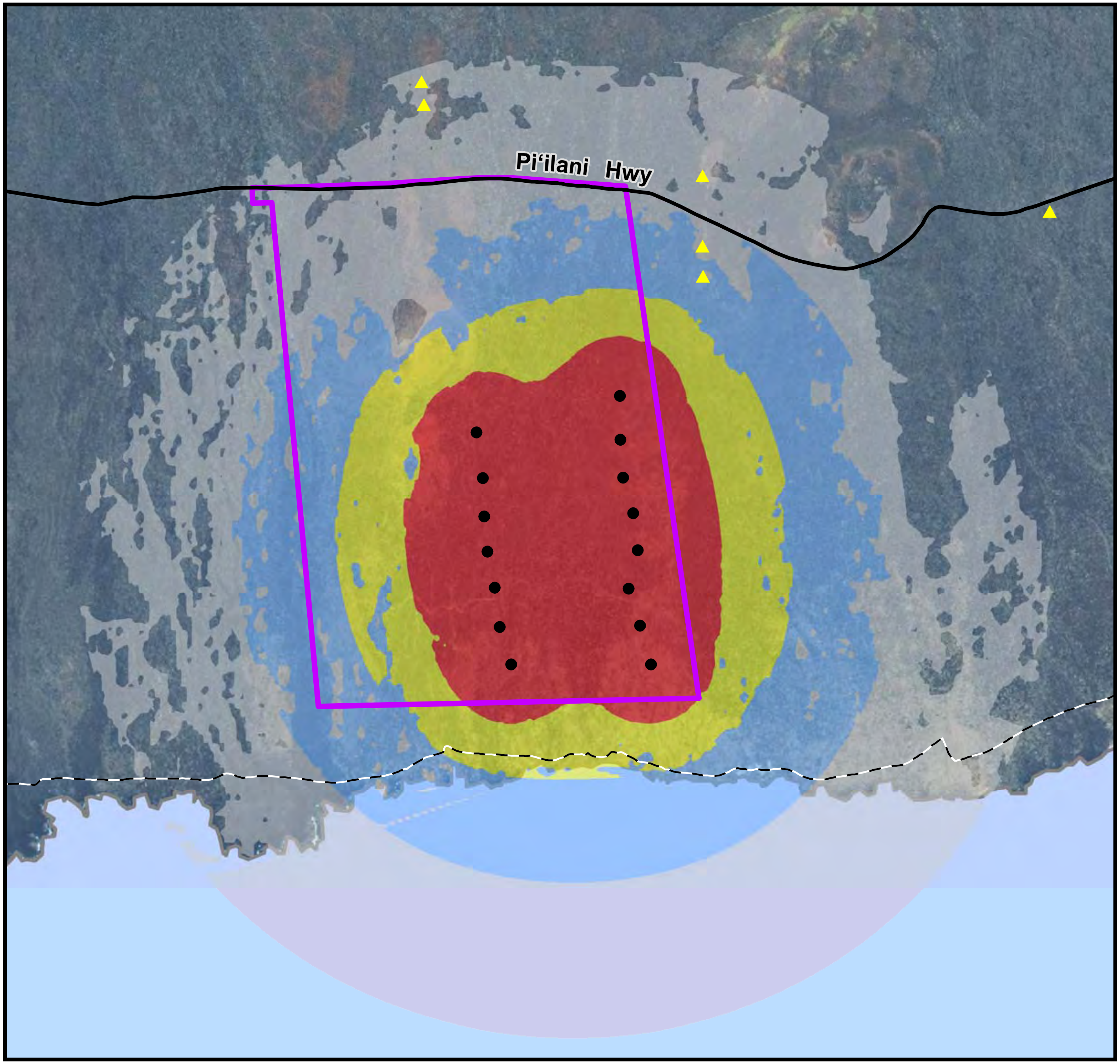


FIGURE 3.11-1

AUWAHI WIND PROJECT

GENERAL ELECTRIC 1.5 XLE
RECEIVED SOUND LEVELS:
WIND TURBINES AT
MAXIMUM ROTATION

- Wind Farm Site
- WTG
- Noise Sensitive Receptor
- Road
- Hoapili Trail

Sound Contour Range (dBA)

- 35-40 dBA
- 40-45 dBA
- 45-50 dBA
- >50 dBA

DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Sound Contours:
TetraTech EC, Inc.
CRoad:
ESRI Streetmap 2007

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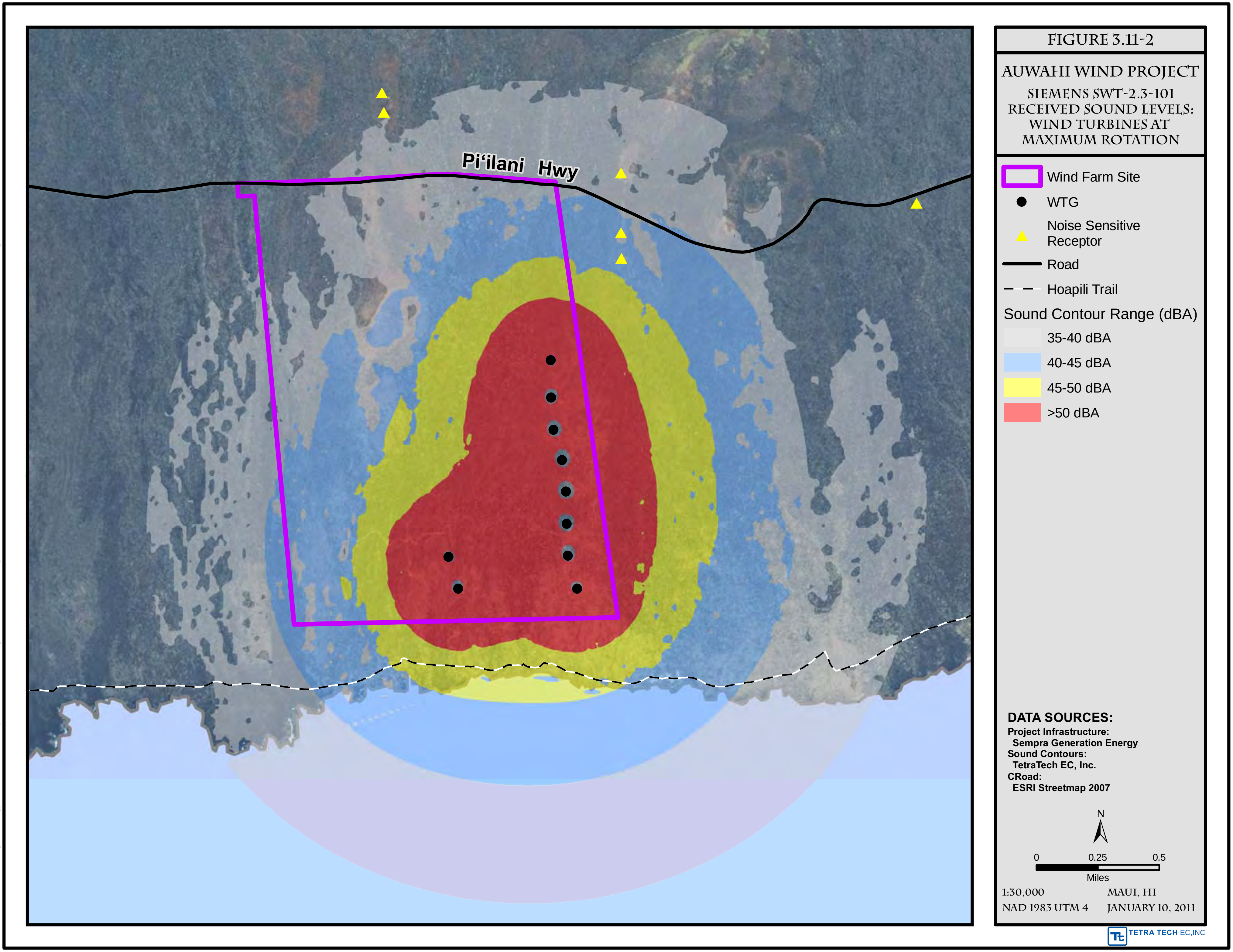

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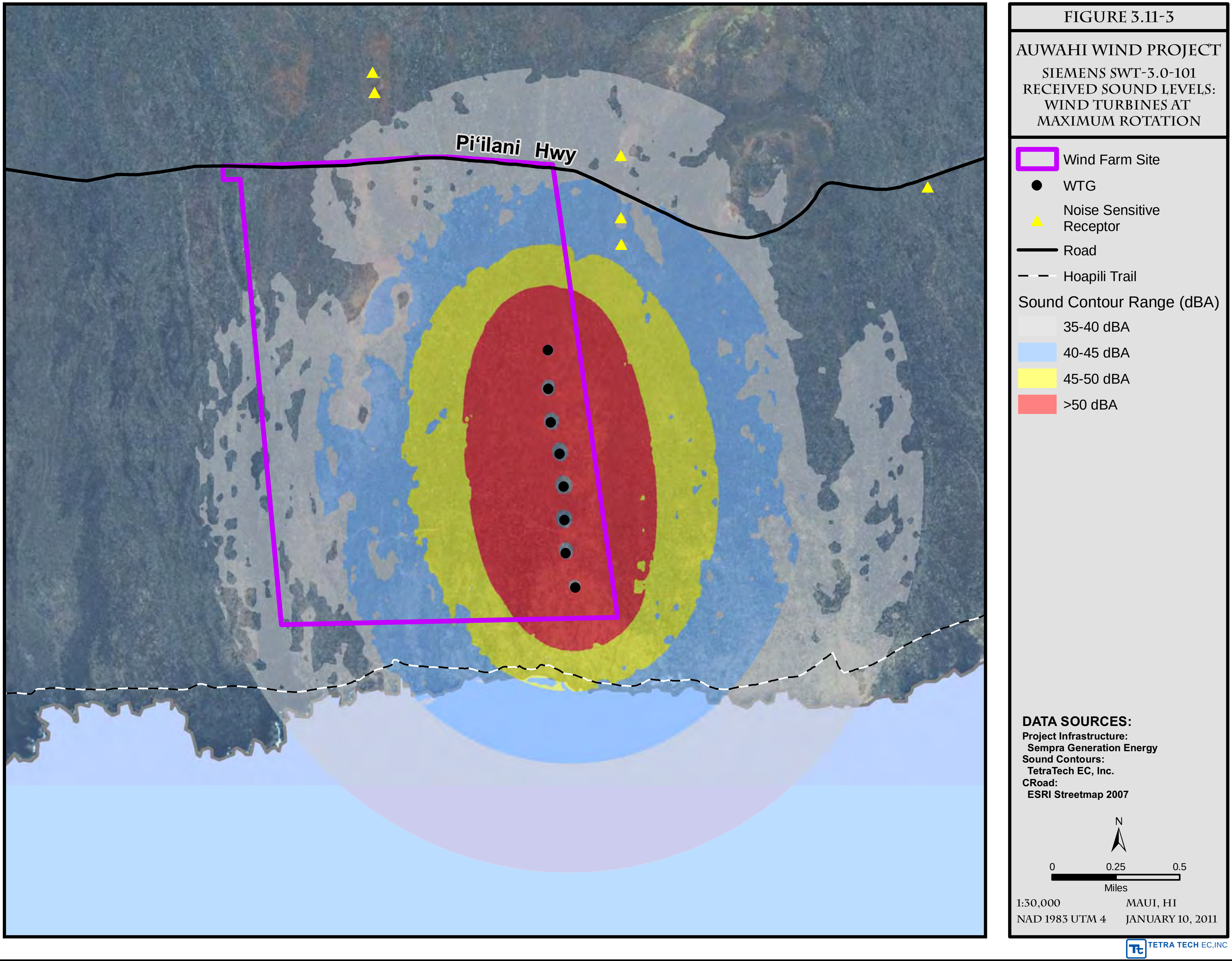

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Special consideration is required for culturally significant and conservation land areas, specifically, users of the Hoapili Trail (King's Highway) located south of the wind farm site. As shown on Figures 3.11-1 through 3.11-3, the 45 dBA contour limit that applies to conservation and preservation lands (10:00 p.m. to 7:00 a.m.) extends past the southern property line indicating that received sound levels may periodically exceed nighttime limits. Although this area is uninhabited, persons traveling on the Hoapili Trail or using the coastal areas for fishing, camping, and cultural practices may hear a gentle swooshing sound characteristic of wind farms, with audibility limited to trail areas closest to the site. The received sound would be well within EPA guidelines of 70 dBA for publically accessible areas and comparatively low level sound would not be expected to interfere substantially with the use and enjoyment of the trail and surrounding areas. It is unlikely that any further abatement options are available to further reduce levels to meet Hawai‘i Community Noise Regulation standards in these conservation areas; therefore, the proposed Project may seek a variance from the HDOH as provided for in HAR § 11-46-8. For all layouts and corresponding WTG models under consideration, acoustic modeling demonstrates that the proposed Project has been adequately designed to meet the Hawai‘i Community Noise Standards at all existing NSRs; therefore, there is no compliance-driven issue that would restrict the proposed Project from selecting the WTG type and layout that best meet the proposed Project's needs and other site constraints.

Traffic noise generated during maintenance and operations, approximately five round trips per day, would add to environmental noise levels. Onsite roadways would be sited as far away from existing residential structures as feasible, and vehicles would use existing roadways as much as possible. Short-term activities such as road maintenance work or equipment repair are also expected, but they would be of limited duration and would not be expected to cause any adverse noise impacts. Noise from periodic testing of emergency diesel generators (i.e., 1 to 2 hours per month for mandatory testing) at the O&M facility would be scheduled for the daytime only.

Generator-tie Lines and Transmission Lines

An approximately 14.5-kilometer (9-mile) 34.5-kV generator-tie line would connect the proposed collector switchyard to the proposed 69-kV interconnection substation at the POI with MECO's existing grid. The POI is on the existing Wailea-Kealahou 69-kV transmission line approximately 1.6 kilometers (1 mile) east of the Wailea substation. Generator-tie lines and transmission lines have the potential to emit environmental noise under certain operating and environmental conditions. This noise (also called corona noise) is caused by the partial electrical breakdown of the insulating properties of air around the electrical conductors and overhead power lines. When audible, corona-generated noise is often described as a crackling or hissing sound when high humidity, fog, or rain occur. This noise increases with the voltage of the line, undersized conductors, irregularities on the conductor surface caused by age or moisture, or wet weather conditions.

Modern generator-tie lines, such as those proposed, are designed, constructed, and maintained so that during dry conditions they operate below the corona inception voltage; that is, the line would generate a minimum of corona-related noise. During dry weather conditions, noise from the proposed lines would be generally indistinguishable from background sound levels at locations beyond the edge of the corridor, with slightly higher sound during rain events, but overall sound levels at the edge of the corridor are expected to remain relatively low.

3.11.3.4 Underwater Noise Effects on Marine Life

Most of the materials and equipment required for the proposed Project, including the WTG 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. Vessel traffic between the islands and port would result in a localized short-term increase in underwater sound levels. The WTGs would not cause increases in underwater sound levels and would, therefore, not result in adverse impacts to marine life.

3.11.3.5 No Action Alternative

Under the No Action Alternative, the wind farm would not be constructed and no wind energy would be produced. No construction- or operations-related noise would be generated. Existing sound levels from local traffic and activities typical of the area would continue.

3.11.3.6 Avoidance, Minimization, and Mitigation Measures

As described above, the Applicant will implement the design features and industry-standard BMPs for noise minimization listed in Table 2-4. The following noise mitigation measures will also be implemented to further minimize the effects of construction and operational noise in the ROI. Together these measures will result in less than significant impacts related to noise.

- Conduct noisy construction activities (including blasting, if required) between 7:00 a.m. and 10:00 p.m., unless further restricted by HDOH noise permits, to reduce the potential impact of construction noise during sensitive nighttime hours.
- Maintain equipment and vehicles in good working order and use adequate mufflers and engine enclosures to reduce equipment noise.
- Establish a toll-free telephone number for receiving questions or complaints during construction and operations, and implement and maintain a noise complaint review process to manage residents' or others' queries and complaints as they arise. Complaints will be logged and investigated on an individual basis to facilitate resolution of the issue.

3.11.3.7 Summary of Impacts

The potential noise impacts of the proposed Project are summarized in Table 3.11-7.

Table 3.11-7.
Summary of Potential Noise Impacts

Impact Issues	Proposed Project	No Action Alternative
Exceedance of the state noise regulation at an NSR	⊙	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact	+ = Beneficial impact
⃠= Significant but mitigable to less than significant impact	N/A= Not applicable
⊙= Less than significant impact	○= No impact

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3.12 AIR QUALITY

3.12.1 Definition of Resource

Under the authority of the Clean Air Act (CAA), the EPA has established nationwide air quality standards to protect public health and welfare. These federal standards, known as National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations for six criteria pollutants: ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, lead, and particulate matter (inhalable particulate matter [PM_{10}] and fine particulate matter [$PM_{2.5}$]). The Clean Air Branch of the 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, EPA designates areas of the United States as having air quality equal to or better than NAAQS (attainment) or worse than NAAQS (non-attainment). The CAA general conformity rule requires that projects occurring in non-attainment and maintenance areas be consistent with the applicable State Implementation Plan. Maintenance areas are areas that previously violated federal ambient air quality standards, but which have now come into attainment of those standards. Because Hawai‘i is, and always has been, in attainment for all pollutants, a general conformity analysis is not required for the proposed Project. The ROI for air quality is the proposed Project and immediate surrounding areas.

3.12.2 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. The HDOH and EPA maintain a network of air quality monitoring stations throughout the islands. Data collected from these monitoring stations indicate that criteria pollutant levels remain well below state and federal ambient air quality standards (HDOH 2010).

The closest air quality monitoring station to the proposed Project is the Kihei Station, located in the Hale Pi‘ilani subdivision of upper Kihei, approximately 12 miles northwest of the wind farm site. The areas surrounding this station are predominantly residential and agricultural land (primarily sugar cane).

The most recent data collected for PM_{10} are from 2008. In 2009, the only measurements collected were for $PM_{2.5.}$ (HDOH 2009, 2010). 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 in 2009 ranged between 0.4 and 25.5 $\mu g/m^3$. The annual averages of PM_{10} and $PM_{2.5}$ reported at the Kihei Station for 2008 and 2009 were 20 $\mu g/m^3$ and 5 $\mu g/m^3$, respectively. These measurements are all below the federal and state standards (HDOH 2009, 2010).

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 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 CAA and the HAAQS.

3.12.3 Potential Impacts and Mitigation Measures

3.12.3.1 Impact Methodology and Factors Considered for Impacts Analysis

Impacts to air quality were from the proposed Project were assessed by estimating emissions from the construction and O&M phases of the proposed Project.

A custom Project-specific spreadsheet model was to estimate construction emissions associated with the proposed Project. This model calculates criteria pollutant and GHG emissions from construction and demolition activities. The spreadsheet model uses a conventional approach to estimating emissions from construction equipment and activity that entails the following steps:

1. Divide the construction or demolition project into activity phases that have similar equipment requirements.
2. Identify equipment types needed for each construction or demolition phase.
3. Identify how many items of each type will be needed, the typical horsepower rating for the item (default values provided in the model), and the typical engine load factor (default values provided in the model).
4. Identify the number of hours per day with active use for each equipment item in each construction or demolition phase.
5. Identify the fraction of each use hour when the equipment will actually be operating (default values provided in the model).
6. Identify the overall disturbed area size for each phase of construction or demolition activity.
7. Identify the duration of each construction or demolition phase.
8. Identify the typical area size that will be disturbed on a given day during each phase of construction or demolition activity.
9. Identify typical fugitive dust emission rates for each phase of construction or demolition activity (default values provided in the model).
10. Identify which construction or demolition phases overlap with each other.

The spreadsheet model summarizes estimated emissions by phase in terms of daily, quarterly, and annual emissions. The spreadsheet model also provides summaries of offsite truck trips and estimated construction worker commute trips.

The spreadsheet model includes a database of 519 entries covering 115 basic equipment types. Entries for each equipment type are subdivided into engine size and fuel type categories that correlate with emission standards that have been adopted in recent years by EPA. In addition to equipment powered by conventional diesel, gasoline, and compressed gas (propane/compressed natural gas/liquefied natural gas/liquefied petroleum gas) engines, the database includes information for electric arc welders, oxy-fuel welders, oxy-fuel cutting torches, plasma cutting torches, stationary diesel engines, large equipment powered by diesel-electric or turbine engines, and stationary gas turbine generators. Database entries also address multi-engine equipment designs for scrapers, concrete pavers, concrete finisher-vibrators, and off-road haul trucks. Metal fume emissions have been incorporated into the PM^{10} emission rates for welders and cutting torches. Fugitive PM_{10} emissions have been incorporated into the emission rates for rock drills, jackhammers, pavement breakers, pavement scarifiers, concrete/industrial saws, and abrasive blasting equipment. Default database entries are provided for the appropriate range of small, medium, and large engine sizes for each equipment type. Default engine sizes are representative of current equipment models from major equipment manufacturers as well as older equipment models that are still in use. All default values in the model can be modified by the user to reflect project-related conditions.

Greenhouse gas emission rates used in the spreadsheet model are based on data from the California Climate Action Registry (CCAR) GHG emissions reporting protocol (CCAR 2007). Most of the GHG emission rates in the CCAR protocol document are based on equipment or vehicle fuel consumption rates. Equipment fuel consumption estimates used in the spreadsheet model are derived from horsepower-hour based fuel use data presented in documentation reports for the 2005 version of the EPA NONROAD model. The spreadsheet model computes the overall global warming potential of carbon dioxide, methane, and nitrous oxide emissions using carbon dioxide equivalence factors identified by the Intergovernmental Panel on Climate Change (IPCC). Users can select from the 1995, 2001, or 2007 IPCC equivalence-factor data sets. The 2007 data set is the default selection.

In addition to equipment engine emissions, the spreadsheet model calculates emissions from several other construction-related sources:

- Fugitive dust emissions from general construction and demolition site disturbance,
- Fugitive dust from mechanical or explosive building demolition,
- Fugitive dust from construction blasting,
- Volatile organic compound emissions from the curing of asphalt pavement,
- Volatile organic compound emissions from paints and surface coatings, and
- PM_{10} aerosol emissions from spray painting activities.

In addition to accounting for active dust control program effects, the spreadsheet model allows emission calculations for fugitive dust from site disturbance to account for the seasonal frequency of precipitation events, frozen ground conditions, and snow cover. Fugitive dust emission estimates also can be adjusted to reflect the seasonal effects of persistently high soil moisture conditions from shallow perched water tables, seeps, or other natural factors. Natural dust control factors are applied to the residual fugitive dust generated after accounting for active dust control program effects.

Construction emissions were evaluated separately for the wind farm site, offsite road construction areas, the generator-tie line site, and the substation site. All construction activity was assumed to occur during 2011. Construction activity at the wind farm site was divided into four overlapping activity phases: site preparation activities; construction of WTG foundations and WTG support towers; installation of WTGs and rotors; and construction of the onsite substation, O&M building, and onsite met tower. Construction activity for offsite roads was divided into four activity phases: site preparation for Pāpaka Road, site preparation for Pi‘ilani Highway, road base installation, and paving/gravel cover. Site preparation for the two roadways was assumed to overlap but other activity phases were assumed to occur sequentially. Construction activity for the generator-tie line was divided into four overlapping activity phases: site preparation activities, tower pole foundation preparation; tower pole assembly and installation, and line stringing and associated activities. Construction activity for the offsite interconnection substation was divided into three nonoverlapping activity phases: access road and site preparation, substation pads and foundations, and substation equipment installation.

Active fugitive dust control at all construction sites was assumed to involve periodic water sprinkling of actively disturbed areas using water trucks. Active dust control was assumed to reduce fugitive dust emissions by 50 percent. Additional fugitive dust control would occur from natural precipitation patterns. Data from a local precipitation monitoring station (WRCC 2010) was used to estimate natural dust control effectiveness by calendar quarter. Over 50 percent of precipitation events at the Auwahi 252 station involve rainfall amounts of 1.3 centimeters (0.5 inch) or more, with more than 90 percent of precipitation events providing 0.3 centimeters (0.1 inch) or more of rainfall. Quarterly dust control from natural precipitation events was estimated to provide 10.9 percent to 17.8 percent additional control of fugitive dust from construction activity.

Emissions from construction-related traffic were estimated using the EPA MOBILE 6.2 vehicle emission rate model (EPA 2003). The construction emissions spreadsheet model summaries of offsite truck trips and construction worker commute trips were used for the analysis. Construction worker commute trip estimates included adjustments for assumed ridesharing rates. The wind farm site would have the largest construction work force and the longest construction period of the project components, and consequently was assumed to have the highest amount of ridesharing. Two-person carpools were assumed for 50 percent of construction workers at the wind farm site, 25 percent of construction workers at the generator-tie line site, and 25 percent of construction workers at the interconnection substation site. Average one-way commute distances were assumed to be 48 kilometers (30 miles) for the wind farm site, 40 kilometers (25 miles) for the offsite roads, 48 kilometers (30 miles) for the generator-tie line site, and 40 kilometers (25 miles) for the interconnection substation site. Average one-way truck trip distances were assumed to be 45 kilometers (28 miles) for the wind farm site, 45 kilometers (28 miles) for the offsite roads, 45 kilometers (28 miles) for the generator-tie line site, and 40 kilometers (25 miles) for the interconnection substation site.

A significant impact on air quality would result if any of the following were to occur as a direct result of the proposed Project:

- Predicted concentrations of Criteria Air Pollutants would exceed state and/or federal ambient air quality standards; or
- Project emissions that would result in a declaration of non-attainment in a specific area for one or more criteria pollutants, or would cumulatively contribute to a net increase in any criteria pollution that would result in non-attainment of the area.

3.12.3.2 Construction Impacts

Construction of the proposed Project would require the operation of heavy equipment and construction vehicles for various activities including construction of access roads, excavation and pouring of foundations, installation of buried and aboveground electrical interconnects, and the erection of WTG components. In addition, there would be additional vehicle traffic to and from the proposed Project associated with construction worker commutes and heavy trucks delivering construction materials and facility components. These activities could have a temporary minor impact on overall air quality at the site. Construction equipment and construction-related vehicle traffic would be a source of GHG emissions, primarily from combustion of engine fuel. The major GHGs for fuel combustion sources are carbon dioxide, methane, and nitrous oxide. Construction truck traffic and 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.

Table 3.12-1 summarizes criteria pollutant emissions from construction activity and construction-related traffic for the proposed Project based on estimates predicted by the Project-specific spreadsheet emissions model. Onsite construction activities would generate somewhat higher emissions than construction-related traffic. While emissions from onsite construction activities would be localized in one area, emissions from construction-related traffic would be spread over relatively long roadway corridors. However, all construction-related emissions would be quickly dispersed by the trade winds. Given that the anticipated quantities of onsite construction emissions are low (Table 3.12-1), that sources construction emissions would be temporary and dispersed throughout the proposed Project areas, that the trade winds have a dispersing effect; and that Hawai'i air quality is currently in attainment for all criteria pollutants, it is anticipated that the proposed Project would be in compliance with all state of Hawai'i and federal ambient air quality standards. The length of the roadway corridors over which traffic-related emissions would be distributed likewise indicates that there would be no localized violations of federal or state ambient air quality standards along construction traffic corridors. Consequently, construction of the proposed Project would not create significant air quality impacts.

Table 3.12-2 summarizes GHG emissions from construction activity and construction-related traffic for the proposed Project.

Table 3.12-1.
Summary of Criteria Pollutant Emissions from Project Construction

Project Element	Emissions Component	Pollutant Emissions, Tons per Year					
		ROG	**NO_x**	**CO**	**So_x**	**PM_{10}**	**$PM_{2.5}$**
Wind Farm	Site Preparation	0.79	6.59	4.03	0.90	0.91	0.68
	WTG Pads and Towers	0.23	2.06	1.50	0.34	0.78	0.34
	WTG Installation	0.06	0.49	0.40	0.08	0.38	0.13
	Substation and Building	0.04	0.29	0.20	0.04	0.18	0.06
	Construction Worker Traffic	0.31	0.24	3.52	0.00	0.01	0.00
	Construction Truck Traffic	0.09	1.42	0.37	0.00	0.04	0.03
	Total	**1.52**	**11.10**	**10.02**	**1.37**	**2.30**	**1.24**
Offsite Roads	Site Preparation – Pāpaka Road	0.02	0.17	0.11	0.02	0.12	0.04
	Site Preparation – Pi'ilani Highway	0.01	0.10	0.05	0.01	0.04	0.02
	Road Base Installation	0.02	0.24	0.16	0.04	0.11	0.04
	Paving/Gravel Cover	0.03	0.22	0.15	0.04	0.05	0.03

Table 3.12-1.
Summary of Criteria Pollutant Emissions from Project Construction

Project Element	Emissions Component	Pollutant Emissions, Tons per Year					
		ROG	NO_x	CO	So_x	PM_{10}	$PM_{2.5}$
	Construction Worker Traffic	0.03	0.03	0.39	0.00	0.00	0.00
	Construction Truck Traffic	0.02	0.33	0.09	0.00	0.01	0.01
	Total	**0.14**	**1.08**	**0.94**	**0.12**	**0.33**	**0.13**
Generator-tie Line	Site Preparation	0.15	1.16	0.74	0.15	0.56	0.22
	Tower Pole Foundations	0.02	0.14	0.10	0.02	0.08	0.03
	Tower Pole Installation	0.02	0.16	0.13	0.03	0.05	0.03
	Line Stringing	0.09	0.42	0.92	0.07	0.08	0.05
	Construction Worker Traffic	0.06	0.05	0.73	0.00	0.00	0.00
	Construction Truck Traffic	0.39	6.15	1.59	0.01	0.18	0.14
	Total	**0.72**	**8.09**	**4.21**	**0.28**	**0.95**	**0.47**
Offsite Interconnection Substation	Site Preparation	0.10	0.77	0.49	0.10	0.15	0.09
	Pads and Foundations	0.01	0.09	0.06	0.01	0.06	0.02
	Equipment Installation	0.02	0.17	0.14	0.03	0.04	0.02
	Construction Worker Traffic	0.04	0.03	0.41	0.00	0.00	0.00
	Construction Truck Traffic	0.00	0.06	0.01	0.00	0.00	0.00
	Total	**0.17**	**1.11**	**1.11**	**0.14**	**0.25**	**0.14**
	Grand Total	**2.55**	**21.39**	**16.29**	**1.91**	**3.82**	**1.98**

CO = carbon monoxide
NO_x = nitrogen oxides (ozone precursors)
PM_{10} = inhalable particulate matter
$PM_{2.5}$ = fine particulate matter
ROG = reactive organic gases (ozone precursors)
SO_x = sulfur oxides

Table 3.12-2.
Summary of Greenhouse Gas Emissions from Project Construction

Project Element	Emissions Component	Greenhouse Gas Emissions, Tons per Year			
		CO_2	CH_4	N_2O	GWP, CO_2e
Wind Farm	Site Preparation	610	0.018	0.013	**614**
	WTG Pads and Towers	250	0.010	0.007	**253**
	WTG Installation	61	0.001	0.001	**61**
	Substation and Building	32	0.001	0.001	**33**
	Construction Worker Traffic	0	0.000	0.000	**0**
	Construction Truck Traffic	1	0.000	0.000	**1**
	Total	**955**	**0.030**	**0.021**	**962**
Offsite Roads	Site Preparation – Pāpaka Road	15	0.000	0.000	15
	Site Preparation – Piʻilani Highway	9	0.000	0.000	9
	Road Base Installation	28	0.002	0.001	28
	Paving/Gravel Cover	27	0.002	0.001	27
	Construction Worker Traffic	0	0.000	0.000	0
	Construction Truck Traffic	0	0.000	0.000	0
	Total	**79**	**0.004**	**0.003**	**80**
Generator-tie Line	Site Preparation	102	0.003	0.002	**102**
	Tower Pole Foundations	15	0.000	0.000	**15**
	Tower Pole Installation	22	0.001	0.001	**22**
	Line Stringing	58	0.004	0.003	**59**
	Construction Worker Traffic	0	0.000	0.000	**0**
	Construction Truck Traffic	3	0.000	0.000	**3**
	Total	**200**	**0.008**	**0.006**	**202**
Offsite Interconnection Substation	Site Preparation	68	0.002	0.001	**68**
	Pads and Foundations	10	0.000	0.000	**10**
	Equipment Installation	21	0.000	0.000	**21**
	Construction Worker Traffic	0	0.000	0.000	**0**
	Construction Truck Traffic	0	0.000	0.000	**0**
	Total	**99**	**0.003**	**0.002**	**100**
	Grand Total	**1,333**	**0.044**	**0.032**	**1,343**

CH_4 = methane, GWP multiplier = 25
CO_2 = carbon dioxide, GWP multiplier = 1
CO_2e = carbon dioxide equivalents
GWP = global warming potential in carbon dioxide equivalents based on IPCC (2007)
N_2O = nitrous oxide, GWP multiplier = 298

As shown in Table 3.12-2, onsite construction activities would generate much higher quantities of GHG emissions than would construction-related traffic. While there are no state or federal impact significance thresholds for GHG emissions, EPA requires air permits for stationary sources that emit more than 75,000 tons/year carbon dioxide equivalents (CO_2e). The EPA permit threshold provides a general indication that GHG emissions from construction of the proposed Project would not be a significant impact. In addition, as discussed in the following section, facility wind energy operations would displace GHG emissions that would otherwise result from alternative fossil fuel power generation sources.

Depending on which WTG model is selected, the wind farm access roads may be modified based on engineering considerations by reducing the length and increasing the grade up to 15 percent. The impacts to air quality from construction of this straightened road alignment would be similar to those from construction of the proposed WTG access roads discussed above.

3.12.3.3 Operations and Maintenance Impacts

Facility operations would be a small source of criteria pollutant and GHG emissions associated with onsite service vehicle use at the wind farm site and periodic facility inspections or maintenance activities at the generator-tie line and interconnection substation sites. In addition, leaks of insulating gas from transformers and switchgear at the wind farm onsite substation and the interconnection substation would be sources of sulfur hexafluoride emissions (a very strong GHG). Given the low voltages of the generator-tie lines from these substations, only very small quantities of sulfur hexafluoride would be expected from these substations.

All power transmitted to the power grid either goes to meet electrical demand that cannot be met by other power generation sources or it effectively displaces power that would otherwise be generated by other sources to meet that demand. Consequently, power generated from the proposed wind farm would effectively displace other existing or future sources of power generation. Power generation on Maui is derived from a mix of sources, most of which produce GHG emissions (DBEDT 2009). About 91.2 percent of power generation on Maui comes from sources that generate GHG emissions (petroleum, coal, and biomass). Only about 8.8 percent of power generation on Maui comes from sources that have no GHG emissions (hydroelectric, solar power, and wind power).

Table 3.12-3 summarizes the GHG emission rates for the existing mix of power sources on Maui. (The analysis is based on data from DBEDT 2009 and California Air Resources Board 2008). Based on the 2008 mix of power sources on Maui, each megawatt-hour of power generated by the proposed Project would effectively displace 558 tons of GHG emissions (CO_2e) that would otherwise be produced by alternative power sources. While the overall power generation from the proposed Project would vary from year to year, each hour of full power generation would effectively displace about 12,278 tons of GHG emissions that would otherwise be produced by alternative fossil fuel power sources. Consequently, just 7 minutes of full power production from the proposed Project would offset all of the GHG emissions generated from Project construction.

Table 3.12-3.
Summary of Greenhouse Gas Emission Rate for Maui Power Generation

Fuel Source	Percent of Power Generation	Greenhouse Gas Emissions, Tons per Megawatt-Hour of Power			
		CO_2	CH_4	N_2O	GWP, CO_2e
Coal	5.0%	710	0.075	0.011	**715**
Petroleum	78.3%	592	0.023	0.005	**594**
Biomass	7.8%	399	0.007	0.001	**399**
Hydroelectric	1.0%	0	0	0	**0**
Solar	0.1%	0	0	0	**0**
Wind	7.7%	0	0	0	**0**
Total	**100.0**	**555**	**0.039**	**0.006**	**558**

CH_4 = methane, GWP multiplier = 25
CO_2 = carbon dioxide, GWP multiplier = 1
CO_2e = carbon dioxide equivalents
GWP = global warming potential in carbon dioxide equivalents based on IPCC (2007)
N_2O = nitrous oxide, GWP multiplier = 298

3.12.3.4 No Action Alternative

Under the No Action Alternative, the wind farm, the generator-tie line, and the interconnection substation would not be constructed. The No Action Alternative would avoid all air quality and GHG emissions associated with construction and operations of the wind farm and associated transmission facilities. The No Action Alternative also would eliminate the long-term displacement of GHG emissions associated with alternative fossil fuel power generation systems.

3.12.3.5 Avoidance, Minimization, and Mitigation Measures

The Applicant will implement standard BMPs for minimizing construction-related air quality impacts as listed in Table 2-4. As described above, the impacts of the proposed Project related to air quality will be less than significant with the implementation of an active dust control program during Project construction. Over the long term, Project operations will have beneficial impacts to air quality that offset GHG emissions generated during the construction period. Therefore, no mitigation measures pertaining to air quality are required.

3.12.3.6 Summary of Impacts

Table 3.12-4 provides a summary of Project-related impacts to air quality.

Table 3.12-4.
Summary of Potential Air Quality Impacts

Impact Issues	Proposed Project	No Action Alternative
Violations of federal or state ambient air quality standards from construction activity and construction-related traffic	⊙	○
Greenhouse gas emissions from construction activity	⊙	○
Greenhouse gas emissions from Project operations	+	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.
LEGEND:
⊗ = Significant impact
⃠ = Significant but mitigable to less than significant impact
⊙ = Less than significant impact
+ = Beneficial impact
N/A = Not applicable
○ = No impact

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3.13 VISUAL RESOURCES

3.13.1 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 resources 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 where it would be located. This section addresses the existing visual conditions and impacts to visual resources in the ROI that includes the proposed Project and surrounding area (see below for the delineation of the zone of visual influence).

3.13.2 Existing Conditions

The visual setting of the island of Maui, one of four islands that comprise Maui County, Hawai'i, consists of agricultural landscapes (52.8 percent of the county), vegetated conservation areas (41.8 percent), and minimal urban and rural development (5.4 percent) (County of Maui 2010c). The western coast of Maui from Ma'alea to Mākena is known as South Maui, with development along this area generally in a linear pattern between the shoreline and Upcountry Pi'ilani Highway to form a continuous urban corridor that hosts Maui's tourist industry supported by the area's abundant ocean access points (County of Maui 2010b).

The area immediately surrounding the proposed Project consists mainly of agricultural and conservation area landscapes. The Kula Forest Reserve, the Kahikinui Forest Project, and the Haleakalā National Park are north of the proposed Project. The Kanaio NAR is adjacent to the northwest side of the proposed Project. The landscape surrounding the proposed Project is a very low density area mainly used as pastureland with open fields of low-lying vegetation extending from the southern coast of Maui, north to the ridge that runs from the 'Ahihi-Kina'u NAR northeast to Haleakalā National Park. The proposed generator-tie line extends from the site north/northwest up this slope, crossing the ridge at approximately 190 meters (623 feet) above mean sea level.

The wind farm site and most of the proposed generator-tie line would be in the Auwahi parcel of 'Ulupalakua Ranch, an actively operating cattle ranch. The site would be entirely in the Special Management Area (SMA), a designated subset of land adjacent to the shoreline within which the County of Maui is authorized to place restrictions on development as a means to protect coastal resources (see Section 5 – Regulatory Context / Consistency with Plans and Policies). The SMA is bordered by Upcountry Pi'ilani Highway to the north, an undeveloped parcel to the west, and the Department of Hawaiian Home Lands to the east. The southern edge of the proposed Project site is approximately 1,000 feet from the Pacific Ocean.

The site is characterized by a relatively steep north-south gradient and is degraded pastureland with a few remnant trees from the native dryland forest. The only structures currently on the proposed Project site are water tanks used for the ranching operation. There are fewer than 10 residences scattered in the vicinity of the site, with only 2 homes within a mile of the site. The 'Ulupalakua Ranch headquarters, general store, and winery are approximately 6.4 kilometers (4 miles) west of the wind farm site. Aside from the scattered homesteads and the ranch, there are no residential or commercial developments in the vicinity. The Hoapili Trail, an ancient fishing trail currently used as a hiking trail, runs along the coast directly south of the proposed wind farm site.

The only public road in the vicinity is Upcountry Pi'ilani Highway. There is a minimal amount of traffic on this portion of the highway. Portions of the road east of the Project site are unpaved or not well-maintained. The Draft Maui Island Plan (County of Maui 2010b) designates the Upcountry Pi'ilani Highway as a proposed designated scenic corridor of exceptional value. The proposed designation follows Pi'ilani Highway for several miles around the southern and eastern coastlines of Maui.

3.13.2.1 Generator-tie Line Corridor

The proposed generator-tie line corridor would extend approximately 14.5 kilometers (9 miles) north and west of the wind farm site to connect with the Wailea-Kealahou line just outside of Wailea. The generator-tie line would pass through 'Ulupalakua Ranch pastureland, crossing both Upcountry Pi'ilani Highway and Kula Highway. The route would pass immediately west of the Auwahi Forest Restoration Project site and east of the Kanaio NAR that is open to the public for hiking. The generator-tie line route would then extend west down the mountains that form the backdrop to the resort towns Wailea and Mākena, which are considered important tourist destinations. Wailea has several exclusive resort hotels, golf courses, notable beaches, and numerous residences. Wailea is bigger than Mākena and already has the Wailea-Keahahou transmission line, which is similar in appearance to the proposed generator-tie line.

3.13.2.2 Construction Access Route

The proposed construction access route is composed entirely of existing state and county roadways, with the exception of Pāpaka Road, which is approximately 7.4 kilometers (4.6 miles) of a collection of privately owned pastoral road. Pāpaka Road crosses private and publicly owned parcels that are either rural residential or undeveloped land. Several rural residences are near Pāpaka Road. Pāpaka Road is currently gated and used only for access to the Ranch and other adjacent privately owned parcels. The west end of Pāpaka Road is in Mākena, a tourist destination. The western portion of the road is also within the SMA.

Pāpaka Road would require modification to allow for transport of equipment during construction. Modification of the road is necessary because much of the eastern roadway is narrow, unpaved, deteriorated, or has slopes or curves that do not conform to the transportation specifications for the trucks hauling WTGs and construction equipment. Modifications to Pāpaka Road would require slope cutting, grading, or fill. Following the construction, Pāpaka Road would only be used for infrequent transport of equipment and would not be used as the primary access to the proposed Project site.

3.13.3 Potential Impacts and Mitigation Measures

3.13.3.1 Impact Methodology and Factors Considered for Impacts Analysis

A visual analysis was performed to evaluate the existing visual and aesthetic characteristics of the area, to identify areas where WTGs could be visible, and to assess the degree of impact on sensitive viewpoints. The steps in the process used to assess potential visual impacts included determining (1) the visibility of proposed Project facilities throughout the study area using viewshed mapping, (2) the existing visual quality at key viewpoints, and (3) the degree of change to the existing visual quality at those viewpoints from the presence of the proposed Project facilities. The Visual Analysis Report is included as Appendix I. This section provides a summary of the methodology and findings of the study.

The WTGs and proposed generator-tie line are the dominant visual elements of the proposed Project and are the focus of the visual analysis. For the purpose of the visual analysis, the 15-WTG layout (i.e., the maximum number of WTGs) was used to create a conservative assessment of the visual and aesthetic effects of the proposed Project. The 15-WTG layout would consist of GE xle 1.5-MW WTGs that have a hub height of 80 meters (262 feet) and blade length of 41.3 meters (135.3 feet) for a maximum blade tip height of 121.3 meters (398 feet). For the generator-tie line, a uniform pole height of 18.3 meters (60 feet) with poles placed at intervals of 38 meters (125 feet) was used for the visual analysis.

3.13.3.2 Viewshed Analysis Methodology

The viewshed analysis component of the visual assessment was done using the ArcInfo Geographic Information System software to determine the area where the WTGs and the generator-tie line would be visible. The study area for the viewshed analysis extends 16 kilometers (10 miles) out from the proposed Project, the distance recommended by the National Research Council (2007) for the analysis of visual effects of wind energy projects. The study area for visual impacts varies depending on factors such as topography, terrain, and vegetation. Given the increasing elevations from the proposed Project to the north and east, a conservative distance of 16 kilometers (10 miles) was chosen for the viewshed analysis.

The 16-kilometer (10-mile) radius and Zones of Visual Influence (ZVIs) are depicted on Figure 3.13-1 for the WTGs and Figure 3.13-2 for the generator-tie line. The ZVI for the WTGs shows areas where WTGs may be visible and indicates how many WTGs would be visible from those areas. The ZVI for the generator-tie line indicates the degree of potential visibility of the generator-tie line and poles.

The visibility pattern resulting from the ZVI analysis is a conservative representation of actual proposed Project visibility. In some areas where the model indicates visibility of proposed facilities, the only visible parts of the facility might be the tips of WTG blades, which would hardly be noticeable in some locations. The basic ZVI model is a line-of-sight model that extends from eye level (1.82 meters [6 feet]) to the WTG blade tips (121.3 meters [398 feet]) and the generator-tie line poles (18.3 meters (60 feet) tall, spaced 125 feet apart) and does not account for attenuating factors such as distance, haze, humidity, background landscape, or weather, any or all of which could make the proposed Project facilities undetectable or barely visible from certain locations under a variety of atmospheric or weather conditions. The basic ZVI model also does not account for screening effects of existing structures or vegetation. As a result, the basic assumptions of the ZVI model create a conservative assessment of the visibility of the WTGs in the area surrounding the proposed Project.

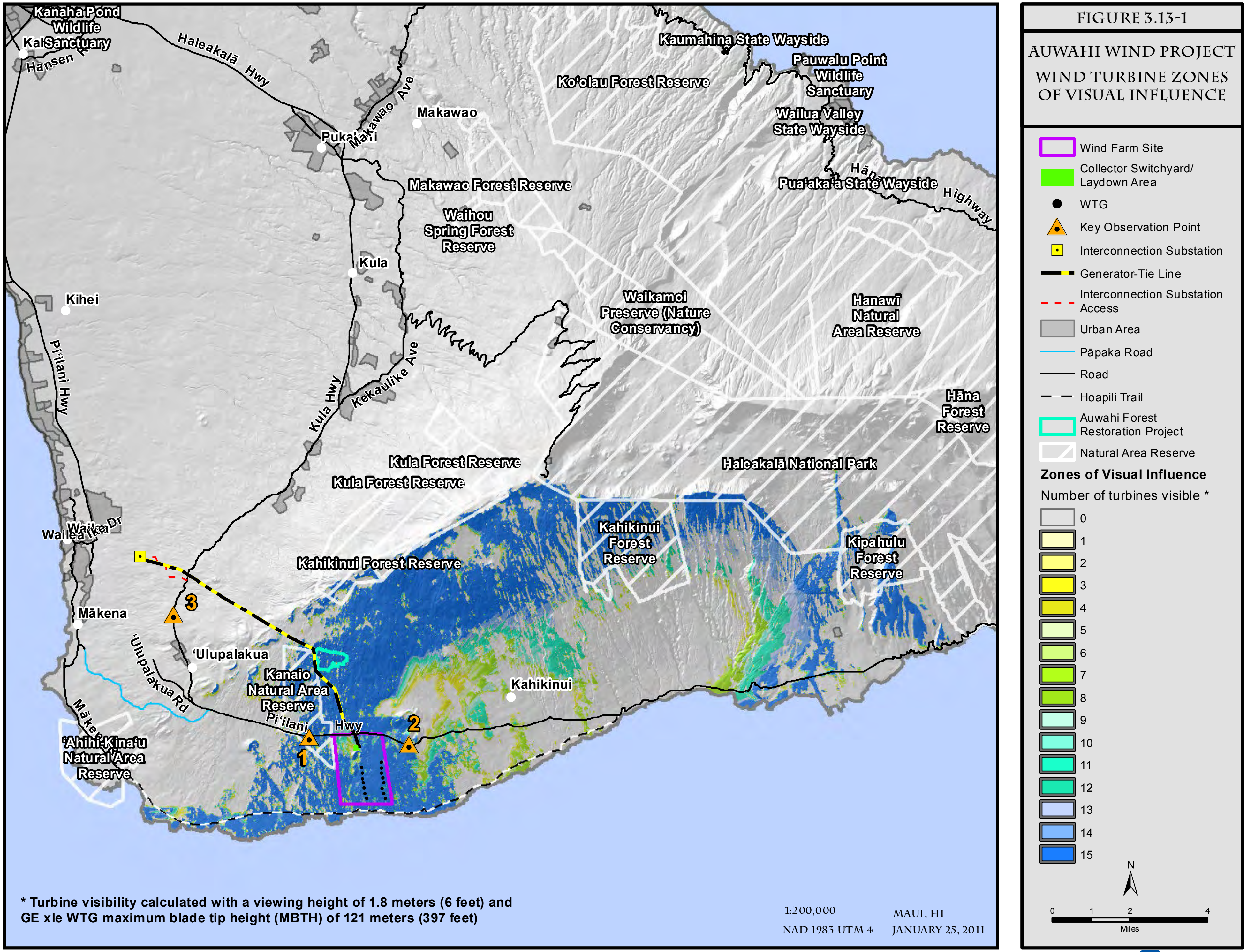

FIGURE 3.13-1

AUWAHI WIND PROJECT

WIND TURBINE ZONES OF VISUAL INFLUENCE

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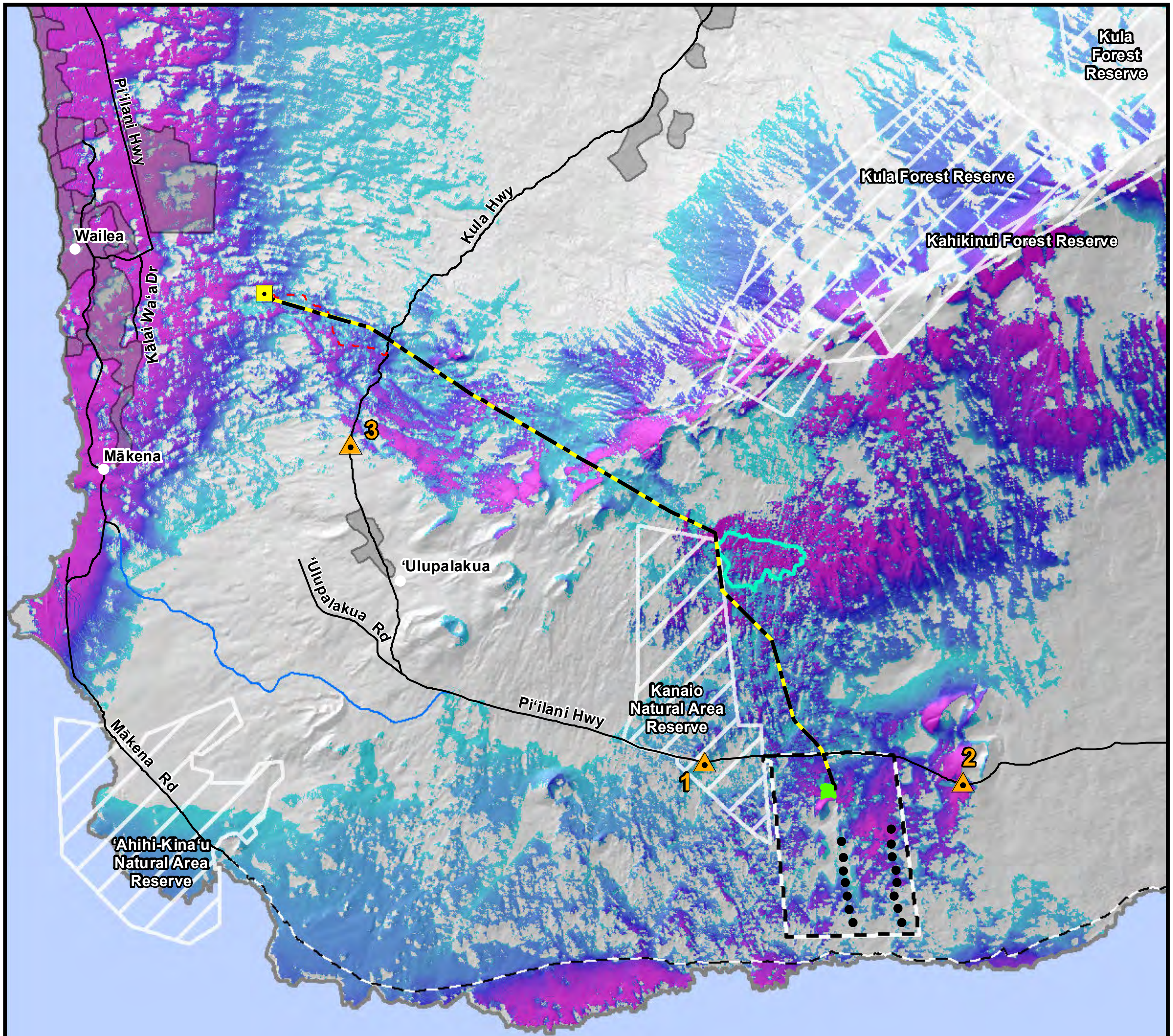

* Generator-tie line visibility calculated with a viewing height of 1.8 meters (6 feet) and transmission line poles 18 meters (60 feet) high, placed every 38 meters (125 feet).
Potential visibility is calculated as the number of transmission line poles visible at any given location

FIGURE 3.13-2

AUWAHI WIND PROJECT

GENERATOR-TIE LINE ZONES OF VISUAL INFLUENCE

- Wind Farm Site
- Collector Switchyard/ Laydown Area
- WTG
- Key Observation Point
- Interconnection Substation
- Generator-Tie Line
- Interconnection Substation Access
- Urban Area
- Pāpaka Road
- Road
- Hoapili Trail
- Auwahi Forest Restoration Project
- Natural Area Reserve

Zones of Visual Influence

Potential Visibility *
High
Low

N

0 0.5 1 2
Miles

1:90,000
NAD 1983 UTM 4
MAUI, HI
JANUARY 25, 2011

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3.13.3.3 Visual Quality Impact Evaluation Methodology

Key observation points (KOPs) were selected based on the viewshed mapping and a field investigation to identify sensitive visual and aesthetic resources that may have views of the proposed Project facilities. Photographs were taken at each KOP to characterize the existing conditions and to provide the basis for preparing simulations of the views as they would appear with the WTGs and generator-tie line in place. Digital visual simulation images were produced on computer renderings of a 3-dimensional model combined with the high-resolution digital base photographs.

Three KOPs were selected for simulation, two KOPs for the WTGs and one KOP in two directions for the generator-tie line. These KOPs are at the following sites:

- KOP 1—Upcountry Pi‘ilani Highway traveling east at Kanaio NAR, view oriented south-southeast toward the proposed Project;
- KOP 2—Upcountry Pi‘ilani Highway traveling west, view oriented south-southwest toward the proposed Project;
- KOP 3a—Kula Highway traveling north, view oriented north-northwest toward the proposed generator-tie line; and
- KOP 3b—Kula Highway traveling north, view oriented north-northeast toward the proposed generator-tie line.

The location of each KOP is shown on Figure 3.13-3.

The concept of visual quality involves the degree to which a view expresses the essence of the subject landscape, including landforms, native vegetation, and built features. Because visual quality relates to the intrinsic quality of a landscape, analysis of existing visual quality is based on assessing the inherent capacity of a landscape to evoke a perceptual response, rather than on expression of individual preferences for a specific scene.

There would be a significant impact on visual resources if construction or operations of the proposed Project resulted in:

- Substantial degradation of the foreground character or scenic quality of a visually important landscape; or
- Substantial dominant visual changes in the landscape that are seen by highly sensitive viewer locations or locations with special scenic, historic, recreational, cultural, archaeological, or natural qualities that have been recognized as such through legislation or some other official declaration; or
- Predicted air pollutant emissions causing a change in visibility that would exceed Class I standards.

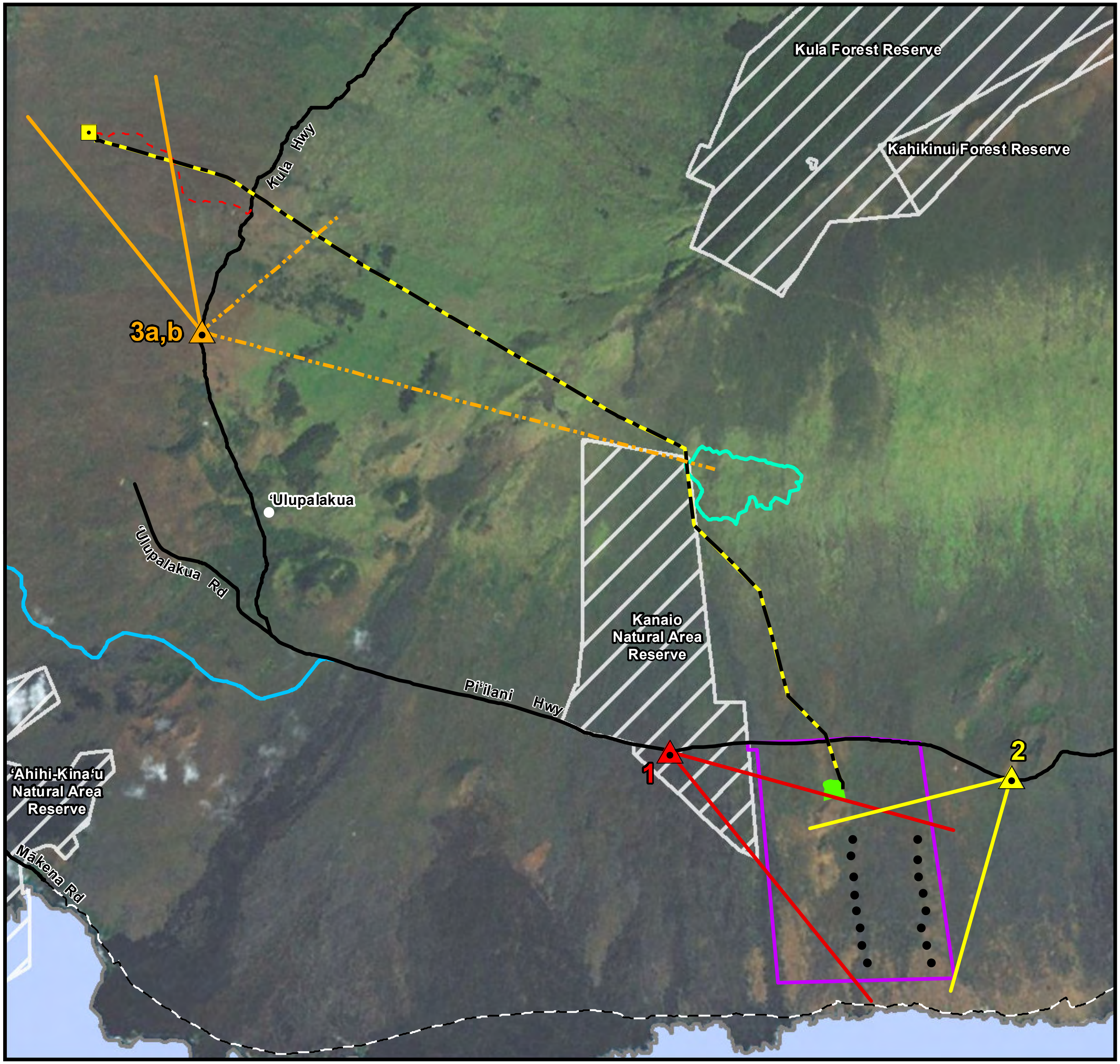

FIGURE 3.13-3

AUWAHI WIND PROJECT

VISUAL SIMULATION KEY OBSERVATION POINTS

Wind Farm Site
Collector Switchyard/ Laydown Area
WTG

Key Observation Point (KOP)
1
2
3

KOP Field of View
KOP 1
KOP 2
KOP 3a
KOP 3b
Interconnection Substation
Generator-Tie Line
Interconnection Substation Access
Pāpaka Road
Road
Hoapili Trail
Auwahi Forest Restoration Project
Natural Area Reserve

N

0 0.25 0.5 1
Miles

1:65,000
NAD 1983 UTM 4

MAUI, HI
JANUARY 25, 2011

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Depending on which WTG model is selected and the grading analysis to be conducted during the final design, the wind farm site access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Chapter 2 for additional details). Construction of the straightened road alignment would require the same construction equipment and activities as the proposed WTG access roads; therefore, impacts associated with construction of the straightened road alignment would be similar to those described below for the proposed WTG access road alignment.

3.13.3.4 Construction Impacts

Visual impacts during construction would be expected to be minor and short-term. Dust could be temporarily generated during site clearing and grading activities and the movement of heavy vehicles and equipment along local roads.

3.13.3.5 Operations and Maintenance Impacts

Existing views from various locations near the proposed Project would be altered to varying degrees by installation of the WTGs and generator-tie line.

Viewshed Analysis

The terrain-based viewshed analysis indicates that the WTGs would be visible mainly from areas south of the ʻAhihi-Kinaʻu NAR to the Haleakalā National Park ridgeline, and immediately around the proposed Project (Figure 3.13-1). Other likely areas of high visibility (i.e., all 15 WTGs visible) are generally limited to the area of the South Maui coastline to the west of the site and along the Hoapili Trail to the south of the site. Local terrain variation creates limited to no visibility beyond approximately 3 kilometers (2 miles) east of the site in areas north and south of Upcountry Piʻilani Highway down to the coast. The Haleakalā volcano forms a natural, rim-like, enclosure around the site to the north, northeast, and east, effectively blocking the Project from sight past the ridgeline.

The terrain-based viewshed analysis for the generator-tie line indicates that areas of high visibility are scattered throughout the southwestern portion of the island of Maui (Figure 3.13-2). This analysis is conservative and does not account for vegetation and local infrastructure that would obstruct the visibility of the generator-tie line and poles more so than the WTGs because they are substantially shorter than the WTGs (18.2 meters [60 feet] versus 12,903 meters [398 feet]).

The area surrounding the proposed Project has few developed and residential areas that would be sensitive viewer locations. There are fewer than 10 residences in the vicinity of the site, with only 2 homes within 1.6 kilometer (1 mile). The ʻUlupalakua Ranch area, approximately 6 kilometers (4 miles) to the northwest, is the nearest developed area and would not have views of either the WTGs or the generator-tie line given the distance from the site and local terrain variations. The topography of the ʻAhihi-Kinaʻu NAR to Haleakalā National Park ridgeline, and the relatively great distance of Mākena and Wailea, at approximately 8 and 9 miles (13 and 15 kilometers) from the proposed Project, respectively, would result in no visibility of the WTGs from these resort towns on the southwestern Maui coast. While views of the generator-tie line from the resort towns would be possible according to the viewshed mapping, views from the resort towns would be mainly oriented west toward the ocean and away from the proposed generator-tie line. The existing transmission line, already a part of the landscape, creates a visual element similar to that of the proposed generator-tie line.

The primary sensitive viewer groups with visibility of the WTGs and generator-tie line would be travelers on Upcountry Piʻilani Highway. Upcountry Piʻilani Highway is a proposed designated scenic corridor of exceptional value in the Draft Maui Island Plan (County of Maui 2010b). The proposed designation follows Upcountry Piʻilani Highway for several miles around the southern and eastern coastlines of Maui. The portion of the highway with visibility of the proposed Project is small in relation to the length of the proposed designated scenic corridor. There are few points of interest or unique views along the section of Upcountry Piʻilani Highway near the site, so travelers on the highway would have transient views of the WTGs and generator-tie line as they pass by the site.

Analysis of Existing and Simulated Views

The factors that determine the degree of visual change associated with an action include the numbers of affected viewers, their sensitivity to visual change, and the viewing distance. In general, the potential for significant visual impacts is most likely for sites in the foreground viewing distance (about 0.8 kilometer [0.5 mile] from the source of the visual change) and is much less likely for sites at middleground (0.8 kilometer to 5.6 kilometers [0.5 mile to 3.5 miles]) and background viewing distances (beyond 5.6 kilometers [3.5 miles]).

Views of the WTGs and generator-tie line from the three KOPs would all be middleground views (between 0.8 kilometer to 5.6 kilometers [0.5 and 3.5 miles]), and would not have a substantially degraded foreground character or scenic quality of a visually important landscape. The WTGs create a vertical contrast with the horizontal landscape sloping downward toward the horizon of the open ocean. Because the scale of the WTGs is diminished sufficiently at this middleground viewing distance, the WTGs are prominent but they do not dominate the other elements of the scene. The proposed generator-tie line would be generally screened by the topography and vegetation and would not interfere with the existing view because the existing transmission line is close to the highway right-of-way near the proposed Project. Figures 3.13-4 through 3.13-7 show the existing and simulated views for each KOP.

Views from Upcountry Piʻilani Highway would be temporary as travelers pass through this area of the highway; views from the Kanaio NAR would be largely screened by vegetation; and the most sensitive views from the southern coastline would be oriented south toward the ocean and way from the proposed Project. As a result, the proposed Project is anticipated to have a negligible to low impact on visual and aesthetic quality.

In addition to the WTGs and generator-tie line, the proposed Project would include a number of other structures that would have limited visual impacts. The proposed Project would include access roads and WTG pads, construction staging and equipment laydown areas, an underground electrical collection system, a collector switchyard, an O&M building, one permanent met tower situated between the two WTG arrays, and an interconnection substation. At night, the Project O&M building and interconnection substation would be minimally lit for operational safety and security, representing minor new sources of light where there generally are few existing exterior lights. The impacts associated with this low-level lighting would be minimal, especially if the lights were generally kept off and, when necessary, triggered on by motion sensors. Downed lighting or shields on the fixtures will also be used. Viewers of these structures would be limited to ranch employees with access to the area surrounding the proposed Project site and would not have any impact on sensitive visual resources.

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Auwahi Wind Project
Visual Analysis
Figure 3.13-4A

KOP 1: Existing view from Pi'ilani Highway traveling east at Kanaio NAR - WTG's
Looking southeast

Auwahi Wind Project
Visual Analysis
Figure 3.13-4B

KOP 1: Simulated view from Pi'ilani Highway traveling east at Kanaio NAR - WTG's
Looking southeast

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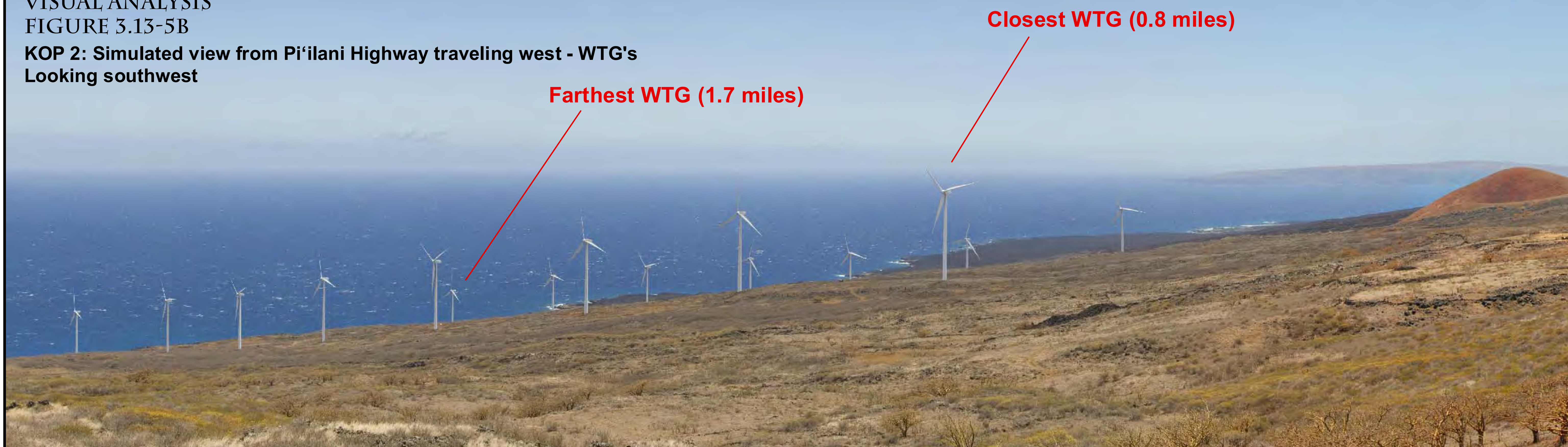
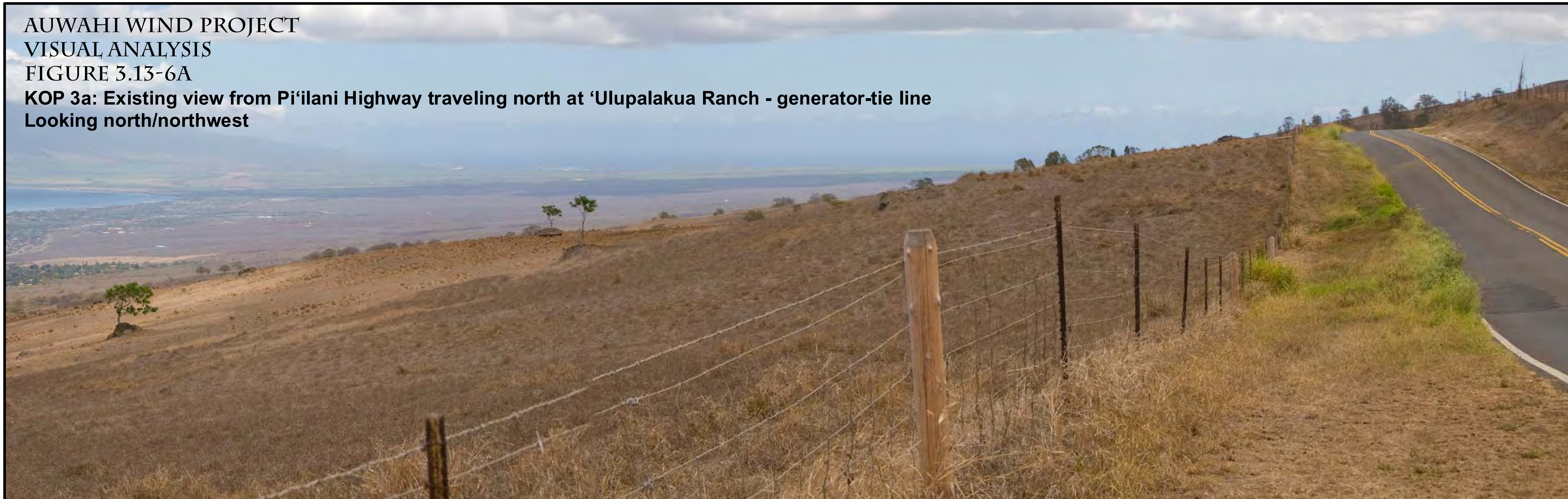
Auwahi Wind Project
Visual Analysis
Figure 3.13-5A

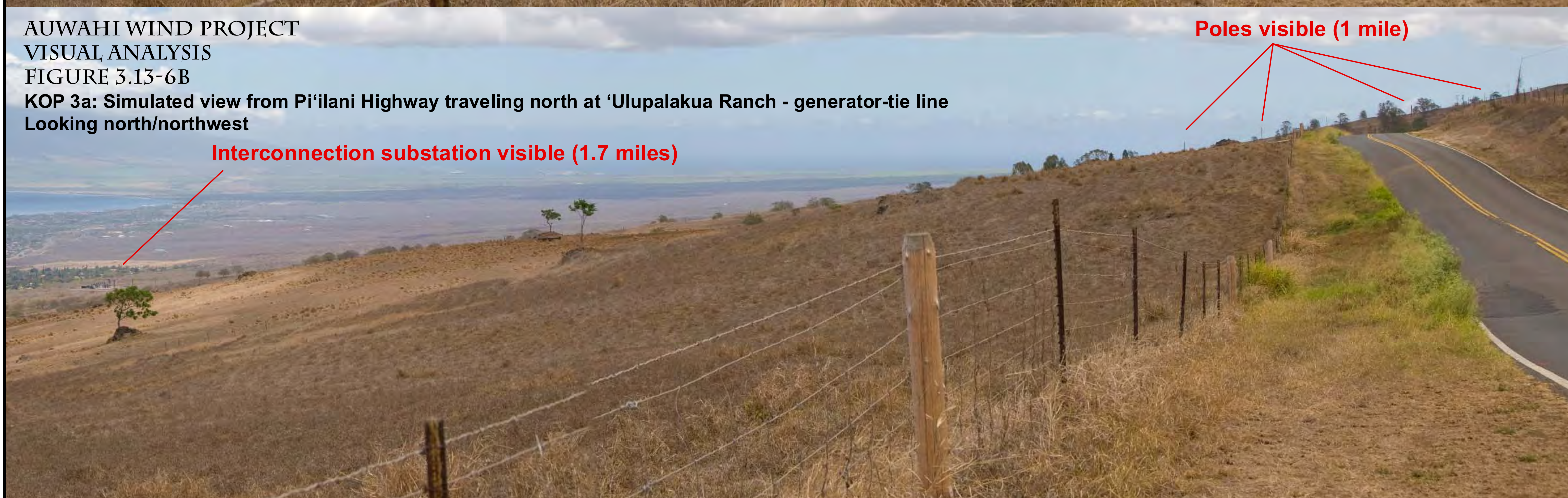
KOP 2: Existing view from Pi'ilani Highway traveling west - WTG's
Looking southwest

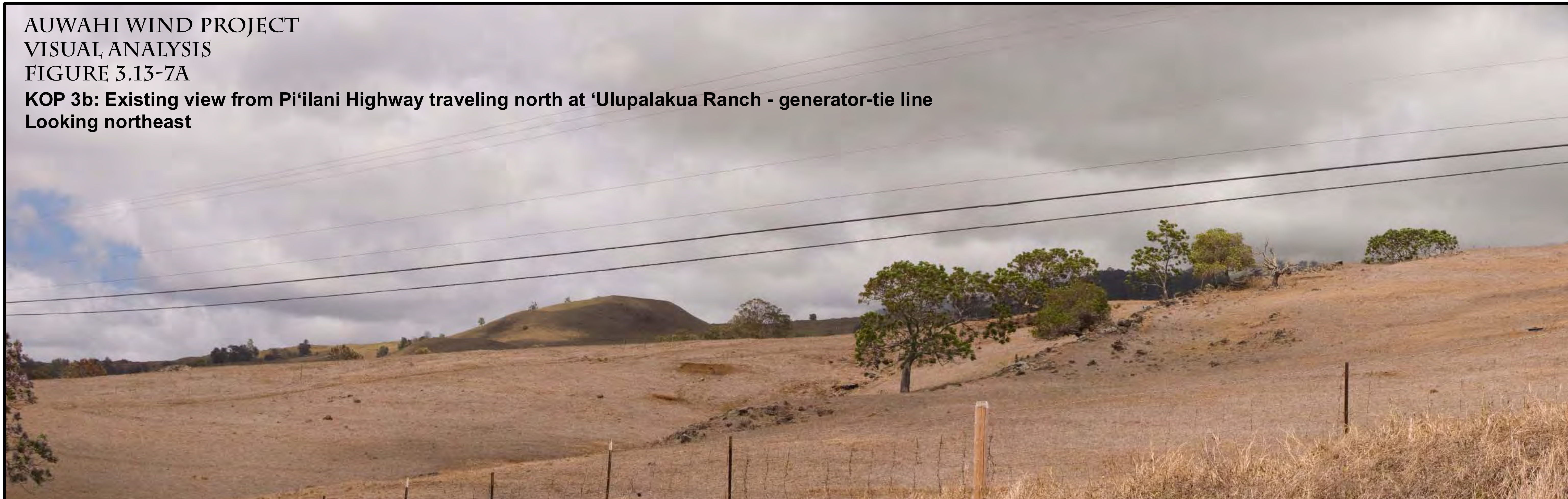
Auwahi Wind Project
Visual Analysis
Figure 3.13-5B

KOP 2: Simulated view from Pi'ilani Highway traveling west - WTG's
Looking southwest



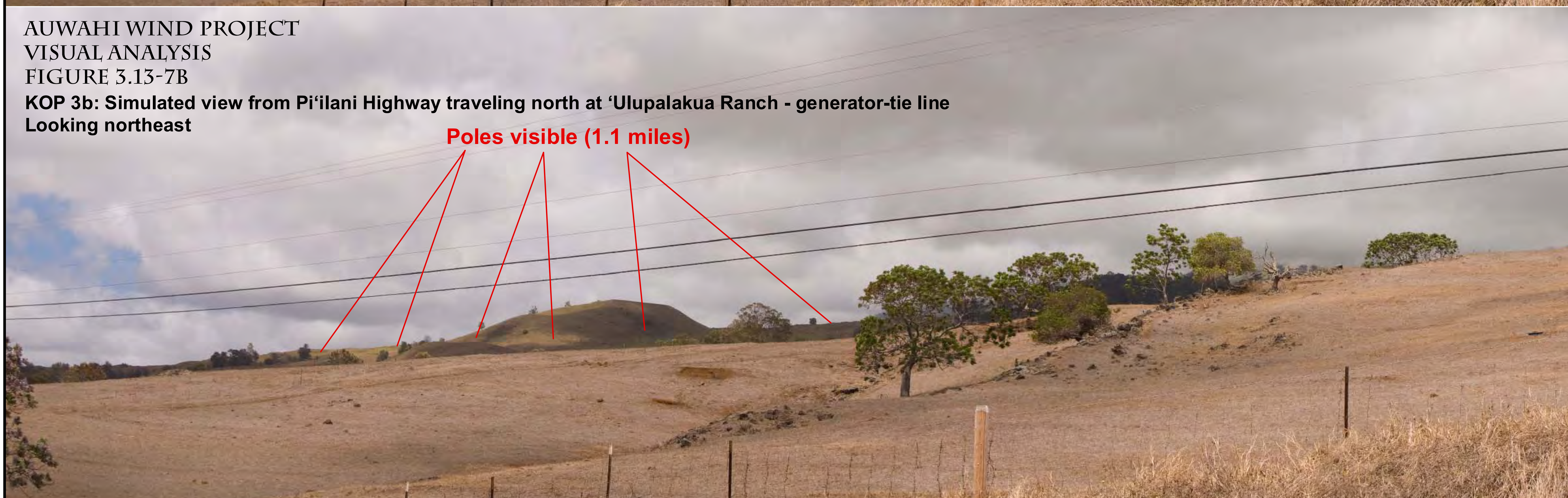

AUWAHI WIND PROJECT
VISUAL ANALYSIS
FIGURE 3.13-6A
KOP 3a: Existing view from Pi‘ilani Highway traveling north at ‘Ulupalakua Ranch - generator-tie line
Looking north/northwest


AUWAHI WIND PROJECT
VISUAL ANALYSIS
FIGURE 3.13-6B
KOP 3a: Simulated view from Pi‘ilani Highway traveling north at ‘Ulupalakua Ranch - generator-tie line
Looking north/northwest
Interconnection substation visible (1.7 miles)
Poles visible (1 mile)



AUWAHI WIND PROJECT
VISUAL ANALYSIS
FIGURE 3.13-7A

KOP 3b: Existing view from Pi'ilani Highway traveling north at 'Ulupalakua Ranch - generator-tie line
Looking northeast



AUWAHI WIND PROJECT
VISUAL ANALYSIS
FIGURE 3.13-7B

KOP 3b: Simulated view from Pi'ilani Highway traveling north at 'Ulupalakua Ranch - generator-tie line
Looking northeast

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The construction access route would result in use of and improvements to an existing private road and would not require new significant land clearing. Visual impacts associated with dust from construction and improvement of access roads would be short-term and minor.

3.13.3.6 No Action Alternative

Under the No Action Alternative, no aspect of the Project would be built. There would be no impacts to visual resources associated with construction and operations of the proposed Project. The existing visual landscape would persist in the current state subject to future land use changes and development.

3.13.3.7 Avoidance, Minimization, and Mitigation Measures

The location of the proposed Project in a low-density rural area avoids significant aesthetic impacts that would necessitate mitigation. Mitigation options for the expected visual impacts are limited given the nature of the proposed Project (tall structures located in an otherwise simple ocean landscape); however, in addition to standard BMPs (e.g., dust suppression measures and revegetation) described in Table 2-4, which will be implemented by the Applicant as part of the design process, the Applicant will also implement the following avoidance and minimization to minimize the possible visual and aesthetic impacts:

- Keep construction time to a minimum.
- Remove construction debris.
- Locate construction staging and storage areas away from adjacent local roads.
- Comply with all required setbacks from roads and residences.
- Build WTGs with uniform design, speed, color, height, and rotor diameter.
- Locate the WTGs in strings to improve aesthetics by providing a more uniform looking development.
- Place much of the Project’s electrical collection system underground, minimizing the Project’s visual impacts.
- Use a low-reflectivity finish for substation equipment to minimize its visibility.
- Use dull gray porcelain insulators to reduce insulator visibility.

To help mitigate impacts to nighttime views, WTG lighting (aviation warning lighting) would be kept to the minimum recommended by the FAA guidelines (FAA 2007) and allow nighttime lighting of perimeter WTGs only, at a maximum spacing of 0.8 kilometer (0.5 mile). Synchronized, medium–intensity, pulsing red strobe lights will be used at night, rather than white strobes or steady burning red lights. While complying with FAA lighting regulations, the Applicant will seek to minimize the number of WTGs that must be equipped with lights.

3.13.3.8 Summary of Impacts

The potential impacts to visual resources associated with the proposed Project are summarized in Table 3.13-1.

Table 3.13-1.
Summary of Potential Impacts to Visual Resources

Impact Issues	Proposed Project	No Action Alternative
Substantial degradation of the foreground character or scenic quality of a visually important landscape	⊙	○
Substantial dominant visual changes in the landscape that are seen by highly sensitive viewer locations or locations with special scenic, historic, recreational, cultural, archaeological, or natural qualities that have been recognized as such through legislation or some other official declaration	⊙	○
Predicted air pollutant emissions causing a change in visibility that would exceed Class I standards	⊙	○
Unresolved conflict with visual standards identified by a federal land management agency (e.g., National Park Service)	N/A	N/A

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:
⊗= Significant impact
⦸= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A = Not applicable
○= No impact

3.14 SURROUNDING LAND USE AND AGRICULTURE

3.14.1 Definition of Resource

Comprehensive plans, policies, and zoning regulations determine 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 affect the suitability of an area for its current, designated, or formally planned use. For purposes of the land use evaluation, the ROI includes the proposed Project site and adjacent parcels.

3.14.2 Existing Conditions

The majority of lands within the proposed Project are on ʻUlupalakua Ranch on the island of Maui. ʻUlupalakua Ranch extends from the southern slopes of Haleakalā to the ocean. James Linton Torbert established the original ranch as "Tobertsville" in 1845. In the 1850s, the ranch was purchased by Captain James Makee and was renamed "Rose Ranch." The area has been primarily used for commercial cattle ranching and agricultural activities since about 1900. ʻUlupalakua Ranch was established in 1963 and has maintained the land as a commercial ranch since.

The wind farm site is currently grazed pastureland and part of ʻUlupalakua Ranch's active ranching operation. The area immediately west of the wind farm site is composed of vacant land owned by the state of Hawaiʻi and the land comprising the Kanaio NAR. The north edge of the site is bounded by Upcountry Piʻilani Highway, with additional pastureland beyond. The land to the east of the wind farm site is owned by the DHHL and supports two homesteads. The Hoapili Trail runs along the coastline, just south of the wind farm site.

The proposed generator-tie line right-of-way corridor is also composed entirely of grazed pasturelands with the exception of the aerial crossings over Upcountry Piʻilani Highway and Kula Highway. The areas surrounding the generator-tie line corridor are also all grazed pasturelands, with the exception of the Kanaio NAR and the Auwahi Forest Restoration Project.

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

The proposed Project is within the boundaries of Maui County's Hāna Community Plan , Makawao-Pukalani Community Plan, and Kihei-Mākena Community Plan. The wind farm site and much of the generator-tie line are within the boundaries of the Hāna Community Plan, which designates this area for agricultural use and preservation. For further discussion on consistency with federal, state, and county regulations, policies, and county plans, refer to Chapter 5 – Regulatory Context.

3.14.2.1 Land Ownership

A total of 28 parcels are crossed by the Project. The wind farm site is located entirely on land owned by ʻUlupalakua Ranch. The generator-tie line is also on ʻUlupalakua Ranch property, although it spans Upcountry Piʻilani Highway, which is in a county easement, and Kula Highway, which is owned by the state. The Pāpaka Road portion of the construction access route crosses 19 parcels, most of which are owned by ʻUlupalakua Ranch. As shown in Table 1-1, 9 parcels are owned by the state, 3 of which are leased by ʻUlupalakua Ranch and 2 of which are co-owned by the County of

Maui; 1 parcel is jointly owned by ʻUlupalakua Ranch and another private party (Piltz); 3 parcels are owned by the County of Maui; and 1 parcel is owned entirely by ATC Makena Holdings, LLC. The landowners of property in the proposed Project area are listed in Table 3.14-1 and are shown on Figure 1-3.

In November 2009, the owners of ʻUlupalakua Ranch decided to preserve in perpetuity two-thirds of their 18,000 upcountry acres as agricultural lands. They did so formally with a donation easement to the Maui Coastal Land Trust (Figure 3.14-1). Ranch operations will not change, although the conservation easement donation—the largest of its kind in Hawaiʻi history—will preclude future generations from selling the ʻUlupalakua land to developers. Wind generation was included as an allowable land use and activity under the conservation easement.

Table 3.14-1.
Parcel Information for the Auwahi Wind Farm Project

Project Component	Tax Map Key (TMK)	Landowner(s)
Wind Farm Site	(2) 1-9-001:006 (por.)	ʻUlupalakua Ranch
Generator-tie Line Corridor, Interconnect Substation	(2) 1-9-001:006 (por.)	ʻUlupalakua Ranch
	(2) 2-1-009:001 (por.)	ʻUlupalakua Ranch
	(2) 2-1-009:999 (por.)	State of Hawaiʻi /County of Maui
	(2) 2-1-008:001 (por.)	ʻUlupalakua Ranch
Pāpaka Road/Construction Access Route	(2) 2-1-002:001 (por.)	State of Hawaiʻi
	(2) 2-1-003-999 (por.)	County of Maui
	(2) 2-1-002:002 (por.)	State of Hawaiʻi
	(2) 2-1-003-050 (por.)	State of Hawaiʻi
	(2) 2-1-003-054(por.)	State of Hawaiʻi
	(2) 2-1-004:006 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:016 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:017 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:018 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:049 (por.)	State of Hawaiʻi; leased by ʻUlupalakua Ranch
	(2) 2-1-004:071 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:106 (por.)	ʻUlupalakua Ranch
	(2) 2-1-004:999 (por.)	County of Maui
	(2) 2-1-005:023 (por.)	ʻUlupalakua Ranch Private Party (Piltz)
	(2) 2-1-005:030 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:045 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:055 (por.)	State of Hawaiʻi; leased by ʻUlupalakua Ranch
	(2) 2-1-005:057 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:077 (por.)	State of Hawaiʻi; leased by ʻUlupalakua Ranch
	(2) 2-1-005:095 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:100 (por.)	ʻUlupalakua Ranch
	(2) 2-1-005:108 (por.)	ATC Makena Holdings, LLC
	(2) 2-1-008:131 (por.)	County of Maui
	(2) 2-1-008:999 (por.)	State of Hawaiʻi /County of Maui

(por.) = only a portion of the TMK is crossed by the proposed Project.

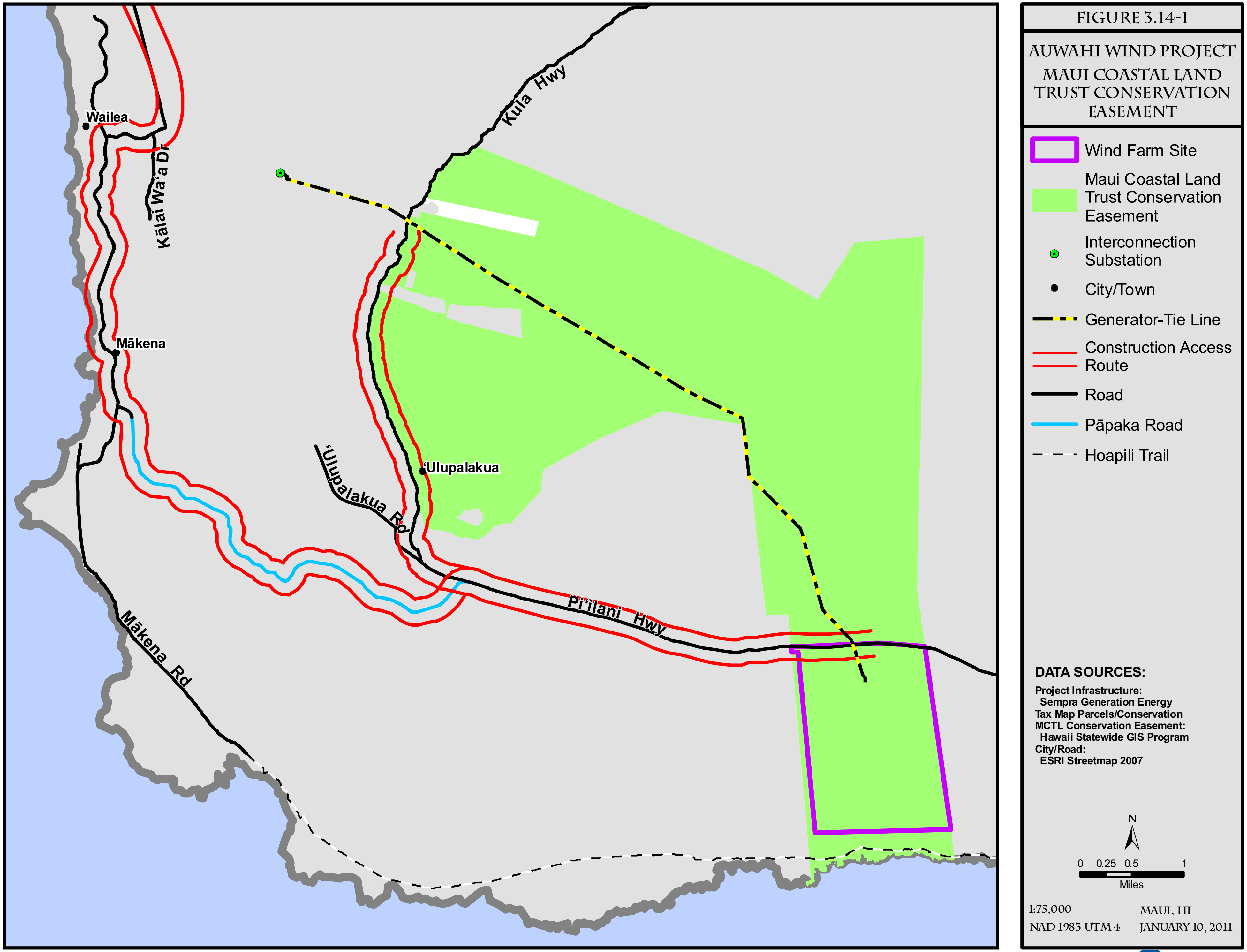

FIGURE 3.14-1

AUWAHI WIND PROJECT MAUI COASTAL LAND TRUST CONSERVATION EASEMENT

DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Tax Map Parcels/Conservation
MCTL Conservation Easement:
Hawaii Statewide GIS Program
City/Road:
ESRI Streetmap 2007

1:75,000
NAD 1983 UTM 4

MAUI, HI
JANUARY 10, 2011

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3.14.3 Potential Impacts and Mitigation Measures

3.14.3.1 Impact Methods and Factors Considered for Impacts Analysis

Impacts to land use and agriculture were assessed based on whether or not the proposed Project would be consistent with current and proposed land uses in the area. The evaluation of these potential impacts was based on the proposed Project's consistency with:

- Existing and planned use;
- Adopted land use plans; and
- Use of agricultural lands.

3.14.3.2 Construction Impacts

Impacts to land use during the construction phase of the proposed Project would include short-term disruption to ranching within the site. Cattle would likely not be grazing in the proposed Project site during construction. For more information on impacts to agricultural lands of importance, see Section 3.3 – Soils.

3.14.3.3 Operations and Maintenance Impacts

Wind farm facilities are widely recognized as being a compatible use of land with active ranches and farmlands; operations of the wind farm would not inhibit continued ranching or farming activities. While not only maintaining active cattle ranching operations and preserving the livelihood of ʻUlupalakua Ranch's employees, operations of the proposed Project are expected to increase the efficiency and productivity of ranching operations through the use of new access roads within the wind farm site. Development and operations of the proposed Project would allow the majority of the Auwahi parcel to remain as open space. The County of Maui Hāna Community Plan's objectives and policies include preserving open space and coastal vistas by "discouraging linear development along the highways" (Maui County Council 1994). While the proposed Project is not entirely a linear development, it would alter the scenic vistas and the qualities of "old Hawaiʻi" in the area. Visual impacts are discussed in detail in Section 3.13 – Visual Resources. The Hāna Community Plan objectives and policies also include "promoting the environmentally and culturally sensitive use of renewable energy resources, like biomass, solar energy, and wind energy, in all sectors of the community" (Maui County Council 1994). The proposed Project would help accomplish this. For further discussion on the proposed Project's consistency with the Maui County General Plan and the Hāna Community Plan, refer to Chapter 5, which assesses consistency with applicable land use plans and polices.

Under 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". The proposed Project, including the eastern half of the proposed generator-tie line and Pāpaka Road, is on land rated E. The western half of the proposed generator-tie line is on land rated C and D (Hawaiʻi Office of Planning 2010) (Figure 3.3-2). See Section 3.3 – Soils for more information on the agricultural productivity ratings. 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 (CUP) will be submitted to the County of Maui in compliance with the requirements of the Maui County Code.

Because the proposed Project would be compatible with the ongoing ranching activities at ‘Ulupalakua Ranch and would be consistent with the state and county regulations, plans, and objectives, it would be expected to have a less than significant impact on land use. Therefore, no mitigation measures are proposed. See Chapter 5 for additional discussion of the proposed Project's consistency with plans and policies.

3.14.3.4 No Action Alternative

No impacts to land use would occur under the No Action Alternative because conditions and activities would remain unchanged.

3.14.3.5 Avoidance, Minimization, and Mitigation Measures

No avoidance, minimization, or mitigation measures are proposed at this time.

3.14.3.6 Summary of Impacts

Table 3.14-2 summarizes impacts to land use and existing activities.

Table 3.14-2.
Summary of Potential Impacts to Land Use and Existing Activities

Impact Issues	Proposed Project	No Action Alternative
Consistency with existing and planned uses	⊙	○
Consistency with adopted land use plans	⊙	○
Use of agricultural lands	⊙	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⦸= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A = Not applicable
○= No impact

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3.15 PUBLIC AND CONSTRUCTION SAFETY

3.15.1 Definition of Resource

Public and worker safety concerns associated with a wind power project involve standard construction-related and operation-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. The ROI for this analysis includes the wind farm site, the generator-tie line corridor, the construction access route, and the interconnection substation site.

Public and worker safety concerns associated with the construction and operations of a wind power project are unique and the focus of this section. Compared to other types of generating facilities, wind power projects use few hazardous materials and generate few such wastes. However, WTGs 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 lightning strikes. Other potential safety concerns associated with the proposed Project include electric and magnetic fields (EMF).

3.15.2 Existing Conditions

The proposed Project is currently composed of open pastureland used for ʻUlupalakua Ranch's active ranching operation. Most of the proposed construction activities would be in remote areas not readily accessible by the public. Much of the proposed Project is fenced and public access is restricted. There are no significant public safety hazards associated with the existing pastureland or ranching operation. For information on the public facilities in the area such as police, fire, and medical services, see Section 3.17 – Public Infrastructure and Services.

3.15.2.1 Fire

The wind farm site is currently used as pastureland and has a limited history of fire incidents. The existing 69-kV MECO Wailea-Kealahou transmission line traverses the ranch property. No incidents of fire caused by the existing MECO transmission line have been reported.

3.15.2.2 Lightning Strikes

The occurrence of lightning in Hawaiʻi is rare, but does occur. No incidences of lightning strikes at ʻUlupalakua Ranch have been reported. For more information on lightning strikes, see Section 3.4 – Natural Hazards.

3.15.3 Potential Impacts and Mitigation Measures

3.15.3.1 Impact Methodology and Factors Considered for Impacts Analysis

The public safety assessment was based on an evaluation of whether the Applicant has committed to measures to be taken during the design, construction, and O&M phases of the proposed Project including:

- Designing all aspects of the proposed Project in accordance with applicable federal, state, and industry codes to minimize the potential for wind, ice, or fire to affect public safety;

- Committing to preparation and implementation of spill prevention, control and containment; notification protocols; immediate spill response procedures; hazardous material handling; and fire management plans during construction; and
- Developing and implementing plans covering routine and emergency measures planned to govern O&M.

3.15.3.2 Construction Impacts

Potential safety issues during construction are associated with public access to the proposed Project during construction and accidents or injuries of construction workers. Workers and the general public could be injured from the movement of construction vehicles, equipment, and materials. A Site Safety Handbook would be prepared and implemented prior to the start of construction. All persons entering the construction areas would be required to review and adhere to the Site Safety Handbook. This handbook would include measures such as establishing safety zones or setbacks from construction work areas and would identify requirements for temporary fencing around staging areas, storage yards, and excavations during construction to control and restrict public access to the construction area. The Site Safety Handbook would also include construction-related measures such as:

- Personal protective equipment requirements (e.g., hard hats, boots, eye protection, and hearing protection);
- Maintenance and operations standards for safety, fall protection, and lifting/rigging equipment, as well as power tools;
- Project speed limits;
- First aid procedures (i.e., weather exposure, insect bites/stings, minor injuries)
- A comprehensive emergency response plan;
- Onsite safety meeting requirements and communications procedures;
- A reporting system construction accidents, injuries, equipment damage, spills, and near misses;
- Applicable OSHA standards;
- Hazardous materials safety procedures; and
- Guidelines for specialized procedures such as cutting and welding, confined space entry, working in and around excavations and trenches; electrical work; working on high-voltage or distribution systems; critical lifting procedures (crane operation); and for conducting overhead work.

In addition to implementation of measures outlined in the Site Safety Handbook, standard construction BMPs would be implemented to reduce the potential for accidents or injuries. Additional measures related to the transport, handling, and storage of hazardous materials are addressed in Section 3.10 – Hazardous and Regulated Materials and Wastes. Collectively, with the restriction of access to the construction areas and implementation of the measures outlined above, potential impacts associated with public and construction worker safety would be minimized.

3.15.3.3 Operations and Maintenance Impacts

Tower Collapse/Blade Throw

Safety hazards related to WTGs include collapse of the WTG tower and rotor blades breaking causing parts to fall or be thrown from the nacelle. Both tower collapse or blade throw can result from improper design, manufacturing, or installation; wind gusts exceeding the WTGs maximum design load; or from lightning strikes (Griffith 2007). It is very rare for a WTG to collapse or a rotor blade to be dropped or thrown from the nacelle, but such incidents do occur and are potentially dangerous for site personnel and the general public.

Compliance with industry standards for design, construction, and operation of WTGs can appropriately and effectively reduce the potential for tower collapse and blade throw (AWEA 2008). Based on the preliminary geotechnical investigation at the proposed site, the foundation for the WTG would likely be spread footing with rock dowels and the foundation for each WTG would consist of approximately 229 cubic meters (300 cubic yards) of concrete, reinforcing bars, and anchor bolts. Operation of the proposed WTG would include a preventative maintenance program that would call for the WTG to be inspected and all major mechanical components, lubrication systems, gearboxes, generators, blades, electrical and transformer components, communication and SCADA components, and meteorological instrumentation to be serviced.

Additional policies and procedures related to routine tower climbing, tower safety and rescue, and fire prevention (see additional discussion below) would be included in the Site Safety Handbook described above. All persons entering the wind farm site would be required to maintain compliance with the Site Safety Handbook. This would ensure a safe work environment is maintained at all times.

Implementing the measures outlined in the Site Safety Handbook and designing and constructing the WTGs per industry specifications and standards would minimize the potential for tower collapse and blade throw. The occurrence of tower collapse and blade throw is rare and the site is on private land; therefore, the general public would not have access to the site, further reducing impacts to public safety. In addition, the WTGs are set back from the parcel line at least 134 meters (440 feet). For these reasons, less than significant impacts to public safety would be expected.

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 and ranchers whose livestock can receive electrical shocks. When electrical systems are grounded some current flows through the earth and a small voltage develops at each point where the system is grounded. Stray voltage can occur if unbalanced neutral currents flow in the earth through ground rods, pipes, or other conducting objects in a facility (AWEA 2008). Stray voltage may come from damaged or poorly connected wiring systems, corrosion on either end of the wires, or weak or damaged insulation materials on the "hot" wire.

Under the proposed action, a three-phase 34.5-kV generator-tie line would be connected to a collector switchyard with a 69-kV interconnection substation. Construction of the generator-tie line would follow standard industry procedures including structure assembly and erection, ground wire, and conductor stringing. O&M activities would include routine monitoring, inspection, and maintenance by qualified personnel. No impacts to public safety from stray voltage are expected.

Fire

The threat of fire associated with the operation of WTGs could result from the electrical collection system and generator-tie lines, the storage and use of flammable materials and equipment, and malfunction of the WTGs. However, as referenced in Section 3.4.2.7, the chance of fire in a Siemens or GE WTG is extremely low. The Confederation of Fire Protection Associations guidelines identify multiple features of risk associated with WTGs including the potential for fire in the nacelle because of the high concentration of values in the nacelle and the concentration of potential ignition sources in the nacelle (CFPA 2010). Values in this context refer to operating parameters such as pressure and temperature of mechanical and electrical systems that are monitored. If the limiting value is exceeded, alarms are triggered, ultimately leading to an automatic shutdown. WTGs contain relatively few flammable components, although the presence of electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic), does create the potential for fire in 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 switchyard, staging and laydown area, and the O&M building.

The potential fire hazards at the proposed site include the electrical collections system and generator-tie line, storage and use of flammable materials and equipment, and malfunction of the WTGs. Auwahi Wind has developed an FMP to mitigate the risk of fire posed by construction and operations of the wind farm. The plan identifies potential fire hazards and provides pre-suppression actions that include ignition prevention, firebreaks, fuel breaks, and fuels management. A copy of the FMP is in Appendix A.

The construction of the underground electrical collection system would deliver energy from the WTGs to the collection substation. By constructing an underground electrical collection system, the likelihood of a fire is greatly reduced as compared to aboveground electric lines. The proposed generator-tie line would connect the collection substation to MECO's existing grid system. The proposed generator-tie line corridor would connect to the existing MECO Wailea-Kealahou 69-kV generator-tie line and would be similar to others in the area. Maintenance on the generator-tie line and generator-tie line corridor would be performed regularly and would reduce potential for fire hazards. During construction and once the WTGs are in operation, diesel fuel, gasoline, lubricating oils, antifreeze, and hydraulic fluids would be used and stored in various areas onsite. Designated storage areas for various types of materials that are potential fire hazards would be provided and include dry containment cabinets for secured storage of hazardous and flammable materials, a containment berm for large vessels containing petroleum products, and secondary fuel containment. In addition to designating storage areas, an SPCC Plan would be developed and implemented. See Section 3.10 – Hazardous and Regulated Materials and Wastes, for more information.

Sempra received statistics about the risk of fire in WTGs from the WTG manufacturers being considered for the proposed Project. As of October 2010, Siemens has installed over 11,000 MW worldwide with almost 4,000 MW in the United States. These figures include over 3,000 individual Siemens 2.3-MW WTGs representing approximately 7,000 MW of generating capacity. Of all the Siemens 2.3-MW WTGs installed worldwide, there have been no reported fires in the nacelle located at the top of the WTG tower. For fire prevention, Siemens installs smoke detectors in areas where there could be an electrical fire. The nacelles have an efficient lightning protection system consisting of steel mesh that acts as a Faraday Cage to prevent fires resulting from lightning strikes. The monitoring and control capability (both onsite and remote) further reduces the risk of fire by monitoring key component temperatures. In addition, the advanced Siemens 3.0-MW WTG has no gearbox lubricating oil inside the nacelle because the direct drive design eliminates the gearbox. Therefore, this WTG design should reduce the risk of fire even further.

Another WTG being evaluated is the GE 1.5-MW model. GE has installed almost 15,000 WTGS of this type worldwide over the past 10 years. During this period, the rate of fire was less than three-tenths of one percent (0.027 percent), representing four reported fires out of nearly 15,000 installations. GE determined the cause was a faulty capacitor inside the converter cabinet, and subsequently fixed the problem in 2004. The affected area was inside the bottom part of the steel tower shell and did not involve the nacelle at the top of the tower. Like other WTG suppliers, GE has over-temperature sensors that will shut down the WTG if normal temperature limits are exceeded.

Manufacturers' recommendations would be followed for construction of the WTGs and maintenance of the mechanical and electrical systems within the turbine and nacelle. These measures, in addition to comply with the Project FMP, would reduce the potential for fire hazards from malfunctions in the nacelle. Therefore, less than significant impacts to public safety from fire hazards would be expected under the proposed Project.

Lightning Strikes

Because of their height and metal and carbon components, WTGs are susceptible to lightning strikes. Comprehensive statistics on lightning strikes to WTGs 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). Under the proposed Project, the design of the WTGs would include a lightning protection system in the grounding of the WTGs to minimize potential adverse effects from lightning strikes. If a WTG failed as a result of lightning strike, there is a potential for pieces of the blades to break or even shatter. However, the area of the proposed wind farm site is on private land with no general public access. Failure of a WTG due to lightning strike would not impact public safety.

Electric and Magnetic Fields

Power lines, like the energized components of electrical motors, home wiring, lighting, and all 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 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 generator-tie lines and 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 from the line. The strength of the electric field is measured in kilovolts per meter.

Magnetic fields around generator-tie lines and 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.

The potential EMF produced by the generation and export of electricity from the WTGs would have no effect on the health and safety of the public or the workers at the wind power facility. The electrical collection system would be constructed underground and the design of the generator-tie line would adhere to industry standards minimizing EMF exposure.

3.15.3.4 No Action Alternative

Under the No Action Alternative, conditions affecting public safety would remain as they are under existing conditions. The wind farm would not be constructed and the open pastureland used for ‘Ulupalakua Ranch’s active ranching operation would remain unchanged. No effects on public safety are expected under the No Action Alternative.

3.15.3.5 Avoidance, Minimization, and Mitigation Measures

As described above, the Applicant will implement the design features, industry-standard BMPs, and Project plans (e.g., Site Safety Handbook) listed in Table 2-4 related to policies and procedures for construction and O&M safety, resulting in less than significant impacts to public and construction safety; therefore, no additional mitigation measures are required.

3.15.3.6 Summary of Impacts

Table 3.15-1 summarizes potential public safety impacts associated with the proposed Project.

Table 3.15-1.
Summary of Potential Public Safety Impacts

Impact Issues	Proposed Project	No Action Alternative
Injuries to workers and the general public from the movement of construction vehicles, equipment, and materials	⊙	○
Falling overhead objects during construction	⊙	○
Falls into open excavations	⊙	○
Electrocution during construction	⊙	○
Tower collapse/blade throw	⊙	○
Stray voltage	○	○
Fire	⊙	○
Lightning strikes	○	○
Electric and magnetic fields	○	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⦸= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A = Not applicable
○= No impact

3.16 SOCIOECONOMIC CHARACTERISTICS

3.16.1 Definition of Resource

Socioeconomic data describe the population, economic condition, and quality of life. 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 ROI, or geographic area, that was selected as the basis on which socioeconomic impacts of the proposed Project will be analyzed includes Maui County.

3.16.2 Existing Conditions

3.16.2.1 Population

As shown in Table 3.16-1, the island of Maui has experienced a dramatic population increase since the 1970s, and its resident population is projected to increase by approximately 50 percent from 117,644 in 2000, to 176,687 in 2030 (County of Maui 2010d).

Table 3.16-1.
Population Trends for Maui County

	2000	2005	2010	2030	% Change 2000-2030
Maui County	117,644	129,471	135,838	176,687	50%

Source: County of Maui (2010d)

3.16.2.2 Economy

Regional Quality of Life

The proposed Project would be located in a rural area known for its open space, cattle ranching, sugar cane, vegetable and flower exports, and luxury homes. 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 (County of Maui 2010b) 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 (County of Maui 2010b).

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 communities. The arts, entertainment, and recreation, accommodation, and food services sector employed the greatest number of workers in the county in 2000 and 2008. The second largest employer sector was the educational services and health care and social assistance sector. Table 3.16-2 presents the distribution of employment for the county among the various industry sectors and the changes experienced in these sectors between 2000 and 2008. The Draft Maui Island Plan (County of Maui 2010b) states that a large proportion of jobs in Maui County are low-wage jobs, often related to tourism. The low wages require most households to support themselves with two or more jobs, because of the high cost of living and housing.

Table 3.16-2.
Sector Employment for Maui County

Sector	Maui County			
	Number of Persons, 2000	**Percent of Total, 2000**	**Number of Persons, 2008**	**Percent of Total, 2008**
Agriculture, forestry, fishing and hunting, and mining	2,246	3.6%	1,859	2.4%
Construction	4,369	6.9%	9,805	12.9%
Manufacturing	2,148	3.4%	2,243	3.0%
Wholesale trade	1,735	2.7%	1,164	1.5%
Retail trade	7,597	12.1%	9,327	12.3%
Transportation and warehousing, and utilities	3,639	5.8%	3,074	4.0%
Information	1,178	1.9%	680	0.9%
Finance and insurance, and real estate and rental and leasing	4,211	6.7%	5,377	7.1%
Professional, scientific, and management, and administrative and waste management services	5,101	8.1%	9,083	11.9%
Educational services, and health care, and social assistance	9,489	15.1%	12,813	16.8%
Arts, entertainment, and recreation, and accommodation, and food services	16,116	25.6%	15,112	19.9%
Other services, except public administration	2,523	4.0%	2,282	3.0%
Public administration	2,583	4.1%	3,276	4.3%
Total employment	**62,935**	**100%**	**76,095**	**100%**

Source: U.S. Census Bureau (2000, 2008a)

Overall, employment rates for Maui Island are forecasted to remain steady, closely tracking the statewide average. The unemployment rate for Maui Island, according to the State of Hawai‘i, Department of Labor and Industrial Relations, was 8 percent in November 2010 (HIWI 2010).

The proposed Project site is in a designated Enterprise Zone that 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 (DBEDT 2010).

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 41 percent from $591,222 in 2003 to $831,424 in 2008 (County of Maui 2010d). According to the Maui Realtors Association, the current year-to-date median single-family home price is $460,000.

The median household income in Hawai‘i ($67,214) is 29 percent greater than the national average ($52,029), but housing units are approximately 283 percent more expensive (U.S. Census 2008b, 2008c, 2008d, 2008e). The overall homeownership rate for Maui is approximately 57 percent, which is nearly the same for the rest of the state, but less than the U.S. average of 66.2 percent (County of Maui 2010d; U.S. Census 2010). The housing vacancy rate for homeowners is very low in Maui (2.3 percent), but rental housing vacancy rates are high (28.8 percent) compared to Hawaiian and U.S. averages. Over a third of Maui's housing units are in multi-unit buildings (U.S. Census 2008f).

3.16.3 Potential Impacts and Mitigation Measures

3.16.3.1 Impact Methodology and Factors Considered for Impacts Analysis

Each of the proposed Project alternatives are reviewed and evaluated to identify potential beneficial or adverse impacts to conditions in the ROI. For the proposed Project, impacts to population, employment, housing, and quality of life were evaluated qualitatively. Three factors were considered in determining whether an alternative would have a significant impact on socioeconomics include the extent or degree to which its implementation would change:

- Population,
- Employment and total income in Maui County, and
- Demand on housing.

Depending on which WTG model is selected and the grading analysis to be conducted during the final design, the wind farm site access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Chapter 2 for additional details). The impacts of the construction of the straightened road alignment to the socioeconomic characteristics of the ROI would be the same as the proposed WTG access road alignment; therefore, the two road alignments are not differentiated in the discussion below.

3.16.3.2 Construction Impacts

Population and Housing

The proposed Project does not conflict with any general or community plan goals 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 plans.

Economy

The Project would generate approximately 50 short-term construction jobs. As shown in Table 3.16-3, the estimated cost for construction would be $140 million, of which approximately $62.25 million (45 percent) would be spent in Hawai‘i.

Table 3.16-3.
Allocation of Construction Costs (Hawai‘i vs. Out of State)

Item	Order-of Magnitude Cost (in million 2010$)	Location of Expenditures (% of Total)		Expenditures (in million $) by Location	
		Out of State	Hawai‘i	Out of State	Hawai‘i
Onsite Roads, WTG Pads, Collection System, Other Site Development	$32.2	40%	60%	$12.88	$19.32
Offsite Roads	$2.0	0%	100%	$0	$2.0
Wind Turbine Equipment and Battery System	$55.7	50%	50%	$27.85	$27.85
Turbine Installation & Commissioning	$11.9	70%	30%	$8.33	$3.57
Transportation & Logistics (including to Port)	$13.0	85%	15%	$11.05	$1.95
Collection Substation, Interconnect Substation, Generator-tie Line	$24.5	70%	30%	$17.15	$7.35
Operations and Maintenance Building	$0.7	70%	30%	$0.49	$0.21
TOTAL	$140.0	55%	45%	$77.75	$62.25

Source: Compiled by Tetra Tech based on estimates provided by Auwahi Wind.

The DBEDT developed estimates of the impact construction expenditures have on other industries in Hawai‘i. A model called the Hawai‘i Input-Output (I-O) Model is used. This measures the relationship of an industry in the local economy to every other industry. This model measures both the direct impacts or economic activity in the construction industry and indirect impacts or additional economic activity. Based on the estimated impact of construction on the economy in 2000, for every direct dollar spent, $1.27 in indirect impact economic impact is generated (DBEDT 2007).

The Inter-County I-O model provides county-specific information not contained in the Hawai‘i I-O Model. The Inter-County I-O Model "shows the value of goods and services flowing among the various economic sectors *within each county*, and it also accounts for flows that occur among the various sectors *between counties*" (DBEDT 2007). Therefore, it can better assess the impacts of county-specific economic activities and provide a useful tool in assessing linkages between rural and urban communities in the state economy. The multipliers in Inter-County I-O Model (for Maui) were applied to the $62.25 million dollar in-state construction expenditures estimated for the proposed Project to calculate the direct, indirect, and induced effects on economic output, earnings, and employment in Hawai‘i. This is shown in Table 3.16-4.

> *A Type I multiplier shows the economic activity produced by the initial final demand change (called the direct effect) and the purchases of inputs from local industries necessary to supply the final demand change (called the indirect effect). A Type II multiplier accounts for the direct effect, the indirect effect, plus the economic activity produced by the consumption spending related to the earnings induced by the direct and indirect effects of the final demand change (called the induced effect) (DBEDT 2007).*

Table 3.16-4.
Project-Related Expenditure Impacts to Economic Output, Earnings, and Employment in Hawai'i

Component	Type I (Direct and Indirect)		Induced		Type II (Total)	
	Multiplier	Amount ($M)	Multiplier	Amount ($M)	Multiplier	Amount ($M)
Output	1.42	$88.4	0.54	$36.6	1.96	$122.0
Earnings	0.45	$28.0	0.14	$8.7	0.59	$36.7
Jobs	12.7	791 persons/year	5.7	355 persons/year	18.4	1,145 persons/year

Source: Compiled by Tetra Tech using expenditures in Table 3.15-2 and factors from the Inter-County I-O Model (DBEDT 2007).

Short-term beneficial impacts would occur from implementing the proposed Project. The projected construction expenditures for the new facilities would marginally increase employment and income in the ROI for the duration of construction and would have a short-term beneficial impact.

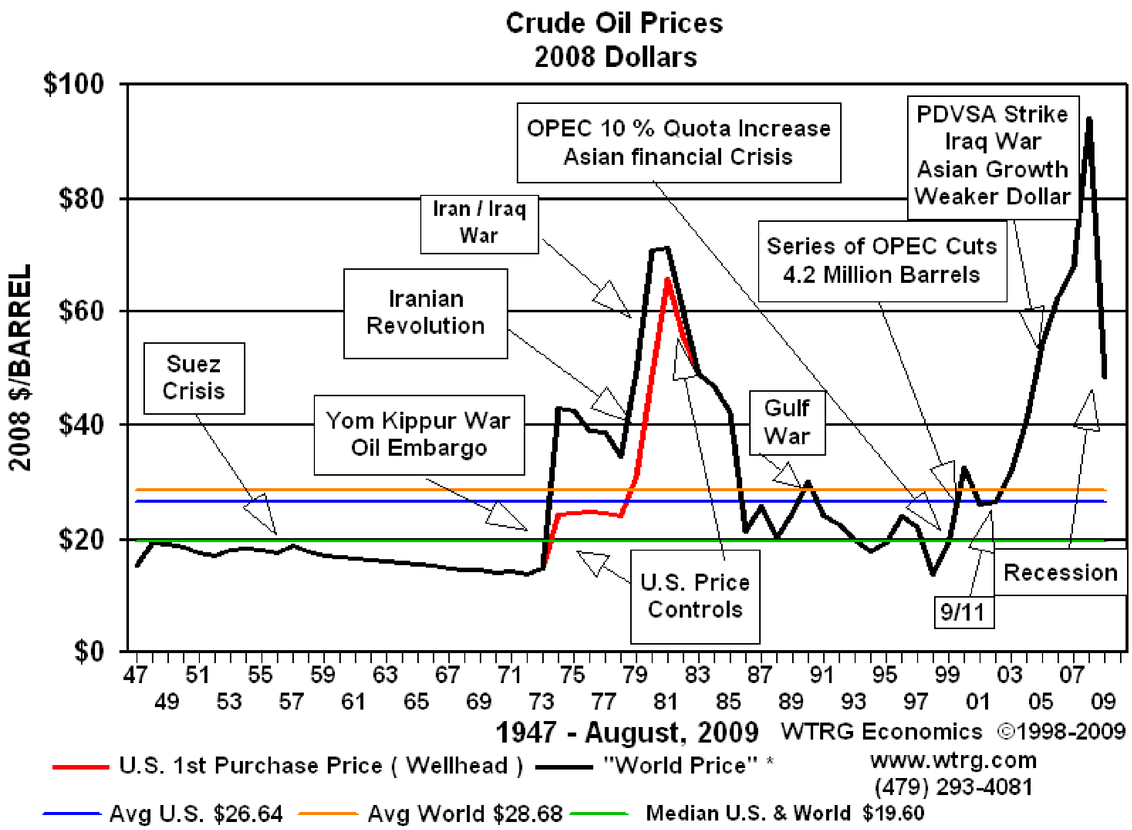
3.16.3.3 Operations and Maintenance Impacts

If the proposed Project is built, there would be approximately five full-time jobs for skilled operators to operate the wind farm and maintain the WTGs and generator-tie lines when the facility is in full operation. Wind energy would provide a set rate through a PPA and therefore prices would not fluctuate with the cost of crude oil. For these reasons, the proposed Project is expected to result in small, beneficial impacts related to employment and electricity rates.

3.16.3.4 No Action Alternative

Under the No Action Alternative, existing conditions would not change; however, the socioeconomic impact would vary. It would be favorable to those who value protection of natural open space lands, but unfavorable to those who value the development of wind energy resources to support renewable energy goals. Potential economic gains from the development of the proposed Project would not occur under this alternative. The existing demand on fossil fuels would continue and, as is shown in Figure 3.16-1, oil prices can vary dramatically depending on world conditions. Wind energy would provide a set rate through a PPA and therefore prices would not fluctuate with the cost of crude oil. Under the No Action Alternative, new jobs and revenue would not be created; therefore, there would be minor negative effects on the local economy.

Figure 3.16-1. Crude Oil Prices



Source: WTRG 2009

3.16.3.5 Avoidance, Minimization, and Mitigation Measures

The proposed Project would have no adverse effects on the socioeconomic characteristics of the ROI; therefore, no additional avoidance, minimization, or mitigation measures are proposed for this resource.

3.16.3.6 Summary of Impacts

Table 3.16-5 presents a summary of potential socioeconomic impacts associated with the proposed Project.

Table 3.16-5.
Summary of Potential Socioeconomic Impacts

Impact Issues	Proposed Project	No Action Alternative
Population	○	○
Employment and Total Income in Maui County	+	⊙
Demand on Housing	○	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:

⊗= Significant impact
⃠= Significant but mitigable to less than significant impact
⊙= Less than significant impact
+ = Beneficial impact
N/A= Not applicable
○= No impact

3.17 PUBLIC INFRASTRUCTURE AND SERVICES

3.17.1 Definition of Resource

This section 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. For this evaluation, the ROI includes the proposed Project site and the surrounding area serviced by utility providers on Maui.

3.17.2 Existing Conditions

3.17.2.1 Electric

The sole electrical utility in Maui County is MECO. It has two plants on Maui, with a total generating capacity of 2,328 MW. The plant located closest to the proposed Project site is in Ma‘alaea and the nearest substation is in Wailea, adjacent to the proposed interconnection substation. Seventy-nine percent of the county's electric power comes from imported oil; the remainder is generated from alternative energy sources including biomass, wind, and hydropower. The wind farm site does not have electric power and the nearest existing utilities are approximately 8.9 kilometers (5.5 miles) from the site entrance. There is an existing MECO transmission line in the general vicinity of the proposed generator-tie line.

3.17.2.2 Solid Waste

Solid waste service is not currently available at the proposed Project site. The Central Maui Sanitary Landfill in Pu‘unēnē receives approximately 907 metric tons (1,000 tons) of refuse per day and is projected to reach capacity in 2024 (GBB 2009). The Central Maui Sanitary Landfill accepts refuse and some hazardous wastes including petroleum products, paint, and contaminated soil and has sufficient capacity (Central Maui Sanitary Landfill 2010). The Maui Demolition and Construction Landfill in Kihei is a privately operated landfill for construction and demolition (C&D) material. The Maui Demolition and Construction Landfill accepts concrete, wood, rock, plastic, metal, and clean dirt and does not anticipate capacity issues (Maui Demolition and Construction Landfill 2010). Unitek removes waste materials such as used oil drums, coolant, and tires and does not anticipate capacity issues (Unitek 2010). Commercial recyclers on the island accept scrap metal for recycling, and compost facilities such as the Maui EKO co-composting facility at the Central Maui Sanitary Landfill accept green waste.

3.17.2.3 Water and Waste Water

Water supply services for most areas of the county are provided by the county's Department of Water Supply. Maui County's average daily production is 443 million liters (117 million gallons) of water (County of Maui 2010). Water 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's Department of Environmental Management has three wastewater reclamation facilities located on Maui in Kihei, Wailuku-Kahului, and Lahaina, which have a design capacity of 22.7, 25.7, and 30.0 million liters (6.0, 6.8 and 8.0 million gallons) per day, respectively. The wastewater processed at each facility is 20.4, 22.7, and 25.4 million liters (5.4, 6.0, and 6.7 million gallons) per day, respectively (Maui Economic Development Board 2008).

The proposed Project site does not currently receive water or wastewater services. There is no public water supply along the proposed generator-tie line. The proposed interconnection substation site has access to infrastructure for water and wastewater services.

3.17.2.4 Police and Fire Protection Services

The proposed Project is designated as a County of Maui Fire Department primary response area. In these areas, the County of Maui Fire Department has the primary responsibility for responding to fires, but under specific circumstances, they can request assistance from the state DOFAW. The main fire station on Maui is in Kahului. The closest fire station to the wind farm site and most of the generator-tie line corridor is in Kula, with an additional station in Makawao. The current response time to ‘Ulupalakua Ranch headquarters from the Kula fire station is approximately 20 minutes.

The Maui Police Headquarters are in Wailuku, and the closest police station is in Kihei.

3.17.2.5 Health Care Facilities and Emergency Medical Services

The nearest hospital is the Kula Hospital, in Kula approximately 11.3 kilometers (7 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.

3.17.2.6 Education Facilities

There are no public schools or facilities within or adjacent to the proposed Project area. The closest elementary school is Kula Elementary, approximately 19.3 kilometers (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 proposed Project site. The nearest intermediate school is Samuel Enoka Kalama Intermediate School, in Makawao, approximately 30.6 kilometers (19 miles) north of the wind farm site. The closest high school is King Kekaulike High School, in Pukalani, approximately 17 miles north of the site.

3.17.2.7 Recreation Facilities

There are several recreational facilities in the proposed Project vicinity. Haleakalā National Park is on Haleakalā summit, approximately 12.9 kilometers (8 miles) northeast of the wind farm site. Kula Forest Reserve, which includes several hiking trails, is approximately 6.4 kilometers (4 miles) north of the site. The Kanaio NAR is adjacent to the proposed wind farm and generator-tie line corridor. The 8.9-kilometer (5.5-mile) Hoapili Trail, part of Na Ala Hele, the state of Hawai‘i Trail and Access Program, is immediately south of the wind farm site.

The Mākena-Wailea coastline, west of the wind farm site and near the proposed interconnection substation, has several resort hotels, golf courses, Mākena State Park, ‘Ahihi-Kina‘u NAR, and notable beaches. The beaches offer swimming, surfing, boating, and shore fishing opportunities.

3.17.3 Potential Impacts and Mitigation Measures

3.17.3.1 Impact Methodology and Factors Considered for Impacts Analysis

This section analyzes potential effects on electricity, solid waste management, water and wastewater management, police and fire protection services, health care facilities and emergency medical services, education facilities, and recreation facilities. Potential infrastructure shortfalls, inconsistencies, inadequacies, or deficiencies identified between the existing infrastructure and the requirements of a Project alternative would be effects.

Factors considered in determining whether an alternative would have a significant impact on utilities include the extent or degree to which its implementation would:

- Interrupt or disrupt any public utility service, from physical displacement and subsequent relocation of public utility infrastructure, in a manner that would be a direct, long-term service interruption or permanent disruption of essential public utilities; and
- Require an increase in demand for public services or utilities beyond the capacity of the utility provider so that substantial expansion, additional facilities, or increased staffing levels would be necessary.

The methods used to determine whether a Project alternative would have a significant impact on public infrastructure and services are:

- Review and evaluate existing and past activities to identify the action's potential to affect utilities;
- Review and evaluate each Project alternative to identify the action's potential to affect utilities; and
- Assess the compliance of the proposed alternative with applicable federal, state, or local regulations, guidelines, and pollution prevention measures.

Depending on which WTG model is selected and the grading analysis to be conducted during the final design, the WTG access roads may be straightened to reduce the number of switchbacks and possibly reduce the overall length of the steep grades (see Chapter 2 for additional details). The potential impacts of the construction of the straightened road alignment on public infrastructure and services would be the same as the proposed turbine access road alignment; therefore, the two road alignments are not differentiated further here.

3.17.3.2 Construction Impacts

<u>Electric</u>

During construction, electricity would be required at the temporary modular office space. Electricity required for onsite facilities during construction may be provided by generators for temporary power or from a permanent distribution line if installed prior to construction start. The electric demand to operate the modular office space would be minimal. If the permanent distribution line were installed prior to construction activities, the demand on the utilities would not be significant.

<u>Solid Waste</u>

Debris generated during construction of the proposed Project would temporarily increase solid waste streams from current levels. The construction contractor will be responsible for the provision of waste collection facilities including maintenance, sorting, offsite transportation, and disposal. During construction, non-recyclable waste would be transported from the site to either the Central Maui Sanitary Landfill in Pu‘unēnē or the Maui C&D Landfill in Kihei or picked up by Unitek. Allowable hazardous waste and petroleum products and contaminated soil would be disposed of at the Central Maui Sanitary Landfill. Unitek would remove used oil, tires, and other hazardous waste. Scrap metal would be transported to commercial recyclers and cleared brush would be transported to a composting facility. Construction debris that could not be recycled included concrete and metal would be disposed at the Maui C&D Landfill. Although the capacity of these waste disposal facilities is finite, it would be sufficient to accommodate construction of the proposed Project. Therefore, waste from constructing the proposed Project would not cause significant impacts to the existing facilities or exceed the capacity of the facilities.

Water and Wastewater

During construction, water would be required for dust suppression and emergency fire suppression. Approximately 95,000 liters (25,000 gallons) of water would be used per day onsite. Three options for providing water to the proposed Project site are being considered: from an onsite well, by truck transport, or by in-line pumps with high-density polyethylene (HDPE) pipe. If a well is drilled onsite, there would be no impacts to the public water supply and distribution system. The second option would involve trucking water to the wind farm site, which may require up to 1,600 truck loads for the duration of Project construction. This option would increase the amount of traffic along the construction access route (Section 3.9 – Transportation and Traffic). The additional traffic, in combination with other Project-related traffic, would result in a less than significant increase in the risk of traffic accidents that would require police, fire, and emergency medical response, as discussed below. Water trucks would be filled at a location to be determined by the construction contractor. The third option would require pumping water with in-line pumps from the Mākena Resort through HDPE pipe to a polyvinyl chloride-lined reservoir with a standpipe and tank. The reservoir would be approximately 2,323 square meters (25,000 square feet) and would be located on the wind farm site.

Portable toilets would be provided during construction. Wastewater would be collected by a private contractor and transported to a regulated facility for disposal. During construction, the wastewater from portable toilets would be minimal and the existing treatment and disposal facilities have adequate capacity to accommodate the temporary increase in sanitary wastewater.

Police and Fire Protection Services

During construction, the transport of equipment and materials to and from the site, the increased activity at the site and on surrounding roads, and the increased presence and activity of site personnel would increase the potential for traffic accidents, injuries, and fires that would require a response by police and fire protection services. Therefore, an increased demand on police and fire services is expected. Fire, police, and emergency services are all available, and implementation of the proposed Project would not be expected to significantly impact the current service levels. These emergency response agencies have the ability to respond to such emergencies with an estimated response time to the ʻUlupalakua Ranch headquarters of approximately 20 minutes.

As described in Section 3.4, an FMP has been prepared to provide a coordinated response in the event of a wildfire and is included as Appendix A. As described in Sections 3.4 – Natural Hazards and 3.10 – Hazardous and Regulated Materials and Wastes, emergency response procedures would be developed and documented, either as part of a hazardous materials management plan or as a separate emergency response plan. A copy of this plan would be provided to local emergency responders so that they could properly coordinate with site personnel to respond to an emergency at the site.

Given the relatively remote location of the proposed Project and the fact that some incidents require an immediate response, it is anticipated that emergency response would involve a combination of onsite response and response from local police, fire, and emergency medical responders, depending on the severity and location of the accident or emergency condition. For example, a small fire or minor injury could be dealt with by site personnel, while response to a larger fire or more severe injury might begin with trained site personnel but would require coordination with and response by local emergency response agencies.

Impacts to police and fire services would be less than significant because the agencies have sufficient capacity to respond to incidents at the site and emergency response personnel would have the opportunity to review and comment on the Project-specific FMP and emergency response plan so that responses would be properly coordinated with site personnel.

Health Care Facilities and Emergency Medical Services

During construction, the presence of equipment and materials and the increased presence of site personnel would increase the potential for injury and need for medical care and emergency services. The nearest hospital is the Kula Hospital, approximately 11 kilometers (7 miles) from the site; however, any emergencies requiring ambulance service would be directed to the Maui Memorial Hospital in Wailuku. As described in Section 3.15 – Public and Construction Safety, a Site Safety Handbook would be prepared. All persons entering the construction areas would be required to review and adhere to the Site Safety Handbook. The plan would include contact information and map and directions to both the Kula and Maui Memorial Hospitals. The Site Safety Handbook would also provide specific direction for maintaining safe working conditions at the site, following company safety policies, and complying with state and federal occupational safety regulations, thus reducing the potential for injury and need for medical services. Existing services are expected to be adequate to accommodate illness or injuries from construction-related incidents.

Education Facilities

Construction of the proposed Project would have no effect on public schools.

Recreation Facilities

The Haleakalā National Park and the Kula Forest Reserve are several miles from the proposed Project. Construction of the proposed Project would not affect users of these recreational areas. The proposed Project is adjacent to the Kanaio NAR and north of the Hoapili Trail. The use of these facilities would not be interrupted by construction of the proposed Project. Construction would occur within the limits of the site boundary on ʻUlupalakua Ranch and would not extend into the Kanaio NAR or on to the Hoapili Trail.

3.17.3.3 Operations and Maintenance Impacts

Electric

Electric requirements for the O&M building and the met tower may be obtained through a MECO transmission circuit in the same transmission line (or generator-tie line) corridor through which power from the proposed Project would be fed. The long-term operation of the O&M building and the met tower would increase electrical demand on MECO's system; however, the increase would be minor resulting in less than significant impacts to the existing system. A final decision for providing electricity required for the O&M building and the met tower will depend on the owner and MECO's preference. Otherwise, generators would be utilized to provide electricity to the O&M building and met tower.

Solid Waste

Solid waste generated from the long-term operation of the proposed Project would be minimal. Waste generated during the operation of the wind farm would primarily be municipal solid waste from the kitchen, bathrooms and offices in the O&M building. This would be transported to the Central Maui Sanitary Landfill in Puʻunēnē. Recycling of solid wastes will be done to the maximum extent practicable.

Water and Wastewater

The O&M building would include a kitchen and bathrooms. Water may be provided by an onsite well, trucked in, or pumped in and stored in onsite storage tanks. If a well is drilled onsite, there would be no impacts to the public water supply and distribution system given the current capacity of the aquifers underlying the wind farm site (see Section 3.5 – Hydrology and Water Resources for additional discussion). If water is pumped to the wind farm site and stored in tanks, demand on the public water supply and distribution system would increase. Approximately five employees would be required to operate the proposed wind farm, resulting in an average daily demand of approximately 3,006 liters (529 gallons) of water per day, with a maximum daily demand of 6,007 liters (794 gallons) and a peak hour demand of 4.2 liters per minute (1.1 gallons per minute). These estimates are based on HAR § 11-62, Water Systems Standards, and represent a preliminary, conservative estimate. It is anticipated that actual domestic water consumption during Project operation would be less. Because this increased demand is slight, impacts to the public water supply and distribution system would not be expected to be significant.

An onsite septic system would be constructed for the O&M building for wastewater from the bathroom and kitchen facilities. An individual sanitation system would be developed per HAR § 11-62-3, Individual Wastewater Systems. This system would be pumped by a private contractor and disposed of in one of the County of Maui's wastewater reclamation facilities. Because of the small number of employees required to operate the proposed wind farm, a small amount of wastewater would be generated and impacts to the existing wastewater disposal and treatment facilities would not be expected to be significant.

Police and Fire Protection Services

Police and fire services are all available in the proposed Project, and the long-term operation of the wind farm would not be expected to significantly impact the current service levels. In addition, the County of Maui Fire Department has conducted rescue training in the event wind farm personnel need to be rescued from a WTG.

Health Care Facilities and Emergency Medical Services

The remote location of the wind farm site and the inaccessibility for the public reduces the potential for injury from the operation of the wind farm. Operations staff would receive appropriate training to effectively and safely carry out their assigned tasks. The likelihood of incidents requiring medical treatment would be low and the existing services are expected to be adequate to accommodate illness or injuries from operating the wind farm.

Education Facilities

Impacts to education facilities during the operations of the wind farm would be the same as those described for construction. There would be no impacts to education facilities from the operation of the proposed Project. As mentioned in Chapter 2, educational signage would be placed in a turn-out area near the wind farm site to provide the public with general information about the area s well as specific information related to the proposed Project.

Recreation Facilities

Impacts to recreational facilities during the operation of the wind farm would be the same as those described for construction. The proposed Project would not interrupt recreational users at Haleakalā National Park, Kula Forest Reserve, Kanaio NAR, or on the Hoapili Trail. As mentioned in Chapter 2, educational signage would be placed in a turn-out area near the wind farm site to provide the public with general information about the area as well as specific information related to the proposed Project.

3.17.3.4 No Action Alternative

Under the No Action Alternative, conditions affecting public infrastructure and services would remain as they are currently. The wind farm would not be built and the open pastureland used for ‘Ulupalakua Ranch’s active ranching operation would remain unchanged. No effects on public infrastructure and services are expected under the No Action Alternative.

3.17.3.5 Avoidance, Minimization, and Mitigation Measures

As described in the previous sections, the impacts of the proposed Project related to public infrastructure and services would be less than significant; therefore, no avoidance, minimization, or mitigation measures are required.

3.17.3.6 Summary of Impacts

Table 3.17-1 summarizes impacts to public infrastructure and services associated with the proposed Project.

Table 3.17-1.
Summary of Potential Public Infrastructure and Services Impacts

Impact Issues	Proposed Project	No Action Alternative
Electric	⊙	○
Solid waste	⊙	○
Water supply and distribution for fire suppression	⊙	○
Water supply and distribution for consumption	⊙	○
Sanitary wastewater	⊙	○
Police and fire protection services	⊙	○
Health care facilities and emergency medical services	⊙	○
Education facilities	○	○
Recreation facilities	○	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table.

LEGEND:
⊗= Significant impact + = Beneficial impact
⃠= Significant but mitigable to less than significant impact N/A = Not applicable
⊙= Less than significant impact ○= No impact

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4.0 CUMULATIVE IMPACTS

4.0 CUMULATIVE IMPACTS

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (HAR § 11-200). HAR § 11-200-17(g) requires that an EIS include "specific reference to related projects, public and private, existent or planned in the region … for purposes of examining the possible overall cumulative impacts of such actions."

This draft EIS analyzes the cumulative impact of the construction, operation and maintenance, closure and decommissioning of the proposed Project, taking into account the effects in common with other past, present, and reasonably foreseeable future projects. The cumulative impacts analysis highlights past projects that are closely-related either in time or space (i.e., temporally or in geographic proximity) to the proposed Project; present projects that are ongoing at the same time this EIS was being prepared; and reasonably foreseeable future projects, including those for which there are existing decisions, funding, formal proposals, or which are highly probable, based on known opportunities or trends.

For the purposes of this EIS, the temporal boundary of cumulative analysis is from approximately 2005 to 2015. This boundary encompasses a range within which data are reasonably available and forecasts can be reasonably made for past, present, and reasonably foreseeable future projects.

The intensity or severity of cumulative impacts considers the magnitude, geographic extent, duration and frequency of the impacts (CEQ 1997). The magnitude of the impact reflects the relative size or amount of the impact; the geographic extent considers how widespread the impact may be; and the duration and frequency refer to whether the impact is a one-time event, intermittent, or chronic (CEQ 1997). If the proposed Project and alternatives would have no direct or indirect effects on a resource, the draft EIS does not analyze potential cumulative effects on that resource.

For the proposed Project, the cumulative scenario includes projects identified in Table 4-1. This table identifies each project, describes the geographic scope of each project, and presents known or anticipated project timelines. Most of the projects listed below have been, are being, or would be required to undergo their own independent environmental review, as applicable.

Table 4-1
Cumulative Projects

Project	Related Project Location	Project Sponsor	Project Description	Project Start	Projected Completion Date
Communication Towers	Generator-tie Line		Two large communication towers located at the top of the ridge adjacent to the proposed generator-tie line alignment.		Completed

Table 4-1
Cumulative Projects

Project	Related Project Location	Project Sponsor	Project Description	Project Start	Projected Completion Date
Communication Tower	Generator-tie Line	Civil Defense	Small communication tower located adjacent to the generator-tie line alignment, approximately 1 mile from the top of the ridge heading towards Wailea.		Completed
Auwahi Forest Restoration Project	Generator-tie Line	Art Medeiros (USGS), various federal, state and local agencies, and community groups	A 76-hectare (188 acres) enclosure located at approximately 1,200 feet elevation in the Auwahi parcel. Within this exclosure, ungulates were eliminated, kikuyu grass mats were killed, and a program was initiated to augment numerous native plant species by broadcasting seeds and outplanting nursery-raised plants.	1997	Ongoing
Kahikinui Forest Project	Wind Farm, Generator-tie line	DHHL, DOFAW, Ka 'Ohana o Kahikinui, and the Leeward Haleakalā Watershed Restoration Partnership	Collaborative land management and forest restoration efforts including fencing, ungulate/predator removal, and native plant restoration on up to 8,000 acres. Parcels are owned by DHHL and DOFAW and located along the southern border of Haleakala National Park.	TBD	TBD
Daily Ranching Activities	All	ʻUlupalakua Ranch	Road, fence, and waterline maintenance, cattle herding; approximately 72 water tanks are located throughout the ranch.		Ongoing
Honuaʻula	Inter-connection Substation	Honuaʻula Partners, LLC	A 670-acre planned development project including a mix of single and multi-family housing, infrastructure improvements, private internal road system with pedestrian and bicycle pathways, golf courses, parks, and open spaces.	TBD	TBD

Table 4-1
Cumulative Projects

Project	Related Project Location	Project Sponsor	Project Description	Project Start	Projected Completion Date
Wailea Ike Drive/ Wailea Alanui Drive Intersection Improvement Project	Construction Access Route	Honua'ula Partners, LLC	Modification of Wailea Alanue Drive and Wailea Ike Drive through widening the north and south portions of the intersection to fulfill county zoning requirements. Additional improvements include construction of a concrete curb and gutter, sidewalk and curb ramps, installation of asphalt concrete pavement, relocation and/or modification of the traffic signal system, roadway pavement marking and signing, and revegetation. Project will improve intersection operations as traffic increases over time.	2012	TBD
Pi'ilani Highway/Wailea Ike Drive Road Widening Project	Construction Access Route	Honua'ula Partners, LLC, ATC Makena Holdings LLC, A&B Wailea LLC, and Keaka LLC	Construction of two additional lanes and related improvements on Pi'ilani Highway from north of Kilohana Drive to Wailea Ike Drive at Pi'ilani Highways existing terminus.	2012	TBD

The specific area of cumulative impact varies by resource. For each resource, the geographic scope of analysis is based on the topography surrounding the proposed Project and the natural boundaries of the resource affected, rather than jurisdictional boundaries. The geographic scope of cumulative impacts often extends beyond the scope of the direct effects, but not beyond the scope of the direct and indirect effects of the proposed Project and alternatives. The discussion below for individual resources identifies the relevant geographic scope for each discipline's analysis of cumulative impacts. Only issue areas with the potential to impact a given resource are discussed in the subsections below; and it can be assumed that if an ongoing or foreseeable project is not mentioned, it would have no impact on that resource.

In addition, each project in a region would have its own implementation schedule, which may or may not coincide or overlap with the proposed Project's schedule. This is a consideration for short-term impacts from the proposed Project. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the proposed Project.

The geographic extent from which cumulative projects were identified was defined by project component and associated activities. For the wind farm site and generator-tie line, an approximately 3.2-kilometer (2-mile) boundary was drawn. For the construction access route (Pāpaka Road) and interconnection substation, the boundary was approximately 1.7 kilometers (1 mile). Pāpaka Road would be upgraded in areas to accommodate large vehicles, but would only be used temporarily during construction. Although the interconnection substation is just a little over a mile from the Wailea area, access for both construction and operations will be from Kula Highway. Therefore the boundary does not include the Wailea area.

The following discussion focuses on cumulative impacts to each resource area that resulted in direct or indirect impacts as a result of the proposed Project. Under the No Action Alternative the Project would not be constructed and it would not contribute incrementally to cumulative impacts for any resource area.

4.1 CLIMATE

Climate change impacts from GHGs occur at regional, continental, and global geographic scales. For the cumulative analysis of climate impacts, the appropriate geographic area is east Maui to provide an understanding of current regional GHG emissions and to understand how the proposed Project would contribute to regional GHG levels. Local emissions of GHGs become a smaller fraction of cumulative GHG emissions as geographic scale increases from regional to continental and global scales. Greenhouse gas pollutants typically have long atmospheric residence times, ranging from several years to centuries. The conventional assessment of global warming potentials uses a 100-year time frame. In contrast to ambient air quality conditions, climate change conditions at any point in time are driven primarily by cumulative historical GHG emissions on a regional or larger geographic scale, rather than recent GHG emissions on a local scale.

Given that the long-term climate change impact of the proposed Project is a beneficial one resulting in displacement of fossil fuel combustion as a source of power generation, the cumulative effects discussion related to climate focuses on GHG emissions. The greatest benefit of wind power is energy generation without air emissions, including carbon dioxide. Of the six GHGs, carbon dioxide is the single largest contributor to emissions on Maui, comprising approximately 87 percent of all GHG emissions from on-island sources in 2007 (ICF 2008). The energy sector (industrial and commercial uses, electric power, transportation, etc.) accounted for 2.3 million tons of carbon dioxide emitted on Maui in 2007 (ICF 2008). Operations of the proposed Project would reduce carbon dioxide emissions by approximately 12,278 tons per hour of operation. Consequently, the proposed Project would have a net benefit on cumulative climate change impacts in combination with other development projects in Table 4-1.

4.2 GEOLOGY AND TOPOGRAPHY

For the cumulative analysis of geologic and topographic impacts, the appropriate geographic area is east Maui. The entire area is in the vicinity of Haleakala, and all of the foreseeable projects listed in Table 4-1 would be subject to volcanic activity and have the potential to impact the function of the same landscape within which the proposed Project is located. The proposed Project does not contain areas of geologic importance and it would not result in significant impacts to geology or topography; with implementation of the mitigation measures as proposed in this EIS in Section 3.2, these risks would be reduced even further. Therefore, the proposed Project would not contribute incrementally to cumulative impacts on geology and topography that could result from the projects listed in Table 4-1.

4.3 SOILS

For the cumulative analysis of impacts on soils, the appropriate geographic area is the ʻUlupalakua Ranch because this captures all areas where potential increases in erosion due to soil disturbance from the proposed Project could occur. As described in Section 3.3 – Soils, impacts from the proposed Project would be less than significant. Therefore, the proposed Project would not contribute incrementally to cumulative impacts on soils potentially generated by the projects listed in Table 4-1.

4.4 NATURAL HAZARDS

For the cumulative analysis of impacts associated with natural hazards, the appropriate geographic area is east Maui because natural hazards take place on a regional scale. As described in Section 3.4 – Natural Hazards, fire is the only natural hazard likely to be impacted by the proposed Project. The proposed Project would have a very low potential for fire risk during construction and operations. With implementation of the mitigation measures as proposed in the FMP, these risks would be reduced even further. Other development projects in the ROI would have similar fire risks. Assuming similar precautions are taken, collectively the proposed Project in combination with other projects would have a low cumulative impact of fire risk.

4.5 HYDROLOGY AND WATER RESOURCES

For the cumulative analysis of impacts on hydrology and water resources, the appropriate geographic scale is all five watersheds within which the proposed Project is located. The potential impacts to hydrology and water resources resulting from the proposed Project would be short-term minor impacts to surface water associated with the proper management of stormwater during construction (see Section 3.5 – Hydrology and Water Resources). With implementation of the mitigation measures as proposed in this EIS in Section 3.5, these risks would be reduced to less than significant. Therefore, the proposed Project would not contribute incrementally to cumulative impacts on hydrology and water resources that could result from the projects listed in Table 4-1.

4.6 VEGETATION

For the cumulative analysis of impacts on vegetation, the appropriate geographic scale is the proposed Project plus a 0.4-kilometer (0.25-mile) buffer surrounding the generator-tie line and construction access route centerlines. This area encompass all direct and indirect impacts of the proposed Project. The proposed wind farm site, located entirely within the Maui Coastal Land Trust Conservation Easement, has very little development; however, past ranching operations have contributed to the overall loss of native vegetation, increased the spread of invasive plant species, and have had potential adverse effects on special status and rare plants and their habitat. Ongoing or proposed restoration efforts in the Auwahi Forest Restoration Project and within the Kahikinui Forest Project would reestablish native vegetation. The only foreseeable project in the ROI with potential impacts to vegetation, the Honuaʻula project, located west of the proposed interconnection substation, would result in additional vegetation removal and has the potential to increase the spread of invasive plant species. These impacts would be minimized if the appropriate measures would be taken by the Honuaʻula project to avoid sensitive plant communities and if standard practices for minimizing the introduction and spread of invasive plant species would be implemented during construction and operations. When viewed in terms of the overall ROI, the potential combined area of disturbance from the proposed Project, the Honua'ula project, and ongoing ranching activities is not expected to result in significant cumulative effects. Overall, considered together with these past, present, and reasonably foreseeable future actions, the cumulative effect of the proposed Project on vegetation is expected to be low.

4.7 WILDLIFE

For the cumulative analysis of impacts on wildlife, the appropriate geographic scale is the proposed Project plus a 0.4-kilometer (0.25-mile) buffer surrounding the construction access route and generator-tie line centerlines. This area includes all direct impacts of the proposed Project on wildlife and wildlife habitat, as well as a reasonable distance beyond which construction or operations of this or other projects is unlikely to disturb wildlife. A discussion of cumulative impacts on non-listed wildlife, MBTA-protected species, Hawai'i Species of Concern, and ESA-listed and species under consideration for listing is provided below.

4.7.1 Non-listed Wildlife

The proposed Project occurs in an area with very little development because it is located entirely within the Maui Coastal Land Trust Conservation Easement. Past ranching operations have resulted in decreased habitat quality because of the introduction and spread of nonnative invasive vegetation. However, ongoing restoration efforts in the Auwahi Forest Restoration Project are working to reestablish native vegetation. The only foreseeable project in the ROI for wildlife, the Honua'ula project, located west of the proposed interconnection substation, would result in additional habitat loss. The proposed Project would make a minor contribution to a cumulative reduction of habitat for some non-listed wildlife species resulting from these past, ongoing, and future actions listed in Table 4-1. However, most of the non-listed wildlife species occurring on the property are common and not native to Hawai'i and generally tolerant of development. Additionally, none of these actions would result in a substantial loss of native vegetation. Therefore, cumulative effects to non-listed wildlife associated with habitat loss or fragmentation are expected to be minor.

There are three existing communication towers near the generator-tie line that present a potential collision risk for non-listed avian species. The proposed wind turbines and met tower would contribute to this risk. As noted above, post-construction monitoring at the wind farm site would assess Project-related effects to all species. Therefore, this risk would be managed to an acceptable level.

There are no other projects proposed that would result in noise or disturbance to wildlife, with the exception of ongoing ranch operations and current use of roads within the proposed Project area. These actions produce the existing level of noise and disturbance within the ROI, and are expected to continue during Project operations. Background noise levels would increase during construction of the two foreseeable road construction projects, but would return to normal levels once construction activities are complete. The proposed Project would contribute to the existing level of noise during construction and due to normal facility operation. Therefore, there would be a cumulative effect to non-listed wildlife associated with noise and disturbance but it would not be expected to preclude non-listed wildlife species from using the ROI.

4.7.2 MBTA Species

Impacts to MBTA-protected avian species from past, present, and future actions in the ROI would be similar to those described above for non-listed avian wildlife including past reductions in habitat quality or quantity associated with ongoing land uses on the ʻUlupalakua Ranch, collision risk due to the three existing communications towers along the generator-tie line, and noise and disturbance due to ongoing ranch operations and use of existing roads. The Honuaʻula project would also result in noise and disturbance and habitat loss. In contrast, the Auwahi Forest Restoration Project and Kahikinui Forest Project would have beneficial impacts to habitat for migratory bird species. Although the proposed Project would contribute to these effects through minor reductions in remnant native habitat, use of the proposed access roads, and operations of the WTGs, the proposed Project includes implementation of the most current avoidance and minimization measures recommended by the USFWS to reduce potential impacts to avian species associated with wind farm operation. Therefore, the proposed Project, would make a negligible contribution to cumulative effects to MBTA species.

4.7.3 Hawaiian Species of Concern

Ongoing use of roads within the ROI and the three existing communications towers presents potential collision risks with the Hawaiian short-eared owl and Pacific golden plover. Construction of the Honuaʻula project would result in noise and disturbance to these species. Use of the proposed access roads and construction and operation of the WTGs would contribute to this risk. However, mitigation measures including adhering to Project speed limits and minimizing nighttime lighting would reduce the proposed Project's contribution to these effects. For this reason, no significant adverse impacts to the species' overall population are expected and no significant cumulative impacts to the species are anticipated.

4.7.4 ESA-listed Species and Species Under Consideration for Listing

The presence of the three communications towers presents an existing risk of collision for the Newell's shearwater, Hawaiian petrel, Hawaiian hoary bat, and nēnē. In addition, ongoing use of roads within the ROI also present a risk of collision for the Blackburn's sphinx moth and yellow-faced bee. In contrast, dryland forest restoration efforts in the Auwahi Forest Restoration Project would improve habitat for species found in dryland forests including the Hawaiian hoary bat, Blackburn's sphinx moth, and yellow-faced bee. The proposed Project also presents a collision risk for avian and bat species, could result in the direct mortality of or loss of host plants for the Blackburn's sphinx moth and yellow-faced bee, and would remove a very minor amount of highly fragmented dryland forest vegetation. However, the mitigation for the proposed Project, as required under the HRS § 195D-4, will collectively provide a net benefit to these species. For these reasons, no significant cumulative effects to any of the listed species are anticipated.

4.8 ARCHAEOLOGICAL AND CULTURAL RESOURCES

For the cumulative analysis of impacts on archaeological and cultural resources, the appropriate geographic area consists of the proposed Project including the wind farm site, the generator-tie line, construction access route, interconnection substation, as well as the surrounding area. This area captures direct impacts of the project, including cultural impacts to the surrounding communities. The Honuaʻula project and the road improvement projects have the potential to cause adverse effects to unknown archaeological and cultural resources. Although project-specific archaeological and cultural resource evaluations would likely be required for the Honua'ula project and mitigation required where resources are identified during pedestrian surveys, it is likely that unknown resources may be encountered and lost during development of the Project. For the two road improvement projects, an archaeological resource monitoring plan will be implemented to avoid any impacts to archaeological and cultural resources during construction (Munekiyo and Hiraga, Inc. 2010a,b). Other ongoing activities in the ROI are not anticipated to impact archaeological and cultural resources. Some of the identified archaeological and cultural sites within the proposed Project are considered to be potentially eligible for listing on the NRHP and the HRHP. The possibility remains that additional resources could exist within the proposed Project where surface evidence was not visible at the time of the surveys. However, with the implementation of mitigation measures identified in Section 3.8 – Archaeological and Cultural Resources, which include worker sensitivity training and procedures to be followed if an unanticipated cultural resource is uncovered during the course of Project construction or operations, the proposed Project in combination with the Honuaʻula project and road improvement projects would not have a substantial cumulative impact on archaeological and cultural resources.

4.9 TRANSPORTATION AND TRAFFIC

For the cumulative analysis of impacts on transportation and traffic, the appropriate geographic area includes regional airports and harbors that could be used during construction of the proposed Project, the length of the existing roads used for Project construction, and the length of the existing roads to be reconstructed or new roads to be built for the Project. The proposed Project would result in short-term impacts to traffic during construction in association with improvements along the construction access route and with the transport of superloads. However, transportation of superloads that would disrupt traffic would require a permit from HDOT or DPW that would likely take into account other traffic disruptions. The short-term adverse traffic impacts would be mitigated with a traffic management plan and transporting superloads during off-peak traffic times. Therefore, the proposed Project would not contribute incrementally to cumulative impacts to traffic that could result from the projects listed in Table 4-1.

4.10 HAZARDOUS AND REGULATED MATERIALS AND WASTES

For the cumulative analysis of impacts associated with hazardous and regulated materials and wastes impacts, the appropriate geographic area includes the proposed Project and surrounding area because construction of the proposed Project would involve the transportation, use, and disposal of hazardous materials within this region on a daily basis. The proposed Project would comply with all relevant laws, ordinances, and regulations and implement standard industry BMPs related to hazardous materials management. Therefore, the proposed Project would not contribute incrementally to cumulative impacts related to hazardous and regulated materials and wastes that could result from the projects listed in Table 4-1.

4.11 NOISE

Cumulative effects to noise can result when sound levels generated by more than one wind farm or other source of noise within the ROI are individually minor, but collectively exceed regulatory thresholds. A new wind farm would need to be within approximately 2 to 3 kilometers (1.2 to 1.8 miles) of the proposed wind farm site to present a possible cumulative influence on sound. There are no known existing or proposed wind farms within this distance from the proposed Project; therefore, cumulative sound levels would not result from the Project operating in conjunction with any other wind farms. No additional sources of noise, such as indirect commercial or industrial development, are known to be planned in the near future in proximity to the proposed Project.

Therefore, the proposed Project would not be expected to contribute to cumulatively significant noise impacts.

4.12 AIR QUALITY

Cumulative air quality impacts would occur when multiple projects affect the same geographic areas at the same time or when sequential projects extend the duration of air quality impacts on a given area over a longer period of time. For the cumulative analysis of impacts on air quality, the appropriate geographic area is east Maui to provide an understanding of current air quality in the region and to understand how the proposed Project and ongoing and foreseeable projects contribute to regional air quality issues. Direct particulate matter emissions such as fugitive dust emissions from construction activities, generally have a localized impact, with the most noticeable impacts occurring within 0.8 kilometer (0.5 mile) or less of active construction sites. Pollutants formed through atmospheric chemical reactions (such as ozone and secondary particulate matter) affect lager geographic areas reflecting pollutant transport over periods of several hours to a few days. The time frame for these chemical reactions means that most emissions of precursor pollutants will be carried beyond the shoreline of Maui before the chemical reactions are completed. Consequently, no significant cumulative air quality impacts related to ozone or secondary particulate matter formation would be expected on Maui.

The wind farm site and most of the generator-tie line corridor fall within a conservation easement, which precludes the potential for most types of development close to sites of Project-related facilities. Existing ranching activities and the reforestation projects near the generator-tie line corridor do not generate large enough quantities of air pollutants to have any meaningful cumulative air quality effect in combination with the temporary construction activities associated with the proposed Project. Air quality could be locally degraded by fugitive dust and vehicle emissions during construction of the two road improvement projects and the Honuaʻula project; however, these impacts would be short-term and limited to the construction period. The proposed Project would contribute to this reduction in air quality; however, given the short-term nature of construction for all of these projects, the existing high air quality of the region, and the presence of the trade winds, any cumulative impacts would be minor and short-term.

4.13 VISUAL RESOURCES

Cumulative impacts associated with visual resources would generally occur where the project visibility is added to other dominant visual structures, such as other wind energy projects, existing transmission lines, and other tall structures or development areas. There are no existing wind energy projects or publicly proposed projects within a 16-kilometer (10-mile radius [i.e., the visual ROI]) that would be visible simultaneously with the proposed Project, as described in Section 3.13.

An existing transmission line runs near the proposed generator-tie line to the substation near Wailea. Other existing structures that could be visible along the generator-tie line corridor include two communication towers near the top of the ridge, one small civil defense communication tower, and various water tanks. These structures would be visible intermittently and generally from middle to background distances from roads in the vicinity of the generator-tie line corridor and therefore, as discussed in Section 3.13, existing views from various locations near the proposed Project would be altered to varying degrees. However, because views from Upcountry Piʻilani Highway would be temporary as travelers pass through, views from the Kanaio NAR would be largely screened by vegetation, and the most sensitive views from the southern coastline would be oriented away from the proposed Project, it is anticipated to have a negligible to low impact on visual and aesthetic quality. Therefore, the Project in combination with structures associated with projects listed in Table 4-1 would not result in significant cumulative visual impacts.

4.14 SURROUNDING LAND USE AND AGRICULTURE

The proposed Project would contribute to cumulative impacts on land use in the southeastern region of Maui, the geographic area in which cumulative effects are assessed for land use and agriculture. This area represents the level at which land use regulations, plans, or authorizations are in effect. The rural area and "old Hawai'i" landscape would be partially altered with the development of the wind farm; however, existing ranching activities would continue. The proposed Project would not contribute to cumulative impacts on existing activities or coastal zone management. The proposed Project would involve construction and operations of a wind farm on agricultural lands that are used for ranching operations; however, the ranching activities would continue mostly unaffected by the wind farm, though approximately 4 percent of the grasslands and pastures in the ROI would be permanently removed (see Section 3.7 – Vegetation for additional information). None of the foreseeable projects listed in Table 4-1 would result in a land use designation or result in the conversion of agricultural land to another land use. The Honua'ula project is in the State Urban District, and all activities proposed in association with this project are consistent with the Urban designation (PBR Hawaii and Associates, Inc. 2010). Therefore, with construction and operations of the proposed Project, in combination with the other foreseeable projects listed in Table 4-1, resulting land uses and corresponding activities would remain largely unchanged from the existing land uses in the region.

4.15 PUBLIC AND CONSTRUCTION SAFETY

For the cumulative analysis of impacts on public and construction safety, the appropriate geographic area includes the communities that coincide with the Project and all other areas occupied by people because these areas are where construction and operation of the proposed Project may affect the health and safety of people. The past, present, and reasonably foreseeable future actions combined with the proposed Project could affect public safety in this area. The construction of the Honua'ula project would include the construction of residential, commercial, recreational, and open space within 2 kilometers (1.2 miles) of the proposed interconnection substation. There is an increased risk of fire once areas not currently occupied are developed and the risk of construction work and public safety associated with construction activities and equipment. The proposed Project would have a very low risk of fire, and would minimize this risk by implementing the project FMP. Additionally, the proposed Project would meet construction safety standards and fire codes and adequate measures for effectively handling fires or other emergencies would be in place. Therefore, issues associated with public and construction safety would be minimized. Therefore, the proposed Project would not contribute incrementally to cumulative impacts to public and construction safety that could result from the projects listed in Table 4-1.

4.16 SOCIOECONOMIC CHARACTERISTICS

For the cumulative analysis of impacts on socioeconomic characteristics, the appropriate geographic area includes the communities that coincide with the proposed Project because these are where economic and other social impacts would occur. The proposed Project would increase economic activity and demand for services within the region. The Project, in combination with the proposed Honua'ula Project, would temporarily increase regional employment and spending during their construction phases. As such, the proposed Project would marginally contribute to cumulative beneficial impacts on the economy within the ROI in the near term.

4.17 PUBLIC INFRASTRUCTURE AND SERVICES

The past, present, and reasonably foreseeable future actions, combined with the proposed Project, could affect public infrastructure and services. For the cumulative analysis of impacts on public infrastructure and services, the appropriate geographic area includes the communities that coincide with the project because this encompasses areas that would provide the proposed Project with infrastructure and services. The existing infrastructure systems are adequate to support the needs of the proposed Project. Therefore, the proposed Project would not contribute incrementally to cumulative impacts to public and construction safety that could result from the projects listed in Table 4-1.

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5.0 REGULATORY CONTEXT / CONSISTENCY WITH PLANS AND POLICIES

5.0 REGULATORY CONTEXT / CONSISTENCY WITH PLANS AND POLICIES

The proposed Project would be subject to federal, state, and county regulations and policies, each of which is briefly described below. In addition, Section 5.4 includes a list of the permits and approvals that would be obtained pursuant to those regulations and policies.

5.1 FEDERAL REGULATIONS

5.1.1 Endangered Species Act

The purpose of the ESA (16 U.S.C. §§ 1531-1544), as amended, is to conserve threatened and endangered plant and animal species and their habitats, specifically those areas that have been designated as "critical habitat." The ESA defines an endangered species as one that is "in danger of extinction throughout all or a significant portion of its range" and a threatened species as one that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Critical habitat includes areas containing essential habitat features, regardless of whether those areas are currently occupied by the listed species. The sections of the ESA most relevant to this EIS are Sections 7, 9, and 10.

Under Section 7 of the ESA, federal agencies must consult with the USFWS and/or National Marine Fisheries Service (NMFS), depending on the species under review, to ensure that their actions are not likely to jeopardize the continued existence of endangered and threatened species or destroy or adversely modify critical habitat for endangered and threatened species. Section 9 of the ESA prohibits take of any threatened or endangered species without a permit, unless otherwise authorized. "Take" under the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct." "Harass," according to the definition of take in the ESA, means "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Harm" means "an act which actually kills or injures wildlife. Such acts may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3).

In 1982, Congress amended the ESA to allow a private applicant to incidentally take an ESA-listed species that would otherwise be prohibited under Section 9(a)(1)(B). When a non-federal landowner wishes to proceed with an activity that is legal in all other respects, but that may result in the incidental taking of a listed species, an ITP, as defined under Section 10 of the ESA, is required. Incidental take is defined as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" (50 CFR 17.3). An HCP must accompany an application for an ITP to demonstrate that all reasonable and prudent efforts have been made to avoid, minimize, and mitigate for the effects of the potential incidental take. To that end, an HCP specifies: (1) the impact that will likely result from the taking; (2) the steps that will be taken to "minimize and mitigate" these impacts, including the funding available to implement these steps; (3 alternatives to the taking that were considered and why such alternatives are not being pursued; and (4) any other measures required by the USFWS as necessary or appropriate to the HCP.

Guidance for preparation and required components of an HCP are provided in the USFWS HCP Handbook (USFWS and NMFS 1996). The USFWS and NMFS issued an addendum to the handbook in 2000 (USFWS and NMFS 2000). Known as the Five-point Policy, this addendum provides additional guidance on: (1) establishing and stating biological goals for HCPs; (2) clarifying and expanding the use of adaptive management where there is uncertainty about the experimental design and scientific evidence with respect to the HCP's approach to conservation; (3) clarifying the purpose and means of how to undertake species and habitat monitoring; (4) providing criteria to be considered by in determining incidental take permit duration; and (5) expanding public participation. Under the Five-point Policy, the USFWS and NMFS afford greater opportunity for public participation in the HCP development process by expanding the public comment period for most HCPs from 30 to 60 days. Additionally, the issuance of an ITP by the USFWS constitutes a federal action subject to Section 7 of the ESA, requiring the USFWS to conduct a Section 7 consultation to determine whether the Project would jeopardize a listed species or adversely modify its critical habitat.

Five federally listed wildlife species and one species under consideration for listing were identified as having the potential to occur in the ROI (Section 3.7 – Wildlife). The Applicant is developing an HCP in cooperation with the USFWS and will apply for an ITP, in accordance with the requirements of Section 10 of the ESA.

5.1.2 National Environmental Policy Act

Issuance of an ITP is a federal action subject to compliance with the procedural requirements of the National Environmental Policy Act (NEPA). The USFWS will prepare and provide for public review an Environmental Assessment (EA) to evaluate the potential environmental impacts of issuing an ITP and approving the implementation of the proposed Project HCP. The USFWS will not make a decision on ITP issuance until after the NEPA process is complete.

5.1.3 Migratory Bird Treaty Act

Under the MBTA (16 U.S.C. §§703-712), taking, killing, or possessing migratory birds is unlawful. Unless permitted by regulations, under the MBTA it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product. The MBTA provides no process for authorizing incidental take of MBTA-protected birds. The Hawaiian petrel and Newell's shearwater are protected under the MBTA. If the HCP is approved and USFWS issues an ITP to Auwahi Wind, the terms and conditions of that ITP would also constitute a special purpose permit under 50 CFR 21.27 for the take of the Hawaiian petrel and Newell's shearwater under the MBTA. Therefore, any such take of these species would not be in violation of the MBTA.

To avoid and minimize impacts to MBTA-protected species that are not listed as threatened or endangered, Auwahi Wind, to the extent consistent with the Project's purpose and need, has incorporated into the Project certain design and operations features contained in the Wind Turbine Guidelines Advisory Committee (2010) draft recommendations for wind energy development (issued to the Secretary of the Interior March 4, 2010). These guidelines contain materials to assist in evaluating possible wind power sites, WTG design and micro-siting, and pre- and post-construction research to identify and/or assess potential impacts to wildlife, including MBTA-listed species.

5.1.4 National Historic Preservation Act

The NHPA of 1966, as amended (Public Law 102-575), requires federal agencies to assure preservation or mitigation of effects to historic properties that are eligible for inclusion on the National Register of Historic Places. The issuance of an ITP is a federal undertaking subject to Section 106 of the NHPA. Cultural and archeological resources surveys have been conducted for the Project. The USFWS will coordinate with the SHPD on cultural resources and address any potential issues in the NEPA EA.

5.1.5 Clean Water Act

The purpose of the CWA is to "restore and maintain the chemical, physical and biological integrity of the nation's waters" (33 U.S.C. § 1251[a]). Section 402 of the CWA establishes the NPDES permit program to regulate point source discharges into waters of the U.S. The Applicant will apply for a Notice of General Permit Coverage for stormwater associated with construction activities. 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 USACE regulations under the Section 404 Program define "waters of the United States" to include (1) interstate waters; (2) waters which are or could be used in interstate commerce; (3) waters such as wetlands, which use or degradation could affect interstate commerce; (4) tributaries of the waters identified above; and (5) wetlands adjacent to these waters. These include such features ordinarily described as rivers, streams, estuaries, the territorial seas, ponds, lakes, and wetlands. Anyone planning to conduct activities in these waters must obtain a permit. Substantial impacts to waters of the United States may require an Individual Permit. Projects that only minimally affect jurisdictional waters may meet the conditions of one of the existing Nationwide Permits. Permit review and issuance involves a stepwise process that encourages avoidance of impacts and minimizing unavoidable impacts to jurisdictional areas and requires mitigation for such impacts.

The USACE takes jurisdiction over the following waters: (1) traditional navigable waters; (2) wetlands adjacent to traditional navigable waters; (3) non-navigable tributaries of traditional navigable waters that are relatively permanent (typically flow year-round or at least seasonally); and 4) wetlands that directly abut such tributaries. The USACE will decide jurisdiction over the following based on whether these waters have a significant nexus with a traditional navigable water: (1) non-navigable tributaries that are not relatively permanent; (2) wetlands adjacent to non-navigable tributaries that are not relatively permanent; and (3) wetlands adjacent to but that do not directly abut a relatively permanent non-tributary.

No " waters of the U.S." are in or near the proposed Project that are subject to jurisdiction under Section 404 of the CWA (David and Guinther 2011). An assessment was prepared by Guinther 2010 (see Appendix B) for the record and presentation to the USACE in May 2010 and a field verification was conducted in July 2010. Therefore, a USACE permit will not be required.

5.1.6 Clean Air Act

Under the authority of the CAA, the EPA 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, nitrogen dioxide, carbon monoxide, sulfur dioxide, 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 the HAAQS.

Based on measurements of ambient criteria pollutant data, EPA designates areas of the United States as having air quality equal to or better than NAAQS (attainment) or worse than NAAQS (non-attainment). The CAA general conformity rule requires that projects 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 would not be required for the Proposed Action. The necessary air permit(s), as required by HAR § 11-60.1, would be obtained prior to construction.

5.1.7 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 would file the notice after the turbine layout is final and prior to the initiation of turbine construction activities.

5.2 STATE REGULATIONS

5.2.1 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 significance criteria, as defined in HAR § 11-200-12. If a significant impact is anticipated from the start of a project, a Final EA may be prepared to serve as a mechanism for public comment and scoping. It was determined that the proposed Project may have a significant impact on the environment, so an EISPN/EA was prepared and published by the Office of Environmental Quality Control (OEQC) in the March 23, 2010, edition of the *Environmental Notice*.

The Proposed Project 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. Project components that will require the use of these lands are the generator-tie line and the construction access route. The proposed Project would also require approval from the County Planning Commission/County Planning Department for a CUP and an SMA Use Permit; these represent the early, major approvals required for the proposed Project. For the SMA permit application, the County requires that an EA or EIS be submitted if it is required to comply with HRS Chapter 343. Based on agreement between the various agencies, the County Planning Commission/Planning Department has been identified as the "accepting agency" for purposes of compliance with HRS Chapter 343.

5.2.2 Hawai‘i Coastal Zone Management Program (HRS § 205A)

The Hawai‘i Coastal Zone Management Program (HCZMP) was formalized in HRS § 205A, as amended, which complies with the Federal Coastal Zone Management Act of 1972 (16 U.S.C. §§ 1451-1456). The HCZMP provides guidance on managing the state's coastal areas including beaches, fishponds, scenic areas, marinas, wetlands, recreational areas open spaces, and ecosystems.

The HCZMP uses broad management to integrate decisions made by state and county agencies and provide better coordination of existing laws and rules. All lands of Hawai'i are considered to be within the coastal zone as defined by HRS § 205A.

The HCZMP gives the County of Maui regulatory control over development within the SMA and Shoreline Setback Area of the coastal zone. The following is a discussion of the proposed Project's consistency with the objectives and policies of HRS § 205A.

Recreational Resources

- Objective: *Provide coastal recreational opportunities accessible to the public.*
- Policies:
  - *Improve coordination and funding of coastal recreational planning and management; and;*
  - *Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
    - *Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
    - *Requiring replacement of coastal resources having significant recreational value including, but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;*
    - *Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
    - *Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
    - *Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;*
    - *Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;*
    - *Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and*
    - *Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.*

Discussion: The wind farm site and generator-tie line corridor are both on private lands. Although there is no public access through these areas, people in the surrounding communities are allowed access to the shoreline and other areas for cultural purposes. This would continue after implementation of the proposed Project. The Hoapili Trail runs along the coastline, just south of the wind farm site. Access to and use of the Hoapili Trail will not be impacted by the proposed Project.

Historic Resources

- Objective: *Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*
- Policies:
  - *Identify and analyze significant archaeological resources;*
  - *Maximize information retention through preservation of remains and artifacts or salvage operations; and*
  - *Support state goals for protection, restoration, interpretation and display of historic resources.*

Discussion: Section 3.8 – Archaeological and Cultural Resources addresses issues and potential impacts to cultural resources in more detail.

Scenic and Open Space Resources

- Objective: *Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.*
- Policies:
  - *Identify valued scenic resources in the coastal zone management areas;*
  - *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;*
  - *Preserve, maintain and where desirable, improve and restore shoreline open space and scenic resources; and*
  - *Encourage those developments that are not coastal dependent to locate in inland areas.*

Discussion: Section 3.14 – Land Use and Section 3.13 – Visual Resources address issues and potential impacts to open space in more detail.

Coastal Ecosystems

- Objective: *Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*
- Policies:
  - *Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*
  - *Improve the technical basis for natural resource management;*

  - *Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;*

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

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

Discussion: The proposed Project will not have an adverse impact on coastal ecosystems. There is no fringing reef along the Kahikinui coastline. Section 3.5 – Hydrology and Water Resources addresses potential impacts related to surface water and stormwater runoff.

<u>**Economic Uses**</u>

- Objective: *Provide public or private facilities and improvements important to the state's economy in suitable locations.*
- Policies:
  - *Concentrate coastal dependent development in appropriate areas;*

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

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

    - *Use of presently designated locations is not feasible;*

    - *Adverse environmental effects are minimized; and*

    - *Adverse environmental effects are minimized; and*

Discussion: Section 3.16 – Socioeconomic Characteristics and Section 3.13 – Visual Resources address issues and potential impacts related to the minimizing adverse social and visual impacts in the coastal zone management area, respectively. Potential impacts to biological resources are discussed in Sections 3.6 – Vegetation and 3.7 – Wildlife.

<u>**Coastal Hazards**</u>

- Objective: *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.*
- Policies:
  - *Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;*

- *Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;*
- *Ensure that developments comply with requirements of the Federal Flood Insurance Program; and*
- *Prevent coastal flooding from inland projects.*

Discussion: Section 3.5 – Natural Hazards and Section 3.15 – Public and Construction Safety address potential impacts related to coastal hazards.

Managing Development

- Objective: *Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*
- Policies:
  - *Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*
  - *Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and*
  - *Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

Discussion: Throughout the planning process, the Applicant has actively engaged government regulators, stakeholders, community groups, and individuals. The submittal of this Draft EIS in conjunction with the SMA Use Permit Application and CUP Application will facilitate the review process and public participation.

Public Participation

- Objective: *Stimulate public awareness, education, and participation in coastal management.*
- Policies:
  - *Promote public involvement in coastal zone management processes;*
  - *Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and*
  - *Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

Discussion: Section 7 – Consulted Parties discusses the public involvement activities related to the proposed Project.

Beach Protection

- Objective: *Protect beaches for public use and recreation.*

- Policies:
  - *Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;*
  - *Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities;*
  - *Minimize the construction of public erosion-protection structures seaward of the shoreline;*
  - *Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and*
  - *Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.*

Discussion: The Hoapili Trail runs along the coastline, just south of the wind farm site. Access to and use of the Hoapili Trail will not be impacted by the proposed Project

<u>Marine Resources</u>

- Objective: *Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*
- Policies:
  - *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*
  - *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;*
  - *Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;*
  - *Promote research, study, and understanding of ocean processes, marine life, and other ocean resources to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and*
  - *Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

Discussion: No impacts to marine resources are anticipated from the proposed Project. Section3.11 – Noise discusses potential underwater noise effects on marine life. Section 3.5 – Hydrology and Water Resources addresses potential impacts related to surface water and stormwater runoff.

5.2.3 State Land Use Law (HRS § 205)

The State Land Use Law (HRS Chapter 205) established the State Land Use Commission that has the authority to designate all state lands into one of four districts: urban, rural, agricultural, or conservation. The proposed Project would be in the state agricultural district, except for two portions of Pāpaka Road, one of which is in the urban district and the other in the conservation district (Figure 5-1).

Pursuant to HRS § 205-4.5(c), lands with productivity ratings of C, D, E, or U (see Figure 3.3-1) are restricted to the uses permitted for agricultural districts as set forth in HRS § 205-5(b) that permits activities compatible with those listed in HRS § 205-2, with the provision that those activities may be further defined by the County of Maui. 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 would not be required.

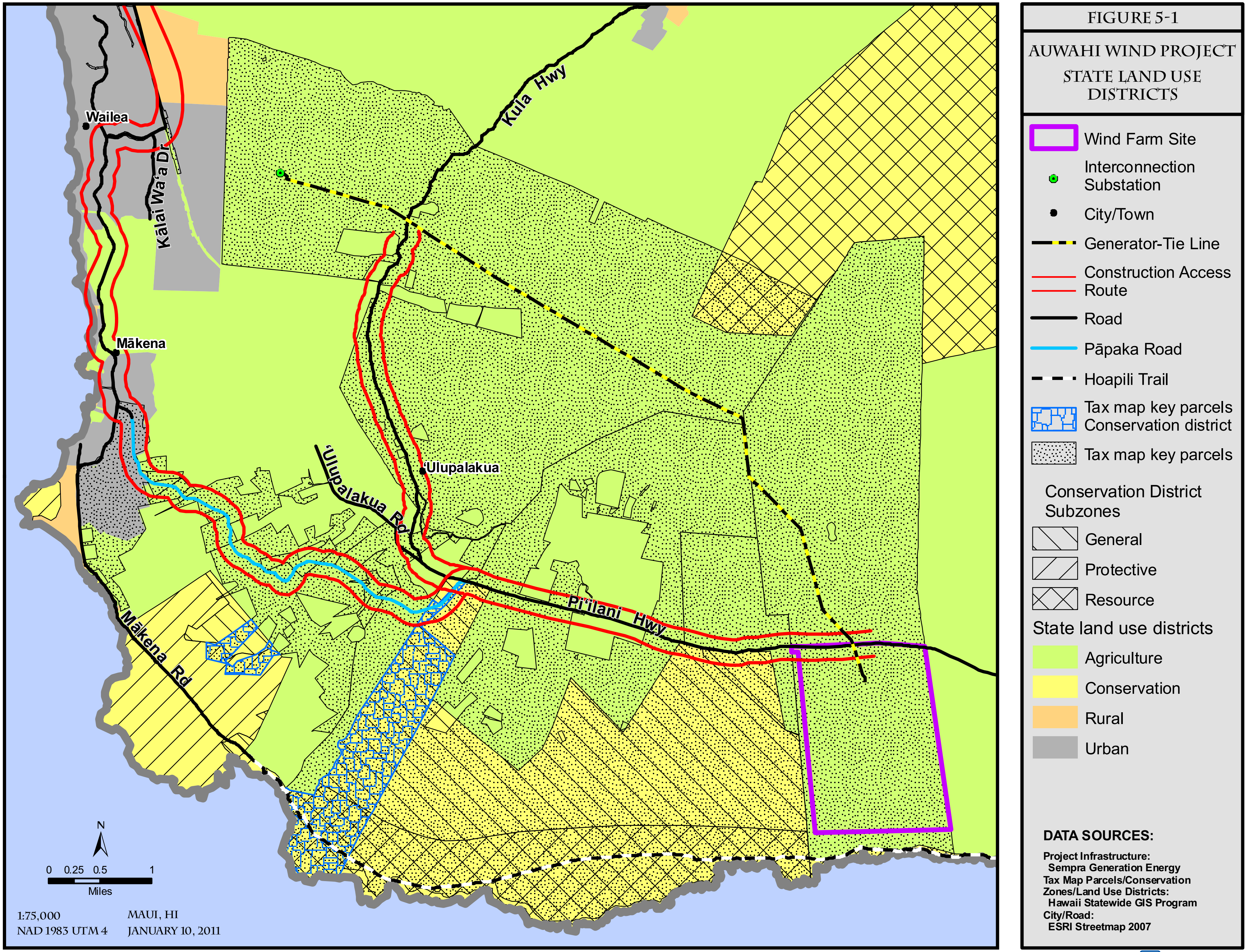
5.2.4 State Conservation District Law (HRS § 183C)

Land uses in the state conservation district are under the sole jurisdiction of the state and are governed by HRS § 183C and the rules of the DLNR (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, general, and a "special" subzone to accommodate unique projects (HRS § 183C-4). Parcel TMK (2) 2-1-004:006 is located in the resource and general subzones of the state conservation district. Parcels TMK (2) 2-1-004:049 and (2) 2-1-002:001 are in the protective and general subzones of the state conservation district; parcel TMK (2) 2-1-002-002 is in the general subzone (Figure 5-1). The portion of the proposed Project within the state conservation district is not within the county zoning jurisdiction. 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 would be sought for the small portion of Pāpaka Road and Upcountry Pi‘ilani Highway road improvements that are located within the conservation district. However, it should be noted that this portion of land is not located within the SMA boundaries.

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

Any species of aquatic life, wildlife, or land plant that has been determined to be a threatened or endangered species pursuant to the ESA 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;
- Overuse for commercial, sporting, scientific, educational, or other purposes;
- Disease or predation;
- The inadequacy of existing regulatory mechanisms; and
- Other natural or artificial factors affecting its continued existence in Hawai‘i.



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An ITL may be obtained from the DLNR 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. Four state and federally listed wildlife species have been identified in the ROI (Section 3.7 – Wildlife); therefore, the Applicant would apply for an ITL with the DLNR.

5.2.6 Hawai‘i State Plan (HRS § 226)

HRS § 226 serves as a guide for the long-range development of the State of Hawai‘i and provides a basis for determining goals, objectives, policies, and priorities for the state's limited resources. Relevant objects and policies within the HRS § 226 are as follows:

- Section 226-7: Objectives and policies for the economy—agriculture.
    - *Support research and development activities that provide greater efficiency and economic productivity in agriculture; and*
    - *Assure the availability of agricultural based lands with adequate water to accommodate present and future needs.*
    - *Promote economically competitive activities that increase Hawaii's agricultural self-sufficiency.*
- Section 226-11: Objectives and Policies for the physical environment—land-based, shoreline, and marine resources.
    - *Prudent use of Hawaii's land-based, shoreline, and marine resources;*
    - *Take into account the physical attributes of areas when planning and designing activities and facilities;*
    - *Mange natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage; and*
    - *Peruse compatible relationships among activities, facilities, and natural resources.*
- Section 226-12: Objective and policies for the physical environment—scenic, natural beauty, and historic resources.
    - *Promote the preservation of views and vistas to enhance historic, cultural, and scenic amenities;*
    - *Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features;*
    - *Encourage the design of developments and activities that complement the natural beauty of the islands.*
- Section 226-13: Objectives and policies for the physical environment—land, air, and water quality.
    - *Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources;*

- *Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people;*

- *Encourage design and construction practices that enhance the physical qualities of Hawaii's communities; and*

- *Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, the cultures, and visitors.*

- Section 226-18: Objectives and policies for facility systems—energy.
  - *Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;*
  - *Increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased; and*
  - *Ensure to the extent that new supply-side resources are needed, the development or expansion of energy systems utilizes the least-cost energy supply option and maximizes efficient technologies.*

5.2.7 State Historic Preservation Functional Plan

The State Historic Preservation Functional Plan serves as a guide for effective decision making on a general level, for coordinating historic preservation activities within Hawai'i, and for communicating statewide historic preservation goals, policies and objectives. See Section 3.8 – Archaeological and Cultural Resources for a discussion on the proposed Project's compliance with applicable historic preservation requirements.

5.3 LOCAL REGULATIONS

5.3.1 County Zoning

Under Chapter 19.30A.060(F) of the Maui County Code, some portions of the proposed Project, which are located in the County Agricultural zoning district, are considered a Special Use, because they meet 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 would require a CUP from the Maui Planning Commission. An application document has been prepared and submitted with the Draft EIS for concurrent processing by the Planning Department. Action on the CUP will be scheduled with the Maui Planning Commission as a public hearing item at the conclusion of the EIS process. All other project components are consistent with the underlying zoning designations. Table 5-1 lists the Project components that will require a CUP.

Table 5-1.
County Special Use Permit Project Components

Project Component	Tax Map Key (TMK)	Community Plan Region	Community Plan Designation	County Zoning
Wind Farm	(2) 1-9-001:006 (por.)	Hāna	Agriculture; Conservation	Agriculture; Interim
Interconnection Substation and Microwave Communication Tower	(2) 1-9-001:006 (por.)	Hāna	Agriculture; Conservation	Agriculture; Interim
	(2) 2-1-008:001 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture

(por.) = only a portion of the TMK is crossed by the proposed Project.

5.3.2 Special Management Area and Shoreline Setback Area

The SMA is a subset of the coastal zone and is regulated to ensure permitted activities are consistent with the objectives and policies of the Coastal Zone Management Act (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 entire proposed wind farm site, including the portion of the generator-tie line that is in the footprint of the wind farm site, is in the SMA (Figure 5-2). Approximately 1,500 lineal feet of the westernmost portion of Pāpaka Road is located in the SMA. With the exception of the portion that is in the wind farm, the generator-tie line, the interconnection substation and related improvements, and microwave communication tower are not in the SMA. Land in the SMA must comply with the goals and objectives of the CZMA. Therefore, an SMA Use Permit would be requested from the County of Maui for the development of the proposed wind farm and a portion of Pāpaka Road.

The southern extent of the proposed Project is more than 1,000 feet from the shoreline and the western extent of Pāpaka Road is approximately 1,300 feet from the shoreline. No portion of the proposed Project is located within the shoreline setback area of the Island of Maui and therefore the Project is not subject to Chapter 12-203, Shoreline Rules for the Maui Planning Commission.

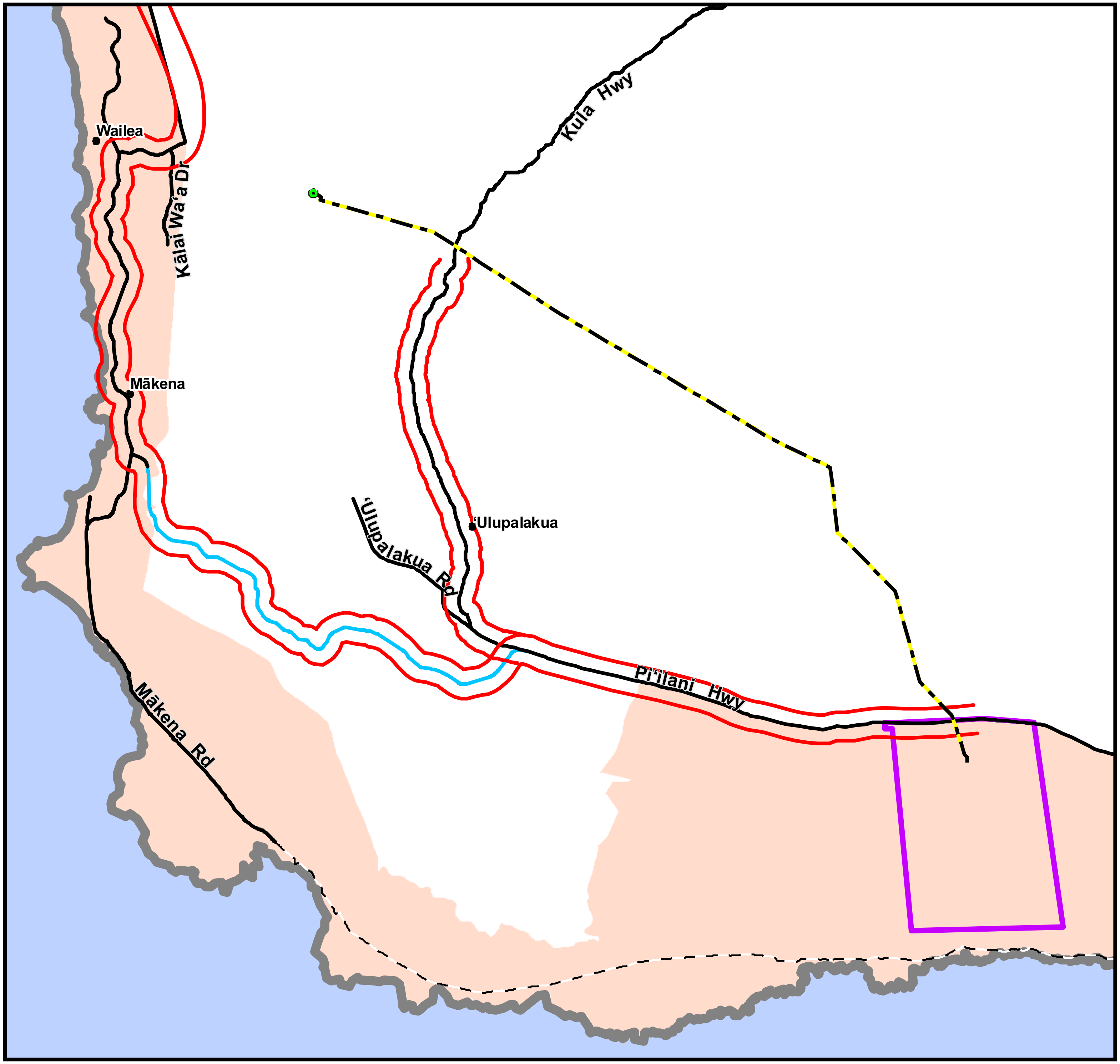
An SMA application document has been submitted with the Draft EIS for concurrent processing by the County of Maui Planning Department. The proposed Project is consistent with the Maui Planning Commission Rules 12-202-12(e)(2)(A) through (L):

In considering the significance of potential environmental and ecological effects, the director shall evaluate:

> *Every phase of a proposed action, its expected primary and secondary consequences, and its cumulative and short or long-term effects. A proposed action may have a significant adverse effect on the environment when the proposed action:*

FIGURE 5-2

AUWAHI WIND PROJECT SPECIAL MANAGEMENT AREA



Wind Farm Site
Interconnection Substation
City/Town
Generator-Tie Line
Construction Access Route
Road
Pāpaka Road
Hoapili Trail
Special Management Area

DATA SOURCES:
Project Infrastructure:
Sempra Generation Energy
Tax Map Parcels/Conservation
Special Management Area:
Hawaii Statewide GIS Program
City/Road:
ESRI Streetmap 2007

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P:\GIS_PROJECTS\Sempra_Energy\Auwahi_Wind_Project\MXDs\EIS\Sempra_Auwahi_EIS_Fig5-2_SpecMngtArea_85l1i_011011 - Last Accessed: 1/11/2011 - Map Scale correct at: ANSI A (11" x 8.5")

(A) *Involves an irrevocable commitment to loss or destruction of any natural or cultural resources;*

Discussion: Construction and operations of the proposed Project does not preclude other uses on the land. At the end of the approximately 20-year life of the proposed Project, there are several options that could be implemented. New electric generation facilities could be constructed and the PPA re-negotiated, or existing facilities could be removed and the land returned to its original condition to the extent possible. See Section 2.1.3.6 for information on decommissioning and restoration.

(B) *Significantly curtails the range of beneficial uses of the environment;*

Discussion: Implementation of the proposed Project will not limit other beneficial uses of the environment.

(C) *Conflicts with the county's or the state's long-term environmental policies or goals;*

Discussion: The proposed Project is consistent with both county and state renewable energy goals. Section 1.2 discusses the purpose and need for the project, including more information on renewable energy goals.

(D) *Substantially affects the economic or social welfare and activities of the community, county, or state;*

Discussion: Implementation of the proposed Project will not adversely affect the economic or social welfare of the community, county, or state. Section 3.16 – Socioeconomic Characteristics address issues and potential impacts related to potential social and economic impacts.

(E) *Involves substantial secondary impacts, such as population changes and increased effects on public facilities, streets, drainage, sewage, and water systems, and pedestrian walkways;*

Discussion: Implementation of the proposed project will not result in a population change. Potential impacts associated with public facilities are discussed in Section 3.17 – Public Infrastructure and Services. Potential impacts on public roadways are discussed in Section 3.9 – Transportation and Traffic.

(F) *In itself has no significant adverse effects but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;*

Discussion: Potential cumulative effects are discussed in Section 4.0 – Cumulative Impacts.

(G) *Substantially affects a rare, threatened, or endangered species of animal or plant, or its habitat;*

Discussion: Potential impacts to rare, threatened, or endangered species are discussed in Section 3.6 – Vegetation and Section 3.7 – Wildlife.

(H) *Is contrary to the state plan, county's general plan, appropriate community plans, zoning and subdivision ordinances;*

Discussion: The proposed Project is consistent with the state plan, the county's general plan, associated community plans, and county ordinances. Implementation of the proposed Project will assist both the county and the state in meeting its renewable energy goals.

(I) *Detrimentally affects air or water quality or ambient noise levels;*

Discussion: No significant impacts related to air quality, water quality or noise are anticipated from implementation of the proposed project. Section 3.12 – Air Quality, Section 3.5 – Hydrology and Water Resources, and Section 3.11 – Noise, discuss potential impacts to these resources and measures to reduce impacts.

(J) *Affects an environmentally sensitive area, such as flood plain, shoreline, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh waters, or coastal waters;*

Discussion: Most of the proposed Project lies within Flood Zone X, which is assigned to those areas that are determined to be outside the 1 percent chance annual floodplain. A small portion of the wind farm site is in Flood Zone A, which means no Base Flood Elevations have been determined. No portion of the proposed Project is within the Civil Defense Tsunami Evacuation Zone. Features to control stormwater and minimize erosion are included in the Project site design and engineering. See Section 3.3 – Soils, for more information on erosion. No estuaries or fresh waters are near the proposed Project.

(K) *Substantially alters natural land forms and existing public views to and along the shoreline; or;*

Discussion: As discussed in Section 3.13, the proposed Project is in a low-density rural area. Potential impacts to visual resources and measures to reduce these impacts are discussed in Section 3.13 – Visual Resources.

(L) *Is contrary to the objectives and policies of chapter 205A, HRS*

Discussion: Section 5.2.2 discusses the proposed Project's compliance with HRS 205A.

Action on the SMA Use Permit will be scheduled with the Maui Planning Commission as a public hearing item at the conclusion of the EIS process.

5.3.3 Maui General Plan

The General Plan of the County of Maui 1990 Update (Maui General Plan) was adopted by Ordnance No. 2039 and took effect on September 27, 1991. In 1993, the General Plan was amended by Ordnance 2234 that took effect on April 23, 1993. 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 (County of Maui 1993). In 2004, Chapter 2.80B of the Maui County Code was established. Chapter 2.80B requires that the General Plan identify and discuss the major issues in regards to the needs and the development of Maui County, and the social, economic, and environmental impacts of development.

The plan is now being revised as the General Plan 2030. Themes of this revision include making Maui County more self-sufficient by limiting the amount of non-renewable energy used. The General Plan serves as long-term, comprehensive planning "blueprint" for physical, economic, environmental development and cultural identity of Maui County. There are three tiers to the General Plan: the Countywide Policy Plan; the Maui Island Plan; and nine Community Plans.

The proposed Project's compliance with the specific goals, policies, and objectives of the Maui General Plan are addressed below.

5.3.4 Countywide Policy Plan

The Countywide Policy Plan (County of Maui 2010c) serves as an overarching policy document with broad goals, objectives, policies, and implementing actions. It also has the policy framework for the development of the Maui Island Plan and the nine Community Plans. The Countywide Policy Plan includes a list of countywide goals, objectives, policies, and implementing actions related to the following themes:

A. Protect the Natural Environment

B. Preserve Local Cultures and Traditions

C. Improve Education

D. Strengthen Social and Healthcare Services

E. Expand Housing Opportunities for Residents

F. Strengthen the Local Economy

G. Improve Parks and Public Facilities

H. Diversify Transportation Options

I. Improve Physical Infrastructure

J. Promote Sustainable Land Use and Growth Management

K. Strive for Good Governance

The following discussion identifies those themes most relevant to the proposed Project and discusses the consistency with related goals, objectives, and policies.

A.	**Protect the Natural Environment**

Goal: ***Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.***

Objective 1: *Improve the opportunity to experience the natural beauty and native biodiversity of the islands for present and future generations.*

- **Policies:**

  a. *Perpetuate native Hawaiian biodiversity by preventing the introduction of invasive species, containing or eliminating existing noxious pests, and protecting critical habitat areas.*

  c. *Restore and protect forests, wetlands, watersheds, and stream flows, and guard against wildfires, flooding, and erosion.*

Discussion: The proposed generator-tie line runs adjacent to the Kanaio NAR and the Auwahi Forest Restoration Project. These biologically sensitive areas were taken into account in the design of the generator-tie line. Complete avoidance of take of the four covered species is not possible; therefore, Auwahi Wind is currently preparing an HCP that will be available for public comment in 2011, and incorporated measures to minimize take of the covered species. These measures, including construction timing considerations, pre-construction surveys, selection of Project components, and siting considerations, are listed below. See Section 3.6 – Vegetation and Section 3.7 – Wildlife for more information. An FMP has been prepared (Appendix A) and, through a program of engineering, maintenance, and fuels management, the fire risk posed by the wind farm and the generator-tie line can be mitigated to acceptable levels (also see Sections 3.4 – Natural Hazards and 3.17 – Public Infrastructure and Services of this EIS).

B. Preserve Local Cultures and Traditions

Goal: ***Maui County will foster a spirit of pono[2] and protect, perpetuate, and reinvigorate its residents' multi-cultural values and traditions to ensure that current and future generations will enjoy the benefits of their rich island heritage.***

Objective 1: *Perpetuate the Hawaiian culture as a vital force in the lives of residents.*

- **Policy a:** *Protect and preserve access to mountain, ocean, and island resources for traditional Hawaiian cultural practices.*

Discussion: Implementation of the proposed Project would not adversely affect existing access for cultural purposes. Most of the proposed Project would be built and operated on private land and access to the ocean and other areas would not change. See Section 3.8 – Archaeological and Cultural Resources for more information.

F. Strengthen the Local Economy

Goal: ***Maui County's economy will be diverse, sustainable, and supportive of community values.***

Objective 4: *Expand economic sectors that increase living-wage job choices and are compatible with community values.*

- **Policy a: Support** *emerging industries, including the following:*

  e. Renewable-energy industry;

Discussion: The proposed Project would help achieve this goal because it would bring renewable energy to Maui, directly contributing to state and county renewable energy goals. Construction would bring approximately $62.25 million into the local economy (approximately 45 percent of the overall expenditures). See Section 3.16 – Socioeconomic Characteristics for more information.

[2] Pono is the Hawaiian word meaning goodness, uprightness, correct or proper procedure, excellence, or well-being (County of Maui 2010c).

I. Improve Physical Infrastructure

Goal: ***Maui County's physical infrastructure will be maintained in optimum condition and will provide for and effectively serve the needs of the County through clean and sustainable technologies.***

Objective 3: *Significantly increase the use of renewable and green technologies to promote energy efficiency and energy self-sufficiency.*

- **Policies:**

  a. *Promote the use of locally renewable energy sources, and reward energy efficiency.*

  d. *Encourage small-scale energy generation that utilizes wind, sun, water, biowaste, and other renewable sources of energy.*

  e. *Expand renewable-energy production.*

Discussion: The proposed Project would help achieve this goal as it would expand the renewable energy production on Maui. See Section 3.17 – Public Infrastructure and Services for more information on the existing infrastructure and potential impacts.

5.3.4.1 Draft Maui Island Plan

"The Maui Island Plan is a blueprint that provides direction for future growth, the economy, social, and environmental decisions on the island through the year 2030" (County of Maui 2010b). Similar to the Countywide Policy Plan, the Maui Island Plan is intended to provide policy direction in areas related to population, heritage, natural hazards, economic development, housing, infrastructure and public facilities, and land use.

Maui County Ordinance 3166 requires the Maui Island Plan (County of Maui 2010b) to identify key challenges and opportunities facing Maui County. One set of such challenges and opportunities identified was for wind energy:

> *Maui has significant potential for wind energy development. View impacts and physical access present challenges to wind energy development on Maui, since many viable sites lie on high ridges. Wind energy may encounter fewer land use and zoning barriers than other types of renewable energy development. Zoning ordinances allow for wind energy development in State and County Agricultural districts; barring conflicting land uses, wind energy is likely to be allowable in rural districts.*

The following discussion identifies those areas most relevant to the proposed Project and discusses the consistency with related relevant goals, objectives, and policies.

2. Heritage: Cultural resources, shoreline, reefs and nearshore waters, watersheds and streams, wildlife and natural areas, and scenic resources.

Cultural Resources

Goal 2.1: ***An island that respects and protects archaeological and cultural resources while perpetuating diverse cultural identities and traditions.***

Objective 2.1.1: *An island culture and lifestyle that complies with the Hawai`i State Constitution, Article 12 Section 7, HRS 7-1.*

- **Policy 2.1.1c:** *Ensure traditional public access routes, including native Hawaiian trails, are maintained for public use.*

Discussion: The wind farm site and generator-tie line corridor are both on private lands. Although there is no public access through these areas, people in the surrounding communities are allowed access to the shoreline and other areas for cultural purposes. This would continue after implementation of the proposed Project.

Objective 2.1.2: *A more effective planning and review process that incorporates the best available cultural resources inventory, protection techniques, and preservation strategies.*

- **Policy 2.1.2a:** *Ensure that the island has a rich and up-to-date inventory of historic and archaeological resources and their cultural significance.*
- **Policy 2.1.2b:** *Require development within Heritage Areas, as identified on Map #2-2 to protect and conserve critical resources, including the area's natural, cultural, scenic, and historic resources.*

Discussion: As part of the proposed Project, an AIS and a CIA have been conducted. Copies of the reports are in Appendices E and F, respectively.

Objective 2.1.3: *Enhance the island's historic, archaeological, and cultural resources.*

- **Policy 2.1.3a:** *Identify and pursue the listing of properties and sites on State and National Register of Historic Places.*

Discussion: The wind farm site contains numerous sites of cultural significance, as discussed in Section 3.8 – Archaeological and Cultural Resources. The Applicant would support any effort to pursue the listing of sites on the state and national registers of historic places.

Wildlife and Natural Areas

Goal 2.4: ***Maui's natural areas and indigenous flora and fauna will be protected.***

Objective 2.4.3: *Greater protection of sensitive lands, indigenous habitat, and native flora and fauna.*

- **Policy 2.4.3c:** *Promote innovative environmental planning and site planning standards that preserve and reestablish indigenous flora and fauna habitat.*

Discussion: See Section 3.6 – Vegetation and Section 3.7 – Wildlife for details on potential impacts and mitigation measures related to native wildlife and sensitive areas.

Scenic Resources

Goal 2.5: ***A beautiful island steeped in coastal, mountain, open space, and historically significant views that are preserved in perpetuity.***

Objective 2.5.2: *Reduce impacts of development projects and public utility improvements on scenic resources.*

- **Policy 2.5.2a:** *Enforce the policies and guidelines of the Special Management Area (SMA) regarding the protection of views.*

Discussion: Although the proposed Project would have a visual impact (see Section 3.13 – Visual Resources for more information), alternative energy sources such as wind are an integral part of meeting Maui County's renewable energy goals. An SMA Use Permit Application would be prepared and submitted for Maui County approval prior to Project implementation.

4. Economic Development: Economic diversification, tourism, agriculture, emerging sectors, and small business development.

Economic Diversification

Goal: ***A sustainable, diversified economy that provides full employment and a living wage.***

Objective 4.1.2: *Increase activities that support principles of sustainability.*

- **Policy 4.1.2a:** *Support industries that are sustainable, and culturally and environmentally sensitive.*

Discussion: In environmentally or culturally sensitive areas, the proposed Project was designed to have the least amount of impact possible. Many changes were made throughout the design process to avoid sensitive areas identified during field survey activities. Renewable energy projects contribute to Maui's economic and environmental sustainability, reducing the need for imported fossil fuels.

Emerging Sectors

Goal: ***A diverse array of emerging economic sectors.***

Objective: *Increase efforts to develop emerging industries.*

- **Policy 4.4.1b:** *Attract and assist industries to compete in high technology activities such as those related to renewable energy, green technologies, diversified agriculture, ocean sciences, health sciences, and other knowledge-based industries.*

Discussion: The proposed Project would help achieve this goal because it would bring renewable energy to Maui, directly contributing to an increase in high technology activities such as those related to renewable energy.

6. Infrastructure and Public Facilities: Solid waste, wastewater, water, transportation, parks, public facilities, schools and libraries, health care, energy, and harbors and airports.

Energy

Goal: ***Maui will meet its energy needs through local sources of clean, renewable energy and through conservation.***

Objective: *Reduce fossil fuel consumption: using the 2005 consumption as a baseline, reduce by 15% in 2015; 20% by 2020; and 30% by 2030.*

- **Policy 6.10.1b***: Support the establishment of new renewable energy facilities such as the Kaheawa Wind Farm and the Auwahi Wind Farm at appropriate locations provided that environmental, view plane and cultural impacts are addressed.*

Discussion: As noted in Policy 6.10.1b, the proposed Project is specifically included as one of the projects identified to assist the County of Maui in meeting its energy needs through a local source of clean, renewable energy, thereby reducing fossil fuel consumption.

5.3.5 Community Plans

The proposed Project is within the boundaries of Maui County's Hāna Community Plan, Makawao-Pukalani Community Plan, and Kihei-Mākena Community Plan. The wind farm site and much of the generator-tie line are within the boundaries of Hāna Community Plan, which designates this area for agricultural use and preservation (Figure 5-3). Table 5-2 provides detail on each affected TMK and the associated community plan regions and designations.

5.3.5.1 Hāna Community Plan

The proposed Project would be located in the area covered by the Hāna Community Plan (Maui County Council 1994). The Community Plan contains goals that express the long-term vision of the Hāna community. These goals are related to land use, environment, cultural resources, economic activity, housing, urban design, physical infrastructure, social infrastructure, and government. 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 Community Plan emphasizes the preservation of the natural beauty, cultural resources, and practices, and the character of the Hāna community, but also focuses on the land use and environmental resources of the entire district. The goals outlined in the plan aim to preserve Hāna's unique resources while providing its residents with economic opportunities.

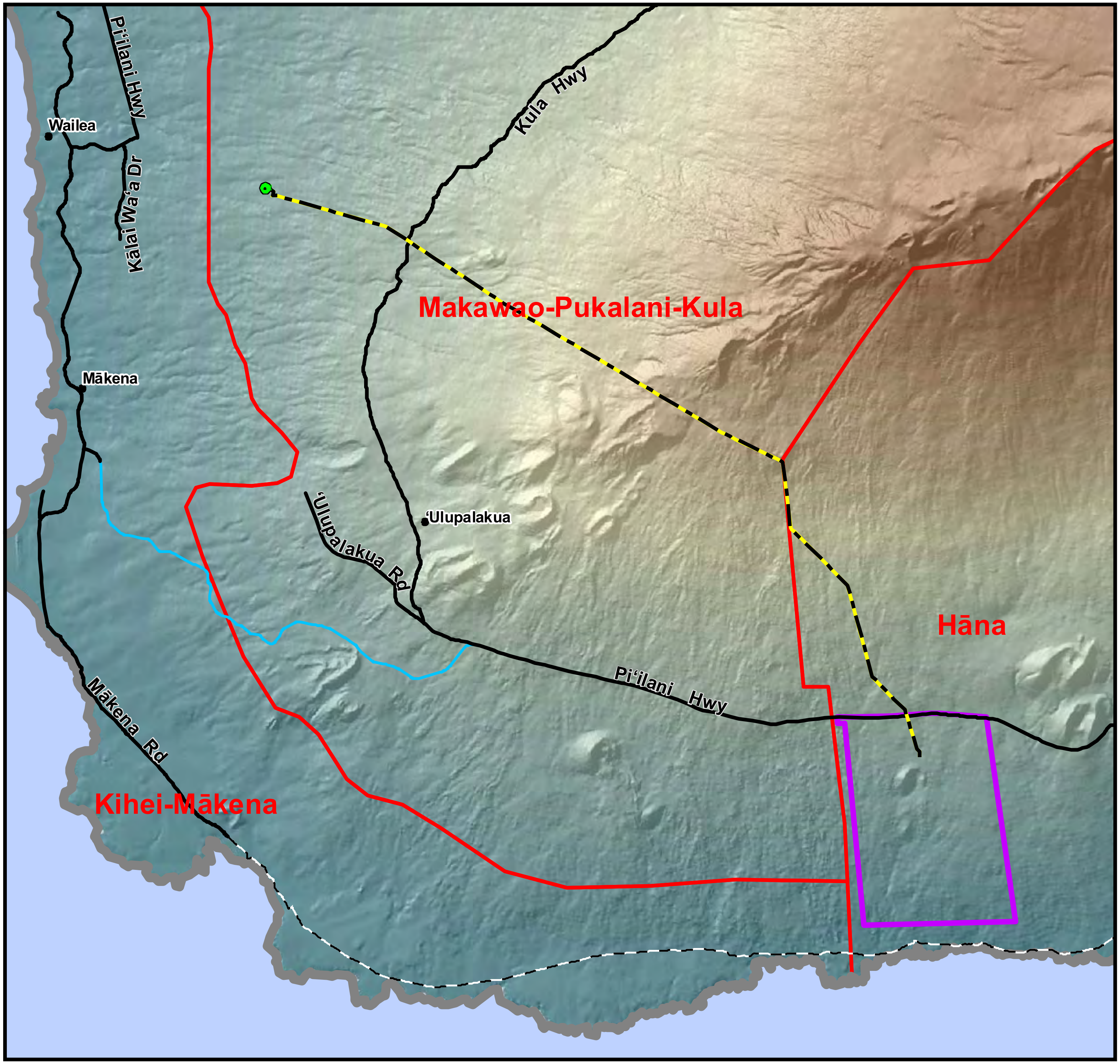

FIGURE 5-3

AUWAHI WIND PROJECT COMMUNITY PLAN BOUNDARIES

- Wind Farm Site
- Interconnection Substation
- City/Town
- Generator-Tie Line
- Pāpaka Road
- Road
- Hoapili Trail
- Maui Community Plan Boundaries

DATA SOURCES:

Project Infrastructure:
Sempra Generation Energy
Tax Map Parcels/Conservation
Community Plan Boundaries
Maui County, Hawaii 2011
City/Road:
ESRI Streetmap 2007

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Table 5-2.
Community Plan Region and Designation

Project Component	Tax Map Key (TMK)	Community Plan Region	Community Plan Designation	County Zoning
Wind Farm Site	(2) 1-9-001:006 (por.)	Hāna	Agriculture; Conservation	Agriculture; Interim
Generator-tie Line Corridor, Interconnection Substation	(2) 1-9-001:006 (por.)	Hāna	Agriculture; Conservation	Agriculture; Interim
	(2) 2-1-009:001 (por.)	Makawao-Pukalani-Kula	Agriculture; Conservation	Agriculture; Interim
	(2) 2-1-009:999 (por.)	Makawao-Pukalani-Kula	Agriculture	Road
	(2) 2-1-008:001 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
Pāpaka Road/Construction Access Route	(2) 2-1-002:001 (por.)	Makawao-Pukalani-Kula/ Kihei-Mākena	Agriculture; Conservation	Agriculture; Interim
	(2) 2-1-003-999 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-002:002 (por.)	Makawao-Pukalani-Kula	Agriculture; Conservation	Agriculture; Interim
	(2) 2-1-003-050 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-003-054 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-004:006 (por.)	Makawao-Pukalani-Kula/ Kihei-Mākena	Agriculture; Conservation; Park	Agriculture; Interim
	(2) 2-1-004:016 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-004:017 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-004:018 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-004:049 (por.)	Makawao-Pukalani-Kula/ Kihei-Mākena	Agriculture; Conservation; Park	Agriculture
	(2) 2-1-004:071 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-004:106 (por.)	Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-004:999 (por.)	Makawao-Pukalani-Kula/ Kihei-Mākena	Agriculture; Park	Agriculture
	(2) 2-1-005:023 (por.)	Kihei-Mākena/ Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-005:030 (por.)	Kihei-Mākena	Agriculture	Agriculture
	(2) 2-1-005:045 (por.)	Kihei-Mākena	Agriculture	Agriculture
	(2) 2-1-005:055 (por.)	Kihei-Mākena	Agriculture	Agriculture
	(2) 2-1-005:057 (por.)	Kihei-Mākena	Agriculture	Agriculture

Table 5-2.
Community Plan Region and Designation

Project Component	Tax Map Key (TMK)	Community Plan Region	Community Plan Designation	County Zoning
	(2) 2-1-005:077 (por.)	Kihei-Mākena, Makawao-Pukalani-Kula	Agriculture	Agriculture
	(2) 2-1-005:095 (por.)	Kihei-Mākena	Agriculture	Agriculture
	(2) 2-1-005:100 (por.)	Kihei-Mākena	Agriculture	Agriculture
	(2) 2-1-005:108 (por.)	Kihei-Mākena	Agriculture, Park; Park (Golf Course), Business/ Commercial; Hotel; Multi-Family; Single-Family	Hotel/Motel; Business; Residential; Road; Agriculture; Open Space; Park
	(2) 2-1-008:131 (por.)	Kihei-Mākena	None	Road and OS
	(2) 2-1-008:999 (por.)	Kihei-Mākena	None	None
	(2) 2-1-009:999 (por.)	Makawao-Pukalani-Kula	Agriculture	Road

Many of the goals, objectives, and policies at the level of the Community Plan are similar to those in the Countywide Policy Plan and the Maui Island Plan, so attention has been paid to those specifically related to the Project component(s) within the boundaries of the Hāna Community Plan. The following discussion identifies those goals most relevant to the proposed Project and discusses the consistency with related relevant objectives and policies.

<u>**Environment**</u>

Goal: ***Protection and management of Hana's land, water and ocean resources to ensure that future generations can enjoy the region's exceptional environmental qualities.***

Objectives and Policies:

2. *Recognize residents' traditional uses of the region's natural resources which balance environmental protection and self-sufficiency.*
3. *Manage, protect, and where appropriate, restore areas which have significant indigenous flora and fauna habitat resource value.*
4. *Discourage water or land development and activities which threaten the biological diversity of the Hana region and degrade the existing quality of the region's (1) air and noise character, (2) marine, surface and ground water and (3) scenic resources and vistas.*
9. *Avoid development of flood prone areas, stream channels and gulches.*
10. *Discourage development of geothermal sources or energy transmission line corridors within environmentally sensitive and archaeologically significant areas in the Hana Community Plan.*

Discussion: As discussed in the Countywide Policy Plan and the draft Maui Island Plan (Sections 5.3.3.1 and 5.3.3.2, respectively), the proposed Project was designed to reduce impacts on sensitive resources to the extent possible. As part of the design process, special attention was given to the Kanaio NAR and the Auwahi Forest Restoration Project. See Sections 3.6 – Vegetation and 3.7 – Wildlife for more information. The proposed Project would not be in any flood-prone areas or impact any stream channels or gulches. Although the Hāna Community Plan discourages the development of energy transmission line corridors in environmentally and archaeologically sensitive areas, the proposed Project was designed to reduce impacts to these resources.

Cultural Resources

Goal: ***Identification, preservation, protection, and where appropriate, restoration of significant cultural resources and practices, that provide a sense of history and identity for the Hana region.***

Objectives and Policies:

1. *Identify, preserve and protect historically, archaeologically and culturally significant areas, sites, and features within the Hana District.*
2. *Acknowledge and respect family ancestral ties to cultural resources.*
3. *Encourage community stewardship of historic sites and provide for the curation of artifacts in the Hana region.*
6. *Encourage and protect traditional mauka and makai accesses for traditional cultural uses and practices.*

Discussion: As discussed in the Maui Island Plan (Section 5.3.3.2), an AIS and a CIA were conducted for the proposed Project. Copies of these reports are in Appendices E and F, respectively. The wind farm site and generator-tie line corridor are both on private lands. Although there is currently no public access through these areas, people in the surrounding communities are allowed access over 'Ulupalakua Ranch lands to the shoreline and other areas for cultural purposes. This would continue after implementation of the proposed Project. See Section 3.8 – Archaeological and Cultural Resources for more information.

Physical Infrastructure

Goal: ***Timely and environmentally sensitive development and maintenance of infrastructure systems which protect and preserve the safety and health of the Hana region's residents and visitors, including the provision of domestic water, utility and waste disposal services, and effective transportation systems which meet the needs of residents and visitors while protecting the region's rural character.***

Objectives and Policies:

All: *Ensure community participation, including resident Hawaiian, in all long-term infrastructure planning*

Energy and Public Utilities: *15. Promote the environmentally and culturally sensitive use of renewable energy resources, like biomass, solar energy, and wind energy, in all sectors of the community.*

Discussion: Throughout the planning process, the Applicant has been meeting with members of the community, including Native Hawaiians. Public meetings were held on the EISPN to receive community input on the proposed Project (see Chapter 7). As discussed under the Countywide Policy Plan and the draft Maui Island Plan, the proposed Project would help achieve this goal by expanding the renewable energy production on Maui.

5.3.5.2 Makawao-Pukalani-Kula Community Plan

The majority of the generator-tie line and Pāpaka Road would be located in 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 Community 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 following discussion identifies those goals most relevant to the proposed Project and discusses the consistency with related relevant objectives and policies. Many of the goals, objectives, and policies at the Community Plan level are similar to those in the Countywide Policy Plan and the draft Maui Island Plan; therefore, attention is paid to those specifically related to the proposed Project component(s) within the boundaries of the Makawao-Pukalani-Kula Community Plan. It should be noted that the proposed Project activities, such as the upgrades to Pāpaka Road, would cause only short-term disturbances during construction and therefore would retain the character of the surrounding community.

<u>Environment</u>

Goal: ***Protection of Upcountry's natural resources and environment as a means of preserving and enhancing the region's unique beauty, serenity, ecology, and productivity, in order that future generations may enjoy and appreciate an environment of equal or higher quality.***

Objectives and Policies:

1. *Preserve environmental resources by maintaining important agricultural lands as an integral part of the open space setting in each community.*
2. *Recognize agricultural lands as an essential ingredient to the Upcountry atmosphere.*
3. *Recognize and protect rare, endangered and unique biological resources in the region.*
6. *Preserve the existing visual, noise, odor and air quality characteristics found in agricultural/rural neighborhoods of the Makawao-Pukalani-Kula region.*

Discussion: Implementation of the proposed Project would not adversely impact the existing ranching operations and would be consistent with agricultural land uses. As discussed under both the Countywide Policy Plan and the draft Maui Island Plan, unique biological resources were given special attention during project design. See Sections 3.6 – Vegetation and 3.7 – Wildlife for more information. Although there would be a visual impact, and some noise would emanate from the wind farm site, areas impacted would be minimal due to the remote location of the wind farm site. See Sections 3.11 – Noise and Section 3.13 – Visual Resources, for noise contours and visual simulations.

Cultural Resources

Goal: ***The identification, preservation and where appropriate, restoration and promotion of cultural resources and practices which reflect the rich and diverse heritage found in the Upcountry region.***

Objectives and Policies:

1. *Recognize the importance of historically and archaeologically sensitive sites, both known and undiscovered, and encourage their preservation and protection.*
2. *Support public and private efforts to inventory, evaluate, classify, register, and protect, as appropriate, cultural resources to increase public knowledge of the region's rich and diverse cultural character.*
7. *Promote distinct cultural resources as an identifying characteristic of the region.*
8. *Protect the visual integrity of upcountry cultural landscapes*

Discussion: As discussed under the Countywide Policy Plan, the draft Maui Island Plan, and the Hāna Community Plan, historically and archaeologically sensitive sites were identified and incorporated into project design to the extent possible. See Section 3.8 – Archaeological and Cultural Resources for more information. Visual integrity is recognized as an important resource, therefore, layout of the wind farm and design of the generator-tie line took this into account. See Section 3.13 – Visual Resources for a description of the potential impacts.

Physical Infrastructure

Goal: ***The timely and environmentally sensitive development and maintenance of infrastructure systems which protect and enhance the safety and health of Upcountry's residents and visitors, including the provision of domestic water, utility and waste disposal services, and effective transportation systems which meet the needs of residents and visitors while maintaining the region's rural character.***

Objectives and Policies:

Drainage

1. *Respect and preserve natural drainageways as part of good land development practices and recognize their value as open-space corridors.*

Energy

1. *Promote conservation and efficiency as the energy resource of first choice.*

Implementing Action: *Study and identify opportunities, including tax incentives, for developing alternative energy sources such as wind, biomass, solar and water driven electricity in the Upcountry region.*

Discussion: Facilities would be designed to minimize changes to naturally existing topography and drainage and to ensure that stormwater would be conveyed away from structures and directed to the designated drainage systems. See the Preliminary Drainage Report in Appendix C. As discussed under the Countywide Policy Plan and the Maui Island Plan, the proposed Project would help achieve this goal by expanding the renewable energy production on Maui.

5.3.5.3 Kihei-Mākena Community Plan

A small portion of the generator-tie line, Pāpaka Road, and the interconnection substation would be in the area covered by the Kihei-Mākena Community Plan (Maui County Council 1998). Like the plans of neighboring communities, the Kihei-Mākena 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. Proposed Project activities within the boundaries of the Kihei-Mākena Community Plan are limited in that most of the impacts would be during construction and would take place on privately owned land within the agricultural zoning district.

Environment

Goal: ***Preservation, protection, and enhancement of Kihei-Makena's unique and fragile environmental resources.***

Objectives and Policies:

b. Preserve, protect, and restore unique natural areas with significant conservation values.

c. Require that new shoreline development respect shoreline resources and maintain public access.

h. Encourage such land uses as would serve to reduce hazardous fire conditions in the developed community plan areas.

Discussion: See Sections 3.6 – Vegetation and 3.7 – Wildlife for information on potential impacts to conservation efforts. Public access to the shoreline will not be impacted by the project. An FMP has been developed and would be implemented prior to the start of construction, reducing the potential threat of fire resulting from the proposed Project.

Cultural Resources

Goal: ***Identification, preservation, enhancement, and appropriate use of cultural resources, cultural practice, and historic sites that:***

b. preserves and protects native Hawaiian rights customarily and traditionally exercised for subsistence, cultural, and religions purposes in accordance with Article XII, Section 7, of the Hawaii State Constitution, and the Hawaii Supreme Court's PASH opinion, 79 Haw. 425 (1995).

Objectives and Policies:

d. Protect those areas, structures and elements that are a significant and functional part of Hawaii's ethnic and cultural heritage.

g. Recognize and respect family ancestral ties to certain sites.

Implementing Action: *b. Require development projects to identify all cultural resources located within or adjacent to the project area, prior to application, as part of the County development review process. Further require that all proposed activity include recommendations to mitigate potential adverse impacts to cultural resources, including site avoidance,* *adequate buffer areas and interpretation. Particular attention should be directed toward the southern areas of the planning region.*

Discussion: See Section 3.8 – Archaeological and Cultural Resources for more information on the potential impacts and proposed mitigation measures related to cultural and archaeological resources.

Economic Activity

Goal: ***A diversified and stable economic base which serves resident and visitor needs while providing long-term resident employment.***

Objectives and Policies:

c. Encourage research, development, and use of alternate energy sources.

Discussion: Implementation of the proposed Project would assist Maui County in meeting its energy needs through a local source of clean, renewable energy, thereby reducing fossil fuel consumption.

Physical and Social Infrastructure

Goal: ***Provision of facility systems, public services and capital improvement projects in an efficient, reliable, cost effective, and environmentally sensitive manner which accommodates the needs of the Kihei-Makena community, and fully support present and planned land uses, especially in the case of project district implementation. Allow no development for which infrastructure may not be available concurrent with the development's impacts.***

Drainage

Objectives and Policies:

a. Design drainage systems that protect coastal water quality by incorporating best management practices to remove pollutants from runoff. Construct and maintain, as needed, sediment retention basins and other best management practices to remove sediments and other pollutants from runoff.

Discussion: See Preliminary Drainage Report in Appendix C.

Energy and Public Utilities

Objectives and Policies:

d. Promote environmentally and culturally sensitive use of renewable energy resources like biomass, solar, wind, and hydroelectric energy in all sectors of the community.

Discussion: As mentioned above, the proposed Project would assist Maui County in meeting its energy needs through a local source of clean, renewable energy, thereby reducing fossil fuel consumption.

5.4 REQUIRED PERMITS FOR PROJECT DEVELOPMENT

The permits or approvals that are or may be required for the proposed Project are presented in Table 5-3.

Table 5-3.
Permits and Approvals Required for the Auwahi Wind Farm Project

Permit or Approval	Responsible Agency	Status
Chapter 343 EA/EIS	Maui County Planning Department/Planning Commission	In progress
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	Not Applicable
Maui County Special Use Permit	Maui County Planning Department/Planning Commission	To be completed
Request for Use of State Lands (Easement)	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
HPUC Approval of Power Purchase Agreement	Public Utilities Commission	To be completed
Notice of Proposed Construction of Alteration	Federal Aviation Administration	To be completed
Noise Permit	HDOH	To be completed
Air Permit	HDOH	To be completed
Flood Development Permit	County of Maui, Department of Planning, Zoning Administration and Enforcement Division.	To be completed
Grading/Building and Other Construction Permits	Various	To be completed

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 USFWS.

DLNR = Department of Land and Natural Resources
DOFAW = Division of Forestry and Wildlife
HDOH = Hawai'i State Department of Health
HPUC = Hawai'i Public Utilities Commission
EA = environmental assessment
EIS = environmental impact statement
HDOT = Hawai'i State Department of Health
NEPA = National Environmental Policy Act

6.0 OTHER HRS 343 REQUIREMENTS

6.0 OTHER HRS 343 REQUIREMENTS

The content requirements for an EIS are defined in HAR § 11-200-17. Most of these components are addressed throughout the EIS, although below they are clearly identified and discussed in distinct sections.

6.1 SECONDARY AND CUMULATIVE IMPACTS

In all resources areas evaluated, neither secondary impacts nor significant cumulative impacts would result from construction or operation of the proposed Project. Significant secondary population and economic impacts are not anticipated to result from construction or operation of the proposed Project. While some beneficial secondary impacts are likely, such as short-term increase in jobs, wages ,and economic output, these impacts are not expected to last into the O&M phase of the proposed Project. Secondary impacts to land use are not anticipated because 'Ulupalakua Ranch would continue to use the Auwahi parcel for cattle pasture as it has done for decades. Similarly, secondary impacts to natural communities, air quality and water quality are not likely. Impacts to these resources are described in Chapter 3 of this EIS.

Because much of the proposed Project lies within the Maui Coastal Land Trust Conservation Easement, future development near the proposed Project is limited. Although the construction and operation of the proposed Project have the potential to contribute to cumulative impacts to sensitive state and federal protected species, the mitigation for the proposed Project and other proposed or operational wind farms on Maui (Kaheawa II and Kaheawa I, respectively), would collectively provide a net benefit to those species. Cumulative impacts are addressed for each resource presented in Chapter 4 of this EIS.

6.2 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Wind energy is an abundant, infinitely renewable resource. Generation and integration of wind energy into the electric grid decreases fossil fuel consumption, thereby reducing GHG emissions, particulate-related health effects, and other forms of pollution associated with coal or diesel fuel electric generation. As proposed, the Project could provide 78,500 megawatt-hours per year (MWh/year) of electricity to MECO's grid, enough to provide electricity to approximately 6,600 households.

The proposed Project would provide economic benefits by contributing to the local economy, generating new jobs, and providing a stable, long-term source of tax revenue for the state and county. Short-term beneficial impacts would occur from implementing the proposed Project. The projected construction expenditures for the new facilities would marginally increase employment and income in the ROI for the duration of construction and would have a short-term beneficial impact. The power generated by the wind farm would be sold to MECO under a long-term, set base price contract with fixed annual escalation providing long-term price stability for consumers.

The proposed Project would demonstrate how renewable energy uses can coexist with agricultural and ranching uses in rural Maui. Development and operations of the proposed Project would allow the majority of the Auwahi parcel to remain as open space. The Maui County Hāna Community Plan's objectives and policies include preserving open space and coastal vistas by "discouraging linear development along the highways" (Maui County Council 1994). While the proposed Project is not entirely a linear development, it would alter the scenic vistas and the qualities of "old Hawai'i" in the area. The Hāna Community Plan objectives and policies also include "promoting the environmentally and culturally sensitive use of renewable energy resources, like biomass, solar energy, and wind energy, in all sectors of the community" (Maui County Council 1994). The proposed Project would help accomplish these objective and policies.

The proposed Project would not foreclose future options on the Auwahi Parcel. Most of the proposed Project lies within the Maui Coastal Land Trust Conservation Easement, and the potential for future development is unlikely. Much of the area affected by the proposed Project is currently grazed pastureland. Although cattle grazing would be precluded during construction, 'Ulupalakua Ranch would continue to use the parcel for cattle pasture during Project operations. While not only maintaining active cattle ranching operations and preserving the livelihood of 'Ulupalakua Ranch's employees, operations of the proposed Project are expected to increase the efficiency and productivity of ranching operations through the use of new access roads within the wind farm site.

6.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction and operations of the proposed Project does not preclude other uses on the land. At the end of the approximately 20-year life of the proposed Project, there are several options that could be implemented. New electric generation facilities could be constructed and the PPA re-negotiated, or existing facilities could be removed and the land returned to its original condition to the extent possible. See Section 2.1.3.6 for information on decommissioning and restoration.

6.3.1 Use of Non-Renewable Resources

Construction of the proposed Project would require the use of non-renewable resources used in the manufacturing of Project components, construction materials, and fuel consumed during construction and O&M of the proposed Project. However, to the extent feasible, construction waste would be recycled. As Project components wear out, they could also be recycled to the extent feasible. Recycling could also be implemented when the Project is decommissioned to retrieve and reuse resources.

6.3.2 Potential for Environmental Accidents

The potential for an environmental accident is low. As discussed in Section 3.10 – Hazardous and Regulated Materials and Wastes, mitigation measures are proposed to reduce adverse environmental impacts. The Applicant would prepare an HMWMP that details proper procedures for storing, using, and disposing of hazardous and regulated materials and wastes. The HMWMP would include emergency response procedures. The Applicant would prepare and implement an SPCC Plan, in accordance with 40 CFR Part 112. The SPCC Plan would detail spill prevention, response, containment, reporting, and cleanup measures; and include worker training requirements, inspection protocols, and emergency procedures. In addition, a Site Safety Handbook would be prepared and implemented. Implementation of these measures and standard industry BMPs would reduce the potential for an environmental accident.

6.4 ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

There is a potential for adverse impacts to archaeological and cultural resources that cannot be avoided, although proposed Project design changes have greatly reduced these impacts. Per HRS §

6E (Historic Preservation), consultation with the SHPD, Maui Island Burial Council, and other interested parties is ongoing. In addition, there is a potential for adverse impacts to threatened and endangered bird species. Measures are being taken to reduce these impacts and applicable consultations are underway with the DOFAW and USFWS.

6.5 RATIONALE FOR PROCEEDING

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. In addition, the proposed Project would provide redundancy in the electric grid.

6.6 UNRESOLVED ISSUES

6.6.1 Archaeological and Cultural Resources

As mentioned above, the potential impacts to archaeological and cultural resources are currently being assessed. Per HRS § 6E (Historic Preservation), consultation with the SHPD, Maui Island Burial Council, and other interested parties is ongoing. This process will be completed prior to Project implementation.

6.6.2 Hydrology and Water Resources

It still being determined whether an onsite well will be constructed. If an onsite well is constructed, applicable permitting and agency coordination would occur.

6.6.3 Wildlife Resources

As previously identified, the potential incidental impacts to threatened or endangered wildlife species and associated mitigation measures are currently being assessed in cooperation with the USFWS and DOFAW while developing the HCP. An ITP/ITL will be obtained from the USFWS and DOFAW prior to Project implementation.

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7.0 CONSULTED PARTIES

7.0 CONSULTED PARTIES

7.1 CONSULTATION

Early coordination meetings with agencies, ʻUlupalakua Ranch, and neighboring communities began in 2007 when this Project was first proposed by SWE. Sempra acquired Auwahi Wind Energy, LLC in October 2009 and resumed coordination and consultation meetings.

The list of parties consulted before and during the development of the EISPN/EA and Draft EIS is presented below in Table 7-1.

Table 7-1.
Consulted Parties

Agency/Entity	Contact Name
U.S. Fish and Wildlife Service	Mr. Bill Standley Ms. Dawn Greenlee Ms. Patrice Ashfield Mr. Jeff Newman
U.S. Army Corps of Engineers	Mr. Farley Watanabe
Federal Aviation Administration	Stacey Kaopuiki, Kahului Airport Tower Manager Cheryl Tsutsuse, Honolulu Airports District Office Representative Flight Standards District Office
U.S. Geological Survey	Jim Jacobi
State of Hawaiʻi, Department of Land and Natural Resources (DLNR)	Ms. Laura Thielen, Chairperson Mr. Russell Tsuji, Deputy Director
State of Hawaiʻi, DLNR, Office of Conservation and Coastal Land (OCCL)	Mr. Sam Lemmo, Administrator Mr. Michael Cain, Planner Ms. K. Tiger Mills, Planner
State of Hawaiʻi, DLNR, Land Division	Ms. Charlene Unoki Mr. Daniel Ornellas Mr. Gary Martin
State of Hawaiʻi, DLNR, Division of Forestry and Wildlife (DOFAW)	Mr. Scott Fretz Ms. Sandee Hufana Mr. Paul Conry Ms. Lauren Goodmiller
State of Hawaiʻi, DLNR, Historic Preservation Division	Ms. Melissa Kirkendall Ms. Jenny Pickett Ms. Patti Conte Ms. Morgan Davis
State of Hawaiʻi, DLNR, Commission on Water Resource Management	Mr. Ken Kawahara, Deputy Director Ms. Lenore Ohye, Hydrologist
State of Hawaiʻi, DLNR, Division of State Parks	Ms. Lauren Tanaka Mr. Dan Quinn
State of Hawaiʻi, Department of Business, Economic Development and Tourism (DBEDT)	Mr. Bill Parks Mr. Maurice Kaya Ms. Maria Tome Ms. Malama Minn

Table 7-1.
Consulted Parties

Agency/Entity	Contact Name
State of Hawai'i, DBEDT, Land Use Commission	Mr. Tony Ching, Executive Officer Mr. Dan Davidson, Executive Officer Mr. Josh Strikler
State of Hawai'i, Department of Transportation (HDOT)	Mr. Dean Yogi, Right-of-Way Manager
DOT, Maui Division Office	Mr. Ferdinand Cajigal
University of Hawai'i (ESRC)	Dr. Cliff Morden, Assistant Professor, Botany Jim Harrison, former Executive Director, Environmental Pat Hart, Assistant Professor, Natural Sciences
State of Hawai'i, Department of Hawaiian Home Lands	Mr. Micah Kane Mr. Todd Gray Ms. Noel Akamu Ms. Julie-Ann Cachola
County of Maui, Department of Planning	Ms. Robyn Loudermilk, Planner Mr. Clayton Yoshida, Planning Program Administrator Mr. Paul Fasi Ms. Ann Cua Mr. Jeff Hunt Mr. Francis Huriso Ms. Kathleen Ross Aoki Mr. Joe Prutch
Maui County Council	Mr. Danny Mateo, Chair Mr. Michael Molina, Vice-Chair Ms. Gladys Baisa Mr. Joseph Pontanilla
County of Maui, Office of Economic Development	Ms. Deidre Tegarden, Economic Development Coordinator Mr. Victor Reyes, Energy Commissioner
County of Maui, Department of Management	Mr. Kalvin Kobayashi, Energy Coordinator
County of Maui, Zoning Administration and Enforcement Division	Mr. Aaron Shinmoto, Planning Program Administrator Mr. Frances Cerezo, Planner
County of Maui, Public Works	Ms. Leslie Otani Mr. Milton Arakawa Mr. Michael Miyamoto Mr. Ralph Nagamine
Ranch Employees	Mr. Sumner Erdman Mr. Kaimi Kona'aihele Mr. Jimmy Gomes
Community Groups	Kula Community Association

7.2 EISPN/EA DISTRIBUTION

The parties listed below in Table 7-2 were provided a copy of the EISPN/EA for review during the 30-day public comment period, which began on March 23, 2010, and ended on April 22, 2010, following the notice of availability published in the OEQC's *Environmental Notice* on March 23, 2010.

Table 7-2.
EISPN/EA Distribution List

Federal Agencies/Legislature	Maui County Agencies
U.S. Fish and Wildlife Service, Pacific Islands Office	Office of the Mayor
National Park Service	Maui County Council
U.S. Senator Akaka	Department of Economic Development
U.S. Senator Inouye	Department of Environmental Management
	Department of Housing and Human Concerns
	Department of Parks and Recreation
	Planning Department
	Department of Public Works
	Department of Transportation
	Department of Water Supply

State of Hawaiʻi Agencies	Community Organizations
Department of Business, Economic Development and Tourism	Auwahi Reserve
Coastal Zone Management Program	Blue Planet Foundation
Office of Hawaiian Affairs	Hui Mākena Alanui
Department of Health, Clean Water Branch	Kahikinui Homeowners Association
Department of Land and Natural Resources	Kihei Community Association
Historic Preservation Division	Kula Community Association
University of Hawaiʻi, Maui Campus	Leeward Haleakalā Watershed Restoration Partnership
	Mākena Homeowners Association
	Maui Chamber of Commerce
	Maui Contractors Association
	Maui Cultural Lands
	Maui Economic Development Board
	Maui Hotel and Lodging Association
	Maui Meadows Neighborhood Association
	Maui Native Hawaiian Chamber of Commerce
	Maui Tomorrow
	Na Kupuna O Maui
	Sierra Club
	South Maui Sustainability
	Sustainability Club of Maui Community College
	Sustainable Living Institute of Maui
	The Nature Conservancy
	U.S. Green Building Council—Hawaiʻi Chapter
	Wailea Community Association

State Legislature	Businesses/Business Organizations
Representative Bertram	Kiefer & Garneau
Representative Carroll	Nonie Toledo & Associates
Representative Morita	Yamamoto & Settle
Representative Yamashita	
Senator Baker	
Senator English	
Senator Gabbard	

Table 7-2.
EISPN/EA Distribution List

Landowners	Individuals
A&B Wailea Dowling Company, Inc. Hawai‘i State Department of Hawaiian Homelands Hawai‘i State Department of Land and Natural Resources, Land Division Haleakalā Ranch Honuaula Partners Pāpaka Road Landowners Rush Moore, LLP Tadeschi Winery ‘Ulupalakua Ranch	Les Kuloloio Charles Maxwell Earl Moehler
Libraries	**Other**
Hawai‘i State Library Maui Community College Library	City and County of Honolulu, Mayor’s Office Hawaiian Electric Company Hawaiian Electric Industries, Inc. Hawai‘i Carpenters Union International Brotherhood of Electrical Workers Local 1186—Maui International Longshore and Warehouse Union Laborers Union Maui Electric Company Operators Engineers Union Pacific Resource Partnership

7.3 COMMENTS RECEIVED ON EISPN/EA

Two public meetings were held during the EISPN/EA comment period. One was held on April 21, 2010, in Kihei at Kamali‘i Elementary School from 6:00 to 8:00 p.m. The second meeting was held on April 22, 2010, at ‘Ulupalakua Ranch from 5:30 to 7:30 p.m. In addition to the public meetings, a media advisory was sent out on April 6, 2010. The parties listed in Table 7-3 provided comments on the EISPN/EA, either in writing or verbally, at one of the public meetings. Copies of the comment letters and responses are included in Appendix J. Summaries of the oral testimonies given at both public meetings and the individual responses are also included in Appendix J.

Table 7-3.
EISPN/EA Comments

Name of Commenter, Title	Agency/Organization
Grant Adams	Community Member
Mario Bonofiglio	Community Member
Leo Caire	Community Member
Tom Croly	Community Member
David Doyle	Community Member
Dana Gibson	Community Member
Netra Halperin	Community Member

Table 7-3.
EISPN/EA Comments

Name of Commenter, Title	Agency/Organization
Mary Hertz	Community Member
Tiana Malia Higa	Community Member
Sam Hironaka	Community Member
Mark Hyde	Community Member
Terri Kauai	Community Member
Jacob Lindsey	Community Member
Shelley Maddigon	Community Member
Jacob Mau	Community Member
Judith Michaels	Community Member
Richard Michaels	Community Member
Earl Moehler	Community Member
David Mogilefsky	Community Member
Randy Piltz	Community Member
Mark Rooney	Community Member
Larry Stevens	Community Member
Wanda Transfiguracion	Community Member
Ray VanWagner	Community Member
Susan Wyche	Community Member
Irene Bowie, Executive Director	Maui Tomorrow
Dick Mayer, Planning Committee Chair	Kula Community Association
Don Medeiros, Director	Maui County Dept. of Transportation
Milton M. Arakawa, AICP, Director	Maui County Dept. of Public Works
Cheryl K. Okuma, Director	Maui County Dept. of Environmental Management
Wayde T. Oshiro, Housing Administrator	Maui County Dept. of Housing and Human Concerns
Tamara Horcajo, Director	Maui County Dept. of Parks & Recreation
Jeffrey K. Eng, Director	Maui County Dept. of Water Supply
Charlene Unoki, Asst. Administrator	Hawai'i State Dept. of Land and Natural Resources, Land Division (includes comments from Office of Conservation and Coastal Land, Water Resources Commission, Historic Preservation Division, Engineering Division).
Alec Wong, P.E., Chief	Hawai'i State Dept. of Health, Clean Water Branch
Brennon T. Morioka, Ph.D., P.E., Director	Hawai'i State Department of Transportation
Clyde Nāmu'o, CEO	Hawai'i State Office of Hawaiian Affairs

7.4 OTHER OUTREACH EFFORTS

The Applicant has undertaken a comprehensive local public affairs strategy for the development of the proposed Project. Taking into account the diversity of the population as well as the proposed Project's overall size, scope, and potential impact, it has been imperative to engage in community outreach and education through a variety of methods. In addition to the public meetings discussed above, a Web page has been developed (http://semprageneration.com/auwahi.htm) that features general Project information. A brochure has been created containing information regarding the proposed Project's energy output, a timeline, a map of the area, and a detailed outline of how wind energy works. This brochure has been distributed to interested parties at stakeholder meetings as well as larger community events. Sempra Generation was a sponsor and participant at both the 2009 and 2010 Asia Pacific Clean Energy Summit. On Maui, Sempra Generation was a sponsor of the 2011 Maui Economic Development Board's Ke Alahele Education Fund Benefit Dinner.

8.0 LIST OF PREPARERS

8.0 LIST OF PREPARERS

This EIS was prepared by Tetra Tech. The following is a list of those involved in the preparation of the EIS and their respective roles and experience. Reviews and input were provided by Mitch Dmohowski, Tom Jennings, and Dan Hyatt of Sempra Generation; and Leilani Pulmano and Kivette Koeppe of Munekiyo & Hiraga, Inc.

Tetra Tech, Inc.
737 Bishop Street, Suite 3020
Honolulu, Hawai‘i 96813
(808) 533-3366

Tetra Tech EC, Inc.
1750 SW Harbor Way, Suite 400
Portland, Oregon 97201
(503) 221-8636

Name	Role	Degree/School	Years of Experience
		Management Team	
Alicia Oller	Auwahi Wind Project Program Manager	BA, Biology, Maryville College MS, Ecology, University of Tennessee	22
Anna Mallon	EIS Lead; also Socioeconomic Characteristics, Regulatory Context / Consistency with Plans and Policies Other HRS 343 Requirements	BA, Communication Studies, University of California, Santa Barbara	12
Connie Farmer	Project Principal and EIS Senior Review	MS, Cultural and Biological Resources Management, Miami University	32
Susan Carstenn	EIS Senior Review	PhD, Systems Ecology and Environmental Science, University of Florida M.Ed., Science Education, University of Florida BS, Education, University of Florida	17
Stephanie Frazier	EIS Support	MS, Evolution, Ecology and Organismal Biology, Ohio State University BS, Zoology, Ohio State University	14
George Redpath	EIS Support	MS, Ecology, University of California, Davis BS, Fish and Wildlife Biology, University of California, Davis	34
Brita Woeck	EIS Support; also Biological Resources	MS, University of Missouri-Columbia BS, University of Washington	9

Name	Role	Degree/School	Years of Experience
Interdisciplinary Team			
Emmy Andrews	Hazardous Materials Hydrology and Water Resources Soils	MS, Environmental Management, University of San Francisco BA, Art and Art History, Duke University	7
Reid Farmer	Cultural Resources Senior Review	BA, Anthropology, Tulane University MA, Anthropology, University of Colorado MBA, Finance, Regis University	30
Robert Friedel	GIS Visual Simulations	MS, 2007, Geography – Remote Sensing & Geographic Information Science, Oregon State University BS, 1998, Geography – Geographic Information Systems, James Madison University	12
Irina Gumennik	Visual Resources	BA, Environmental Science and Public Policy, Harvard University	4
Landin Johnson	Land Use Natural Hazards Traffic and Transportation	BA, Political Science and Economics, University of Hawai‘i Certificate in Environmental Studies, University of Hawai‘i	6
Erik Kalapinski	Noise	BS, Civil and Environmental Engineering, University of Massachusetts - Amherst	15
Alex Lockard, P.E.	Traffic and Transportation	BS, Civil Engineering, Oregon State University	16
Sydne Marshall	Cultural Resources	PhD, Anthropology, Columbia University MPhil, Anthropology, Columbia University MA, Anthropology, Columbia University BA, Anthropology, The American University	39
Jon Mollison	Geology & Topography Hydrology and Water Resources Soils	BS, Geology, University of Oklahoma	9
Marleina Overton	Public Infrastructure and Services Public Safety	BS, Environmental Studies, Florida State University	10

Name	Role	Degree/School	Years of Experience
Tricia Pellerin	Noise	Bachelor of Engineering Science (Chemical/Biochemical), The University of Western Ontario Master of Engineering Science (Chemical/Biochemical), The University of Western Ontario	5
Bob Scully	Air Quality	MS, Ecology, University of California, Davis BS, Zoology, Michigan State University	38
Aaron Ungerleider	Hazardous Materials	MA, Ecologically Sustainable Development, Murdoch University, Perth, Australia BA, Geography, University of Hawai'i	3
Production Support			
Teresa Kacprowicz	Technical Editor	BA, Antiquities, Missouri State University BA, French, Missouri State University	20
David Gravender	Technical Editor	MA, English, University of Toronto BA, English, University of Washington	10
Cindy Schad	Word Processing	BFA, Creative Writing, Emerson College	20
Steve Flegel	Word Processing	BA, English, Northwest University	23
Dawn Stuart	Word Processing	NA	14

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9.0 REFERENCES

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