APPENDIX A
SCOPING REPORT

Scoping Report

Na Pua Makani Wind Farm Project

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1.0 INTRODUCTION

This report summarizes the public scoping process for the Environmental Impact Statement (EIS) being undertaken jointly by the U.S. Fish and Wildlife Service (USFWS) and the Hawaii Department of Land and Natural Resources (DLNR) to evaluate the environmental impacts associated with the proposed Na Pua Makani Wind Project (Project) and Habitat Conservation Plan (HCP). This document is a public record of the scoping activities conducted for the Project EIS.

Na Pua Makani Power Partners, LLC (NPMPP), a wholly owned subsidiary of Champlin Hawaii Wind Holdings, LLC, proposes to construct and operate the Project near the town of Kahuku on the island of Oahu, Hawaii. The Project is proposed to begin construction in the fourth quarter of 2015 and begin commercial operation by December 2016. Refer to Section 1.1 for a more detailed description of the proposed Project.

The Project would consist of up to 10 wind turbine generators and associated infrastructures. Because the proposed Project could potentially impact species listed under the Federal Endangered Species Act (ESA), NPMPP is preparing a joint Federal and State HCP)to accompany its application for an ITP from the USFWS under Section 10(a)(1)(b) of the ESA, and an Incidental Take License (ITL) from the Hawaii Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) under Hawaii Revised Statute (HRS) Section 195D. The purpose of the HCP is to ensure that measures to minimize and mitigate the adverse effects of the applicant's proposed action on the Covered Species are adequate. USFWS published a Notice of Intent (NOI) in the *Federal Register* on November 5, 2013 announcing the preparation of joint federal and state EIS. An EIS Preparation Notice (EISPN) was published in the State Office of Environmental Quality Control's (OEQC's) *The Environmental Notice* on December 23, 2013. Subsequently, this EISPN was withdrawn due to the addition of a second access point into the Project which added new Tax Map Key (TMK) parcels that were not included in the original EISPN, as well as other modifications in the proposed Project design. A new EISPN was published on November 8, 2014. Copies of both the NOI and the both versions of the EISPN are provided in Appendix A.

Publication of the NOI in the Federal Register initiated a 30-day public scoping period during which time agencies and the public could submit comments on the Project. Publication of the EISPN initiated a separate 30-day scoping period during which comments could also be submitted. A second 30-day State scoping period was initiated in association with republication of the EISPN. Public meetings were held during each of the three scoping periods.

All comments received during the federal and state scoping periods, including public review and comment on the EISPN and NOI, are consolidated in this report in order to identify environmental issues and/or concerns that the USFWS, DLNR, and NPMPP should consider during the draft EIS process. These comments were received by mail, e-mail, and through testimony recorded at the two public scoping meetings held November 13, 2013 and January 10, 2014 in Kahuku, Hawaii. No public testimony was submitted during the November 19, 2014 public meeting

The National Environmental Policy Act (NEPA) and the Hawaii Environmental Policy Act (HEPA) provide that there shall be an early and open process for determining the scope of issues to be addressed in the EIS and for identifying the significant issues related to a proposed action. The purpose of this scoping process, including the scoping meetings, was to allow the public, and specifically the impacted communities, to provide comment on what the EIS should study, including a reasonable range of alternatives. This information will then be used to assist resource specialists in data collection and analysis for the development of the draft EIS.

Supporting documentation for this summary report is provided in the following appendices:

- Appendix A – includes a copy of the NOI published in the *Federal Register* on November 5, 2013 and a copy of the EISPN published in *The Environmental Notice* on December 23, 2013 and a copy of the EISPN published on November 8, 2014.
- Appendix B – includes local newspaper scoping meeting notification publication information.
- Appendix C – includes transcripts from the public scoping meetings.
- Appendix D – contains the comments received during the scoping periods of November 5, 2013 to December 5, 2013; December 23, 2013 to January 22, 2014; and November 8, 2014 to December 7, 2014 and the corresponding comment response letters, as required under HEPA.

1.1 Project Description

The proposed Project includes portions of two parcels (Tax Map Key [TMK] 5-6-008:006 and 5-6-006:018) located in the Koolauloa District, west of the town of Kahuku in the City and County of Honolulu. These parcels will be leased from the DLNR (approximately 234 acres (95 hectares) and from the Malaekahana Hui West, LLC (approximately 452 acres (183 hectares). Additional parcels would be used to access the Project (TMK 5-6-006: 047, 051, 055, and 5-6-005:018) for which NPMPP would utilize temporary entry permits or licenses or easements. The leased area plus the State-owned access is hereafter referred to as the "wind farm site," consisting of approximately 707 acres (286 hectares). The proposed Project is located almost entirely within the State agricultural land use district with only a small portion of the wind farm site (2 acres [1 hectare]) near Kamehameha Highway falling within the State urban land use district. All of the proposed Project facilities are located within the State agricultural land use district. The proposed Project is located within Honolulu County agricultural zoning districts: General Agricultural and Restricted Agricultural. The Project, is accessible via local roads off of Kamehameha Highway, and is located east of the existing Kahuku Wind Farm.

The proposed Project would consist of up to 10 wind turbines each with a nameplate generating capacity of up to 3.3 megawatts (MW). NPMPP is currently considering turbine models from leading turbine manufacturers including Siemens, Vestas, and GE. The turbine array could include a combination of models from a single manufacturer ranging in generating capacity and dimensions. Turbine models being considered range in hub height from approximately 262 feet (80 meters) to 302 feet (92 meters) with rotor diameters ranging from 328 feet (100 meters) to 384 feet (117 meters), resulting in a maximum height at the top of the blade of up to 512 feet (156 meters) above

ground level. NPMPP would select the most appropriate turbines for the site-specific conditions of the wind farm site prior to construction.

The Project would also include permanent facilities including access roads, overhead and underground transmission and collector lines, an onsite substation, and an operation and maintenance (O&M) building and associated storage yard and parking area. Temporary wind turbine assembly lay down areas would also be used during construction. The Project is expected to produce approximately 88,000 megawatt hours (MWh) of electricity generation per year (assuming an installed capacity of up to approximately 25 MW). The energy generated by the Project would connect to an onsite substation and feed into the Hawaii Electric Company's (HECO's) grid. The Project supports the objectives of the Hawaii Clean Energy Initiative as well as HECO's compliance with the requirements of the Renewable Portfolio Standard.

A joint federal and state HCP is being prepared in anticipation of seeking an ITP from the USFWS, and an ITL from the DLNR, DOFAW. The issuance of an ITP triggers the need for environmental compliance under NEPA. The USFWS is the lead agency under NEPA. The USFWS will use this EIS in whether or not to approve the HCP and issue an ITP for the Project. Due to the Project's need to obtain a commercial lease from the DLNR Land Division authorizing commercial operation of a wind project on State of Hawaii lands and use of State-owned lands, Hawaii Revised Statutes (HRS) Chapter 343 review is required and DLNR Land Division is the Accepting Authority for the HEPA environmental review. The USFWS and DLNR Land Division have determined that a joint state and federal EIS will be prepared as a single document that is consistent with both NEPA and HRS Chapter 343 regulations.

Three alternatives are being considered and analyzed in the EIS. They include:

- Alternative 1 – No Action
- Alternative 2 (Proposed Action) – Wind Project of up to 10 Turbines
- Alternative 3 – Larger Generation Wind Project (up to 12 Turbines)

Public comment received during the public scoping period helped inform the identification of alternatives. The EIS will identify and disclose direct, indirect, and cumulative impacts for all resource issues by alternative, including the no action alternative.

1.2 History of the Project and Public Involvement

In 2009, Oahu Wind Partners, LLC (OWP) proposed to construct and operate a 25 MW wind farm, also called Na Pua Makani, on the DLNR owned portion of the current Project site. The OWP wind project did not move forward and a Chapter 343 analysis was not completed. NPMPP's proposed Project is a new project separate from OWP's 2009 proposed project.

In May 2013, NPMPP began holding community meetings, small focus group meetings with stakeholders, and individual meetings with community leaders and legislators to discuss the proposed Project and engage the public in the Project's planning and design. Key stakeholders before whom NPMPP has presented the Project include the Kahuku Community Association, Koolauloa Neighborhood Board, and Laie Community Association.

2.0 SCOPING MECHANISMS

The following section describes the mechanisms used to solicit and capture public comment in accordance to Council on Environmental Quality guidance (40 CFR 1501.7), HRS Chapter 343, and USFWS guidelines (550 FW 2.3).

2.1 Scoping Announcements and Meeting Notices

The USFWS published an NOI in the *Federal Register* on November 5, 2013 announcing the preparation of joint federal and state EIS, the date for a public scoping meeting, and the invitation to submit comments on the scope of issues to be addressed in the EIS. The publication of the NOI commenced a 30-day federal scoping period (November 5 through December 5, 2013). A copy of the NOI is included in Appendix A.

A public meeting notice for the November 13, 2013 NEPA public scoping meeting was published in the *Honolulu Star-Advertiser* on Thursday, November 7, 2013 (see Appendix B). A press release was also issued by the USFWS on November 5, 2013 and meeting invitation letters were mailed to the stakeholders on the Project mailing list. Flyers advertising the meeting were posted in the Kahuku community prior to the meeting. These notices are available in the Project record.

An EISPN was published in the OEQC's *The Environmental Notice* on December 23, 2013 which included a copy of the USFWS NOI. The publication of the EISPN commenced a 30-day state scoping period (December 23, 2013 through January 22, 2014). A second 30-day State scoping period (November 8, 2014 to December 7, 2014) was initiated in association with republication of the EISPN on November 8, 2014. Public meetings were held during each scoping period. A copy of both the December 23, 2013 and November 8, 2014 published EISPNs are included in Appendix A.

To provide notice of the public scoping meeting for the HEPA (state) process, NPMPP issued legal notices that were published in the *Honololu Star-Advertiser* on Thursday, January 2, 2014 for the first HEPA scoping meeting (January 10, 2014) and on November 8, 2014 for the second HEPA scoping meeting (November 19, 2014). Copies of each published legal notice are included in Appendix B. In addition, invitation letters were mailed to the stakeholders on the Project mailing list. Flyers advertising the January 10, 2014 HEPA scoping meeting were posted in the Kahuku community prior to the meeting. These notices are available in the Project record.

2.2 Public Scoping Meetings

The NEPA scoping meeting was held in November 2013 and the HEPA scoping meetings were held in January 2014 and November 2014. All comments received were addressed individually in accordance with Chapter 343 requirements (see Section 3.0 for additional discussion). Public scoping meeting dates and locations are summarized in Table 1. Transcripts for the public meetings are included in Appendix C.

Table 1. Scoping Meetings, Dates, Locations, and Attendance

Meeting Location	Date	Time	Estimated Attendance
Kahuku Community Center 56-576 Kamehameha Hwy Kahuku, HI 96731	November 13, 2013	5:30 PM to 9:00 PM	35
Kahuku Community Center 56-576 Kamehameha Hwy Kahuku, HI 96731	January 10, 2014	6:30 PM to 8:00 PM	19
Kahuku Community Center 56-576 Kamehameha Hwy Kahuku, HI 96731	November 19, 2014	6:00 PM to 7:30 PM	0

The November 13, 2013 scoping meeting was held by the USFWS and included both informal as well as formal components. Attendees were welcomed at the entrance and asked to sign in. Thirty-five attendees signed in. The meeting commenced with an informal open house so that attendees could review meeting handouts and the display boards, as well as speak one-on-one with representatives from the USFWS and NPMPP. The display boards included an overview of the objectives of the scoping meeting, an overview of the Project, a description of the species covered in the HCP, a process chart explaining the NEPA and HEPA process and opportunities for public comment, and instructions on how to submit comments. After the open house portion of the meeting, a PowerPoint presentation was given that included an introduction to the NEPA process, an overview of the Project, HCP, and the scoping period, and information on next steps and how to provide comment. A public comment period followed the formal presentation. At the close of the public comment period, an informal question and answer period occurred. Nine people provided oral testimony. Although comment forms were available at the meeting so that attendees could submit written comments during the meeting or mail them in at a later date, no written comments were submitted. Supporting information for the November 13, 2013 public scoping meetings, including the PowerPoint presentation, display boards, sign-in sheets, a sample comment form, and the meeting transcript are included in the Project record. A meeting transcript is included in Appendix C.

The January 10, 2014 meeting held by NPMPP for the HEPA scoping process included both informal and formal components. Attendees were welcomed at the entrance and asked to sign in. Nineteen attendees signed in. After an informal open house where attendees could review meeting handouts and display boards, formal introductions began. NPMPP and Tetra Tech gave presentations on the Project and EIS process and timeline. After this, attendees were invited to provide public comments. At the close of the public comment period, an informal question and answer session occurred. Ten people provided oral testimony. Comment forms were available at the meeting so that attendees could submit written comments during the meeting or mail them in at a later date. Two written comments were received. Supporting information for the HEPA scoping meeting is included in the Project record. A meeting transcript is included in Appendix C.

The November 19, 2014 public scoping meeting consisted of an open house with display boards highlighting changes in the Project since the previous scoping meeting. There were no attendees at this meeting.

3.0 SUMMARY OF COMMENTS RECEIVED

Public scoping comments were received via:

- Oral discussion or testimony at the public scoping meetings.
- Written comments received by the USFWS via e-mail.
- Written comments received by Tetra Tech via email, the postal service or hand-delivery.

There were a total of 34 submissions during the federal scoping period, 40 submissions during the first state scoping period, and 11 submissions during the second state scoping period. A submission is defined as the entirety of a written or oral entry. Comments are defined as discrete concepts conveyed in submissions. The complete text of each received submission is included in the Administrative Record for the EIS and in Appendix D. Each comment submission (during both the NEPA and HEPA scoping periods) was replied to with a formal response letter from NPMPP, per HRS Chapter 343. Response letters were sent to commenter's whose submissions included contact information.

Each submission was read and analyzed for substantive comments. Substantive comments were assigned to an issue category and given an issue code. Each issue code had a summary statement drafted. The issue categories, issue codes, and summary statements are listed in Table 2. The public comment submissions generated 522 coded comments, sorted into 21 issue categories and 55 issue codes with accompanying summary statements.

Among the scoping comments received, some issues were raised more frequently than others. A key purpose of scoping is to "determine the scope and the significant issues to be analyzed in depth in the environmental impact statement (40 CFR 1501.7). Significant issues can be raised by just a few comments or by many commenters. It is the significance of the issue and not the frequency of the comment that determines how it should be addressed in the EIS.

Table 2. Issue Category Codes

Issue Category	Issue Code	Summary Statement	Number of Comments[1/]
Comment Acknowledged	ACK	Comments that were received and noted, including general comments, expressions of opinion, and comments that do not fall within the scope of analysis for this EIS.	131
		Total Comment Acknowledged Comments	**131**
Air Quality	AIR 1	Air quality impacts (criteria pollutants) and greenhouse gases resulting from construction and operation of the Project, and how impacts will be calculated and mitigated.	7
	AIR 2	Impacts to meteorology (at the meso-scale and micro-scale) resulting from the Project.	1
	AIR 3	Impacts related to climate change should be identified and analyzed.	3
		Total Air Quality Comments	**11**
Alternatives	ALT 1	Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.	11
	ALT 2	An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.	19
	ALT 3	The alternatives analysis should include a reasonable range of alternatives, and should describe how alternatives were developed and also how they were eliminated from further analysis.	7
		Total Alternatives Comments	37
Cultural Resources	CUL 1	Protection of Native Hawaiian cultural sites and burial grounds, and preservation of culturally-significant lands.	2
	CUL 2	Native Hawaiian land access and gathering rights being restricted as a result of the Project.	4
	CUL 3	Proper consultation is conducted between the USFWS and Native Hawaiian people and mitigation measures are developed for potential impacts to cultural resources.	2
		Total Cultural Comments	8
Data	DAT 1	Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.	23
	DAT 2	Recommended visual simulations of the Project be included in the EIS.	3
		Total Data Comments	26
Direct, Indirect, and Cumulative Impacts	DSC 1	Direct, indirect, and cumulative impacts to public health, visual resources, and socioeconomics for communities nearby.	5
	DSC 2	Direct, indirect, and cumulative impacts to aquatic and terrestrial ecosystems, habitat, native plants, wildlife, bat, and avian species.	4
	DSC 3	The EIS should utilize a clear methodology for analyzing direct, indirect, and cumulative impacts; proposed mitigation measures should be identified and analyzed; and past, present, and future actions should be analyzed as part of the cumulative impact analysis.	10

Table 3. Issue Category Codes (continued)

Issue Category	Issue Code	Summary Statement	Number of Comments[1/]
Direct, Indirect, and Cumulative Impacts	DSC 4	Cumulative impacts associated with power generation of the Project when combined with other nearby wind farms, and whether the power being produced is more than is needed.	2
		Total Direct, Indirect, and Cumulative Impacts Comments	21
Environmental Justice	ENJ 1	The EIS should address any disproportionate adverse impacts to minority and low-income populations, and should reflect coordination with those affected populations.	3
		Total Environmental Justice Comments	3
Public Health and Safety	HAS 1	Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.	39
	HAS 2	Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.	15
	HAS 3	Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.	13
		Total Public Health and Safety Comments	**67**
Natural and Man-Made Hazards	HAZ 1	The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.	13
	HAZ 2	Hazardous wastes, chemicals, and pesticides that will be produced or used by the Project, and how they will be stored, disposed of, and managed.	3
		Total Natural and Man-Made Hazards Comments	**16**
Land Use	LAN 1	The existing condition of the land and land uses within the wind farm site.	5
	LAN 2	The status and value of agricultural lands within the wind farm site.	3
	LAN 3	Potential negative impacts to U.S. Army training facilities located adjacent to the wind farm site.	3
	LAN 4	Potential impacts to agriculture and how any impacts may be mitigated.	1
		Total Land Use Comments	**12**
Mitigation	MIT 1	Would like to see mitigation measures included in the analysis to reduce impacts to biological resources such as ecosystems, habitat, native plants, wildlife, bird and avian species.	3
	MIT 2	Would like to see mitigation measures and BMPs related to water resources, including water quality, landscape irrigation, and stormwater management.	9
	MIT 3	Would like to see mitigation measures designed to minimize traffic impacts during construction.	1
	MIT 4	Would like to see mitigation measures constructed to use less hazardous materials during construction and operation.	1

Table 4. Issue Category Codes

Issue Category	Issue Code	Summary Statement	Number of Comments[1/]
	MIT 5	Suggested a specific mitigation measure for inclusion in the impact analysis in the EIS.	2
		Total Mitigation Comments	**16**
Noise	NOI 1	Noise from the wind turbines associated with construction and operation of the Project impacting sensitive receptors.	5
		Total Noise Comments	**5**
Proposed Project	PRO 1	The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.	30
	PRO 2	Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.	8
	PRO 3	Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.	29
	PRO 4	Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.	6
		Total Proposed Project Comments	**73**
Recreation and Tourism	REC 1	Potential decreases in tourism to the area could occur as a result of the change to the visual landscape from the Project.	3
		Total Recreation and Tourism Comments	**3**
Regulatory	REG 1	Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.	12
	REG 2	The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.	13
	REG 3	The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.	60
	REG 4	Would like to see the development of a scientifically-supportable Habitat Conservation Plan (HCP), and a description of how the HCP will be implemented.	3

Table 5. Issue Category Codes

Issue Category	Issue Code	Summary Statement	Number of Comments[1/]
		Total Regulatory Comments	**88**
Socioeconomics	SOC 1	Concerned about the details of the community benefits package.	13
	SOC 2	How the Project would affect homeowners' ability to install photovoltaic systems.	8
	SOC 3	Concern that the Project would impact the quality of life for nearby communities.	9
	SOC 4	How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.	19
	SOC 5	Concern that the Project would lower property values and make it harder for homeowners to sell homes that are in close proximity to the turbines.	4
	SOC 6	Short- and long-term socioeconomic impacts to the community resulting from the Project.	14
		Total Socioeconomics Comments	**67**
Transportation and Traffic	TRA 1	Short- and long-term traffic impacts to the community, and what mitigation measures could be used to decrease impacts during construction.	2
		Total Transportation and Traffic Comments	**2**
Vegetation and Wetlands	VEG 1	Potential impacts to Native plant communities located within the wind farm site, and how any impacts would be mitigated.	1
	VEG 2	The EIS should include measures to monitor and control invasive plant species and noxious weeds.	1
		Total Vegetation and Wetlands Comments	**2**
Visual Resources	VIS 1	Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.	22
		Total Visual Resources Comments	**22**
Water Resources	WAT 1	Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the EIS.	10
		Total Water Resources Comments	**10**
Wildlife (including Threatened and Endangered Species)	WIL 1	Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.	15
	WIL 2	Critical fish habitat within the wind farm site and potential impacts should be disclosed.	1
	WIL 3	Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.	13
		Total Wildlife (including Threatened and Endangered Species) Comments	**29**

[1/] Note: Some comments received multiple codes.

4.0 NEXT STEPS IN THE PLANNING PROCESS

This section is intended to be a very broad overview of the next steps in the joint NEPA/HEPA process.

4.1 Develop Alternatives

The comments received inform the identification of a reasonable range of alternatives that meet the purpose and need of the Project to be examined in the EIS. Pertinent input from the scoping process will be incorporated into the range of potential alternatives. This ensures that a full spectrum of positions expressed by participants in the scoping process has been considered, in accord with NEPA. Alternatives that were eliminated from further consideration and are not brought forward for formal analysis in the EIS will be identified, along with justification for elimination.

4.2 Describe the Affected Environment

Available environmental information associated with the identified issue categories will be reviewed and summarized. The summary will include available scientific research and pertinent studies and surveys required for areas that would be potentially impacted by the viable alternatives. This information will be presented in the Affected Environment chapter of the EIS.

4.3 Assess Environmental Consequences of Alternatives

The potential environmental consequences of alternatives carried forward for analysis will be evaluated, including direct, indirect, and cumulative effects. NEPA compliance associated with federal, state, and local agency permits will be identified and incorporated into the analysis of potential effects. This step will be conducted after the range of alternatives is identified.

4.4 Issue the Draft EIS

A Draft EIS will be prepared and made available for review by the public and local, state, and federal agencies. The Draft EIS will be available for a 90-day review after the Notice of Availability has been published in the Federal Register. The public hearings will offer another opportunity for public comment on the Draft EIS. A public meeting will be held during the public comment period.

4.5 Issue the Final EIS and Record of Decision

After analyzing public comments received on the Draft EIS, the document will be revised to create a Final EIS. The Final EIS will include the comments submitted on the Draft EIS, including changes made to the EIS in response to comments. This step will include public notice of document availability, the distribution of the document, and a 30-day comment/waiting period on the final document. The issuance of a Record of Decision will conclude the EIS process under NEPA. The selected alternative will be identified, as well as the USFWS/DLNR rationale for their conclusions

regarding the environmental effects and appropriate mitigation measures for the proposed Project. Acceptance of the Final EIS by the DLRN Land Division will complete the HEPA process.

5.0 CONTACTS

Lead Agencies

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APPENDIX A
NOTICE OF INTENT AND ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE

- Public comments; and
- Adjourn.

Members of the public who wish to participate in the November 20, 2013, public meeting (which will be held by webinar) should register at the following Web site by November 19, 2013: *https://www1.gotomeeting.com/register/774101625.* Upon your registration, instructions on how to join the meeting will be sent to your email address. The webinar is limited to 100 participants.

Written comments may be sent to the Designated Federal Official listed in the **FOR FURTHER INFORMATION CONTACT** section above. To review all related material on the Commission's work, please refer to *http://www.doi.gov/cobell/commission/index.cfm.* All meetings are open to the public.

Dated: October 30, 2013.

Kevin K. Washburn,

Assistant Secretary—Indian Affairs.

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BILLING CODE 4310–W7–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS–R1–ES–2013–N213; FXES11120100000–134–FF01E00000]

Notice of Intent To Prepare a Draft Environmental Impact Statement on a Proposed Incidental Take Permit for the Na Pua Makani Project, Kahuku, Hawaii

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of intent; announcement of public scoping meeting; request for comments.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), intend to conduct public scoping under the National Environmental Policy Act (NEPA) to gather information to prepare a draft environmental impact statement (DEIS) related to an incidental take permit (ITP) application that Champlin Hawaii Wind Holdings, LLC (Champlin) intends to submit to the Service pursuant to the requirements of section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (ESA). The proposed permit would authorize the incidental take of listed species caused by the construction and operation of Champlin's proposed Na Pua Makani Project (Project) near Kahuku, Hawaii, for production of wind-generated electrical energy on the island of Oahu. In accordance with ESA requirements for an ITP, Champlin is preparing a habitat conservation plan (HCP) to minimize and mitigate the impacts of take of the covered species likely to be caused by the Project. The DEIS will address the impacts of, and alternatives to, issuance of the ITP and implementation of the HCP to determine if these actions may significantly affect the human environment. This notice initiates the public scoping period for the DEIS during which we invite other agencies and the public to attend a public meeting and submit oral and written comments that provide suggestions and information on the scope of issues and alternatives that should addressed in the DEIS.

DATES: A public scoping meeting will be held on November 13, 2013, from 5:30 p.m. to 9:00 p.m. at the Kahuku Village Association Community Center, 56576 Kamehameha Highway, Kahuku, Hawaii 96731. The public is invited to provide oral and written comments at this meeting related to our preparation of a DEIS for this proposed permit action. To ensure consideration of written comments, please send your written comments on or before December 5, 2013.

ADDRESSES: Comments concerning the issuance of the ITP, the development of the Na Pua Makani HCP and the preparation of the associated DEIS should be identified as such, and may be submitted by one of the following methods:

- *Email: NaPuaMakanihcp@fws.gov.* Include ''Na Pua Makani HCP and DEIS'' in the subject line of the message;
- *U.S. Mail:* Loyal Mehrhoff, Field Supervisor, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3–122, Honolulu, Hawaii 96850;
- *In-Person Drop-off, Viewing, or Pickup:* Written comments will be accepted at the public meeting on November 13, 2013, or can be dropped off during regular business hours at the above address on or before December 5, 2013; or
- Written comments can also be faxed (*Fax:* (808) 792–9581, Attn.: Loyal Mehrhoff) to the Service on or before December 5, 2013.

FOR FURTHER INFORMATION CONTACT: Mr. Loyal Mehrhoff or Aaron Nadig, U.S. Fish and Wildlife Service (see **ADDRESSES** above); by telephone (808) 792–9400; or by email at *NaPuaMakanihcp@fws.gov.* If you use a telecommunications device for the deaf, please call the Federal Information Relay Service at (800) 877–8339.

SUPPLEMENTARY INFORMATION:

Reasonable Accommodation

Persons needing reasonable accommodations to attend and participate in the public meeting should contact Loyal Mehrhoff or Aaron Nadig (see **FOR FURTHER INFORMATION CONTACT** above). Please note that the meeting location is accessible to wheelchair users. To allow sufficient time to process requests, please call no later than 1 week in advance of the meeting.

Background

Section 9 of the ESA and the implementing regulations for the ESA in the Code of Federal Regulations (CFR) at 50 CFR part 17 prohibit the ''take'' of fish or wildlife species listed as endangered or threatened. Take of listed fish or wildlife is defined under the ESA as ''to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct'' (16 U.S.C. 1532). The term ''harass'' is defined in the regulations as ''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'' (50 CFR 17.3). The term ''harm'' is defined in the regulations as ''an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering'' (50 CFR 17.3).

Under limited circumstances, we issue permits to authorize incidental take—i.e., take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Regulations governing ITPs for threatened and endangered species are found at 50 CFR 17.32 and 17.22, respectively. In addition to meeting other criteria, an ITP must not jeopardize the continued existence of federally listed threatened or endangered species. Section 10(a)(1)(B) of the ESA contains provisions for issuing such ITPs to non-Federal entities for the take of endangered and threatened species, provided the permit and related conservation plan meet the following criteria: (1) The taking will be incidental; (2) the applicant will, to the maximum extent practicable, minimize and mitigate the impact of such taking; (3) the applicant ensures that adequate funding for the plan will be provided; (4) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild;

and (5) the applicant will carry out any other measures that the Service may require as being necessary or appropriate for the purposes of the HCP.

NEPA (42 U.S.C. 4321 *et seq.*) requires that Federal agencies conduct an environmental analysis of their proposed actions to determine if the actions may significantly affect the human environment. Under NEPA, a reasonable range of alternatives to a proposed project is developed and considered in the Service's environmental review. Alternatives considered for analysis in an EIS for an HCP may include, but are not limited to: Variations in the scope of covered activities; variations in the location, amount, and type of conservation activities; variations in permit duration; or a combination of these elements.

Proposed Action

Champlin's proposed Project would be located on private and public lands near the town of Kahuku, County of Honolulu, on the island of Oahu, Hawaii. The proposed Project would provide up to 45 megawatt capacity of renewable wind-generated electrical energy to the island of Oahu. A portion of the Project would be located on State of Hawaii lands managed by the Department of Land and Natural Resources (DLNR). The proposed Project's location is adjacent to the existing Kahuku Wind Farm. The Project would be completed in two phases. Phase 1 is anticipated to include approximately eight turbines and phase 2 is anticipated to include approximately six turbines. Supporting infrastructure for the proposed Project may include access roads, wind turbine assembly lay down areas, overhead and underground transmission and collector lines, and may also include an on-site substation and an operations and maintenance building.

Champlin proposes to develop an HCP as part of their application for an ITP under section 10(a)(1)(B) of the ESA. The proposed HCP will cover potential take of the federally-listed species discussed below that is incidental to activities associated with the construction, operation, maintenance, and decommissioning of the Project. The HCP will include measures to minimize and mitigate impacts to covered species and their habitats.

The proposed Federal action would be the issuance of an ITP to Champlin to authorize incidental take of the covered species, subject to compliance with and implementation of Champlin's HCP for the Project. We anticipate Champlin to request ITP coverage for a period of 20 years.

Covered Species

Champlin intends to seek incidental take coverage for the following five federally-listed threatened and endangered species:

- Newell's shearwater (*Puffinus auricularis newelli*)—Threatened;
- Hawaiian coot (*Fulica americana alai*)—Endangered;
- Hawaiian common moorhen (*Gallinula chloropus sandvicensis*)—Endangered;
- Hawaiian stilt (*Himantopus mexicanus knudseni*)—Endangered; and
- Hawaiian hoary bat (*Lasiurus cinereus semotus*)—Endangered.

The following State-listed endangered species may also be included as a covered species in Champlin's proposed HCP:

- pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*).

The final list of covered species may include the above listed species, a subset, or additional species, based on the outcome of the planning process.

Public Scoping

The primary purpose of the scoping process is for the public to assist the Service in developing a DEIS for this proposed ITP action by identifying important issues and alternatives related to Champlin's proposed Project, to provide the public with a general understanding of the background of the proposed HCP and activities it would cover, and an overview of the NEPA process. In order to ensure that we identify a range of issues and alternatives related to the proposed ITP action, we invite comments and suggestions from all interested parties.

The scoping meeting will be held on November 13, 2013, from 5:30 p.m. to 9:00 p.m. at the Kahuku Village Association Community Center, 56576 Kamehameha Highway, Kahuku, Hawaii 96731. The meeting format will consist of an initial open house from 5:30 p.m. to 6:15 p.m. The open house format will provide an opportunity to learn about the proposed action, permit area, and the covered species. The open house will be followed by a formal presentation from 6:15 p.m. to 6:45 p.m. of the proposed action and a summary of the NEPA process, followed by an opportunity for oral comments from the public from 6:45 p.m. to 9:00 p.m. We will accept oral and written comments at the public meeting. A court reporter and an interpreter will be present if deemed necessary. You may also submit your comments and materials by one of the methods listed in the **ADDRESSES** section. Once the DEIS and draft HCP are complete and made available for review, there will be additional opportunity for public comment on the content of these documents through an additional public hearing and comment period.

Public Comments

We request data, comments, new information, or suggestions from the public, other concerned governmental agencies, the scientific community, native Hawaiian organizations, industry, or any other interested party on this notice. We and the applicant will consider these comments in developing the DEIS and the draft HCP related to the proposed Project. We particularly seek comments on the following:

1. The direct, indirect, and cumulative effects that implementation of any reasonable alternative to the proposed Project could have on endangered or threatened species and other unlisted species and their habitats;
2. Other reasonable alternatives to the proposed permit action for issuance of an ITP for the proposed Project or that avoid the need for an ITP that should be considered and their associated effects;
3. Relevant biological data and additional information concerning the proposed covered species;
4. Current or planned activities in the subject area and their possible impacts on the proposed covered species;
5. The presence of archaeological sites, buildings and structures, historic events, sacred and traditional areas, and other historic preservation concerns;
6. The scope of covered activities, including potential avoidance, minimization, and mitigation measures for incidental take of the proposed covered species;
7. Appropriate monitoring and adaptive management provisions that should be included in the HCP; and
8. Identification of any other environmental issues that should be considered with regard to the proposed Project and permit action.

Public Availability of Comments

Comments and materials we receive in response to this notice and at the public meeting, as well as supporting documentation we use in preparing the DEIS under NEPA, will become part of the public record and will be available for public inspection by appointment, during normal business hours, at the Service's Pacific Islands Fish and Wildlife Office (see **ADDRESSES** above). Before including your address, phone number, email address, or other personal identifying information in your comment(s), you should be aware that

your entire comment(s)—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment(s) to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Environmental Review and Next Steps

The Service will conduct an environmental review to analyze the proposed action, along with other alternatives considered and the associated impacts of each for the development of the DEIS. The DEIS will include an analysis of impacts on each covered species and the range of alternatives to be addressed. The DEIS is expected to provide biological descriptions of the affected species and habitats, as well as the effects of the alternatives on other resources, such as vegetation, wetlands, wildlife, geology and soils, air quality, water resources, water quality, cultural resources, land use, recreation, water use, the local economy, and environmental justice. Following completion of the environmental review, the Service will publish a notice of availability and request for public comments on the DEIS, Champlin's permit application, and the draft HCP. The DEIS and draft HCP are expected to be completed and available to the public in 2014.

Authority

The environmental review of this project will be conducted in accordance with the requirements of the NEPA of 1969, as amended (42 U.S.C. 4321 *et seq.*), Council on Environmental Quality Regulations (40 CFR Parts 1500—1508), other applicable Federal laws and regulations, and applicable policies and procedures of the Service. This notice is being furnished in accordance with 40 CFR 1501.7 of the NEPA regulations to obtain suggestions and information from other agencies and the public on the scope of issues and alternatives to be addressed in the DEIS.

Dated: October 18, 2013.

Richard R. Hannan,

Deputy Regional Director, Pacific Region, U.S. Fish and Wildlife Service, Portland, Oregon.

[FR Doc. 2013–26465 Filed 11–4–13; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LLCON00000 L10200000.DF0000 LXSS080C0000]

Notice of Public Meeting, Northwest Colorado Resource Advisory Council Meeting

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of public meeting.

SUMMARY: In accordance with the Federal Land Policy and Management Act and the Federal Advisory Committee Act of 1972, the U.S. Department of the Interior, Bureau of Land Management (BLM) Northwest Colorado Resource Advisory Council (RAC) will meet as indicated below.

DATES: The Northwest Colorado RAC scheduled a meeting from 10 a.m. to 3:00 p.m., Dec. 5, 2013, with a public comment period regarding matters on the agenda at 11:15 a.m. A specific agenda will be available before the meeting at *www.blm.gov/co/st/en/BLM_Resources/racs/nwrac.html.*

ADDRESSES: The meeting will be held at the Colorado River Valley Field Office, 2300 River Frontage Road, Silt, CO 81652.

FOR FURTHER INFORMATION CONTACT: David Boyd, Public Affairs Specialist, see address above; (970) 876–9008. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339 to contact the above individual during normal business hours. The FIRS is available 24 hours a day, seven days a week, to leave a message or question with the above individual. You will receive a reply during normal business hours.

SUPPLEMENTARY INFORMATION: The Northwest Colorado RAC advises the Secretary of the Interior, through the BLM, on a variety of public land issues in northwestern Colorado.

Topics of discussion during Northwest Colorado RAC meetings may include the BLM National Sage-Grouse Conservation Strategy, working group reports, recreation, fire management, land use planning, invasive species management, energy and minerals management, travel management, wilderness, wild horse herd management, land exchange proposals, cultural resource management and other issues as appropriate.

These meetings are open to the public. The public may present written comments to the RACs. Each formal RAC meeting will also have time, as identified above, allocated for hearing public comments. Depending on the number of people wishing to comment and time available, the time for individual oral comments may be limited.

Dated: October 22, 2013.

John Mehlhoff,

BLM Colorado Acting State Director.

[FR Doc. 2013–25539 Filed 11–4–13; 8:45 am]

BILLING CODE 4310–JB–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LLMTL07000–L1420000–BJ0000–LXSIHRRB0000]

Notice of Filing of Plats of Survey; Montana

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of filing of plats of survey.

SUMMARY: The Bureau of Land Management (BLM) will file the plat of survey of the lands described below in the BLM Montana State Office, Billings, Montana, on December 5, 2013.

DATES: Protests of the survey must be filed before December 5, 2013 to be considered.

ADDRESSES: Protests of the survey should be sent to the Branch of Cadastral Survey, Bureau of Land Management, 5001 Southgate Drive, Billings, Montana 59101–4669.

FOR FURTHER INFORMATION CONTACT: Josh Alexander, Supervisory Cadastral Surveyor, Branch of Cadastral Survey, Bureau of Land Management, 5001 Southgate Drive, Billings, Montana 59101–4669, telephone (406) 896–5123 or (406) 896–5009, *jalexand@blm.gov.* Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339 to contact the above individual during normal business hours. The FIRS is available 24 hours a day, 7 days a week, to leave a message or question with the above individual. You will receive a reply during normal business hours.

SUPPLEMENTARY INFORMATION: This survey was executed at the request of the BLM Lewistown Field Office, and was necessary to determine federal interest lands.

The lands we surveyed are:

Principal Meridian, Montana

T. 25 N., R. 19 E.

The plat, in one sheet, representing the dependent resurvey of a portion of

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ESTHER KIA'AINA
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 2, 2013

OFC. OF ENVIRONMENTAL QUALITY CONTROL
'13 DEC 10 P12:20
RECEIVED

Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813

FILE COPY
DEC 2 3 2013

Dear Director:

Under the provisions of Act 172, Session Laws of Hawaii 2012, the Department of Land and Natural Resources has determined at the outset that an environmental impact statement is required for the Na Pua Makani Wind Project being proposed by Champlin Hawaii Wind Holdings, LLC situated at TMK (1) 5-6-008:006 and TMK (1) 5-6-006:018, in the Koolauloa District in the City and County of Honolulu, on the island of Oahu. A completed Bulletin Publication Form and a summary of the proposed action are enclosed (with a copy of the same sent via electronic mail to oeqc@doh.hawaii.gov).

Pursuant to the requirements of Section 11-200-3, Hawaii Administrative Rules, and Section 11-200-15, Hawaii Administrative Rules, we request that you publish a public notice of this statutory determination in the next available periodic bulletin (Environmental Notice) for the public to submit comments to Champlin Hawaii Wind Holdings, LLC with copies of the approving agency during a thirty-day public comment period.

If there are any questions, please contact Ms. Leilani Pulmano at (808) 983-1233 or Ms. Brita Woeck at (425) 482-7645.

Very Truly Yours,

William J. Aila, Jr.
Chairperson

Copy: Champlin Hawaii Wind Holdings, LLC

Enclosures: (1) Completed OEQC Publication form
(2) Summary description of action in electronic format

APPLICANT ACTIONS
SECTION 343-5(C), HRS
PUBLICATION FORM (JANUARY 2013 REVISION)

RECEIVED
'13 DEC 10 P12:20
OFC. OF ENVIRONMENTAL QUALITY CONTROL

Project Name: Na Pua Makani Wind Project

Island: Oahu

District: Koolauloa

TMK: 5-6-008:006, 5-6-006:018

Permits: Possible permits include:

1. Incidental Take Permit from the U.S. Fish and Wildlife Service
2. Incidental Take License from the State Department of Land and Natural Resources /Division of Forestry and Wildlife
3. Conditional Use Permit – Minor from City & County of Honolulu
4. National Pollution Discharge Elimination System Construction Permit from State Department of Health
5. Public Utilities Commission Approval
6. Federal Aviation Administration Clearance
7. Lease for or easement right from State Department of Land and Natural Resources for use of state land
8. Permit to Move Oversized/Overweight Load from State Department of Transportation and City & County of Honolulu
9. Community Noise Permit for Construction Activities from State Department of Health
10. Construction and Building permits from City & County of Honolulu

Approving Agency:
Board of Land and Natural Resources
Contact: William J. Aila, Jr., Chairperson, Department of Land and Natural Resources, Kalanimoku Building,1151 Punchbowl Street, Honolulu, Hawaii 96813; (808) 587-0400

Applicant:
Champlin Hawaii Wind Holdings, LLC
Contact: Mike Cutbirth; 2020 Alameda Padre Serra, Suite 123, Santa Barbara, CA 93103; (805) 568-0300

Consultant:
Tetra Tech, Inc
Contact: Brita Woeck, Tetra Tech, Inc., 737 Bishop St., Suite 2340, Mauka Tower, Honolulu, HI 96813; (808) 441-6600

Status (check one only):

__DEA-AFNSI — Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day comment period ensues upon publication in the periodic bulletin.

__FEA-FONSI — Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov; no comment period ensues upon publication in the periodic bulletin.

__FEA-EISPN — Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and

	PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day consultation period ensues upon publication in the periodic bulletin.
X Act 172-12 EISPN	Submit the approving agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov. NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. No comment period ensues upon publication in the periodic bulletin.
__Statutory hammer Acceptance	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.
__Section 11-200-27 Determination	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page):

Champlin Hawaii Wind Holdings, LLC (Applicant) proposes to construct the Na Pua Makani Wind Project (Project) near Kahuku, Hawaii to provide up to 45 megawatts (MW) capacity of clean, renewable, wind energy to the Island of Oahu. The Project will be completed in two phases, resulting in the construction of up to 15 turbines. A portion of the Project is located on state lands, which triggers a Hawaii Revised Statutes (HRS) Chapter 343 review. A joint federal and state Habitat Conservation Plan is being prepared in anticipation of seeking an Incidental Take Permit (ITP) from the U.S. Fish and Wildlife Service (Service), and an Incidental Take License from the State Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife. The issuance of an ITP triggers the need for environmental compliance under the National Environmental Policy Act (NEPA). The Service and DLNR have determined that an Environmental Impact Statement (EIS) is warranted. By issuing this notice, the State process under HRS Chapter 343 and the federal process under NEPA will be aligned, and the EIS will be put forth as a single document that meets the requirements of both regulations.

Environmental Impact Statement Preparation Notice for the Proposed Na Pua Makani Wind Project, Kahuku, HI
Notice of Intent to Prepare an Environmental Impact Statement for the proposed Na Pua Makani Wind Project.

APPLICANT:
Champlin Hawaii Wind Holdings, LLC; Address: 2020 Alameda Padre Serra, Suite 123, Santa Barbara, CA 93103; Contact: Mike Cutbirth

ACCEPTING AUTHORITY:
Department of Land and Natural Resources/Land Division; Address: 1151 Punchbowl Street, Honolulu, HI 96813; Contact: Russell Tsuji, Administrator, (808) 587-0414

BRIEF DESCRIPTION OF PROPOSED ACTION:
Champlin Hawaii Wind Holdings, LLC (Applicant) has prepared this Environmental Impact Statement Preparation Notice (EISPN) pursuant to the State of Hawaii (State) Environmental review process, as required and defined by Chapter 343, Hawaii Revised Statutes (HRS) and Title 11, Chapter 200, Hawaii Administrative Rules (HAR), and Act 172-12. The purpose of this EISPN is to initiate the EIS scoping process under Chapter 343 and provide an opportunity for comment by reviewing agencies and the public to ensure the environmental concerns are given appropriate consideration in the decision making process along with economic and technical considerations.

The Na Pua Makani Wind Project (Project) is proposed as an up to 45 megawatt (MW) wind energy project located on public and private lands in Kahuku, Hawaii, adjacent to the existing Kahuku Wind Project. A portion of the Project site is located on land that is designated by the State of Hawaii as an agricultural district and is zoned by the City & County of Honolulu as AG-1 Restricted Agricultural District and AG-2 General Agricultural District. The portion of the Project located on public land is being leased from the Department of Land and Natural Resources (DLNR), who has been identified as the Accepting Authority for the purposes of complying with the Chapter 343 environmental review. The other portion of the Project is located on private land owned by Malaekahana Hui West LLC and is designated by the State of Hawaii as an agricultural district and is zoned by the City & County of Honolulu as AG-1. The location of the Project is indicated in Figure 1.

The Project will be completed in two phases, resulting in the construction of up to 15 turbines. Supporting infrastructure for the proposed Project currently includes met towers, access roads, wind turbine assembly lay down areas, overhead and underground transmission and collector lines, and may also include an on-site substation, and an operations and maintenance building. Construction of the Project is anticipated to begin in 2015.

The following describes the potential Project components. Note that dimensions, acreages, and other measures are subject to change based on refinement of the Project design and will be fully described in the draft joint National Environmental Policy Act/Hawaii Environmental Policy Act EIS.

Wind Turbines
The Applicant is currently considering 3.0 MW wind turbines but will select the most appropriate model based on the latest technology available. The Siemens 3.0-108 model meets current Project design criteria and will be used to analyze potential Project impacts. It has a hub height of 262 feet (ft; 80 meters [m]) and a rotor diameter of 354 ft (108 m); as a result, the maximum height to the top of the blade is 440 ft (134 m). Each turbine would be transported from the Honolulu Harbor via highways and assembled on site on a constructed foundation. After construction, a portion of the turbine pad area would be revegetated to minimize erosion, and a portion would be graveled to allow for operations and maintenance requirements and facilitate monitoring efforts.

Met towers
The Project would include at least one permanent lattice-frame (no guy wires) met towers. The tower would support weather instruments that measure and record weather data to measure performance and guide Project operation. The met tower would be approximately 262 ft (80 m) tall with base dimensions approximately 22 ft by 22 ft (7 m by 7 m) and reducing down to approximately 2 ft by 2 ft (1 m by 1 m) for the top 42 ft (13 m).

Access Roads
Internal access roads used for the Project will include portions of an existing road network plus the addition of new roads. Phase I may include 3.3 mi (5.4 km) of road and Phase II may include 1.2 mi (1.9 km) of road, depending on the final turbine layout. Existing roads would be improved, as needed, and expanded to meet construction and maintenance activity requirements.

Construction staging and equipment laydown area, operation and maintenance facility
This area would serve a variety of storage and support functions. During construction the area would be used as temporary storage and laydown area, refueling location, and waste collection area. It would also serve to provide

temporary parking, office space, and sanitary facilities. The permanent operations and maintenance building, storage, and parking area would be constructed in the same area, and these facilities would be used throughout the life of the Project.

Electrical Collection and Interconnect System

Power produced by the turbines would be collected through an electrical collection system. This would feed into an electrical substation, which steps-up the voltage and transmits the power to the point of interconnect with the island's general transmission system via a generator-tie line. To the extent practicable the collection system would be installed underground. Length below ground for the electrical collection system would be approximately 2.4 mi (3.9 km) for Phase I and approximately 1.7 mi (2.7 km) for Phase II.

The interconnection substation will be protected by a perimeter fence and would include the substation pad and below-grade electrical infrastructure. During construction, the substation area would be cleared and graded, and the substation pad would be compacted with well-graded material. Foundations would be installed for the components as required.

The generator-tie line will consist of an above ground power line mounted on monopoles. Pole dimensions, spacing, and locations will be determined based on detailed engineering that will take into account factors such as existing access, environmental constraints, and cost. Approximately 1.0 mi (1.6 km) of generator-tie line would be required for Phase II. Phase II would require reconductoring upgrades to approximately 20.5 mi (33 km) of existing overhead transmission line along the eastern shore of Oahu between the point of interconnect and the Waihee substation to support the increased load anticipated from the Project. This process would include a replacement of the electrical wires and reuse or replacement of existing power poles.

SUPPLEMENTARY INFORMATION

In 2009, Oahu Wind Partners, LLC (OWP) proposed to construct and operate a 25 MW wind farm, also called Na Pua Makani, on the DLNR-owned parcel. OWP prepared a draft Environmental Assessment (DEA) which was published in the OEQC Environmental Notice on September 8, 2009 for public comment. The OWP wind project did not move forward and the Chapter 343 analysis was not completed. Champlin's Na Pua Makani Project is a new project.

The U.S. Fish and Wildlife Service (Service), with the DLNR, intend to prepare a joint EIS to address the potential impacts associated with the construction, operation, maintenance, and decommissioning of the Project on state and private lands, and will also address the impacts of issuance of an Incidental Take Permit (ITP) under the federal Endangered Species Act of 1973, as amended, and an Incidental Take License (ITL) under the HRS Chapter 195D, and implementation of the associated joint Habitat Conservation Plan (HCP) prepared by the Applicant. The joint EIS will be prepared to comply with the requirements of the National Environmental Policy Act and the Hawaii Environmental Policy Act, and all necessary permits and approvals from other local, state, and federal agencies. The joint National Environmental Policy Act/Hawaii Environmental Policy Act EIS will describe the existing conditions and the potential environmental effects of the Project on resources of the physical, biological, and social environment.

The proposed joint HCP will cover potential take of federally-listed species that is incidental to activities associated with the construction, operation, maintenance, and decommissioning of the Project, and will include measures necessary to minimize and mitigate impacts to covered species and their habitats to the maximum extent practicable. We anticipate that the following five federally-listed endangered species will be included as covered species in the Applicant's proposed HCP:

- 'a'o or Newell's shearwater (*Puffinus auricularis newelli*);
- ōpe'ape'a or Hawaiian hoary bat (*Lasiurus cinereus semotus*);
- 'alae ke'oke'o or Hawaiian coot (*Fulica alai*);
- 'alae 'ula or Hawaiian common moorhen (*Hawaiian moorhen; Gallinula chloropus sandvicensis*); and
- ae'o or Hawaiian black-necked stilt (*Hawaiian stilt; Himantopus mexicanus knudseni*).

For these covered species, the Applicant would seek an ITP/ITL.

The following state-listed endangered species will also be included as a covered species in the Applicant's proposed HCP.

- pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*).

The final list of covered species may include all of the above listed species, a subset, or additional species, based on the outcome of the planning process.

DATES:

- All comments on this notice will be considered if received between December 23, 2013, and January 22, 2014.
- A public scoping meeting will be held on January 10, 2014, at 6:30 p.m.in Kahuku, HI.

COMMENTS:
The primary purpose of this EISPN is to initiate the EIS scoping process under Chapter 343 and provide an opportunity for comment by reviewing agencies and the public to ensure the environmental concerns are given appropriate consideration in the decision making process along with economic and technical considerations. We request comments, suggestions, and data from all interested parties to ensure that a reasonable range of alternatives is presented and that all potentially significant issues are identified in the EIS. We will fully consider all comments received during the comment period. Comments and materials we receive will become part of the public record and will be available for public inspection, by appointment, during regular business hours.

We request data, comments, new information, or suggestions from the public, other concerned governmental agencies, the scientific community, native Hawaiian organizations, industry, or any other interested party on this notice. We will consider these comments in developing a draft EIS. We particularly seek comments on the following:

- The direct, indirect, and cumulative effects that implementation of any reasonable alternative could have on the biological, physical, social, and cultural environments;
- Other reasonable alternatives for consideration, and their associated effects;
- Relevant biological data and additional information concerning the proposed covered species;
- Current or planned activities in the subject area and their possible impacts on the biological, physical, social, and cultural environments;
- The presence of archaeological sites, buildings and structures, historic events, sacred and traditional areas, and other historic preservation concerns, which are required to be considered in project planning by the National Historic Preservation Act;
- Covered activities, including potential avoidance, minimization, and mitigation measures;
- Monitoring and adaptive management provisions; and
- Identification of any other environmental issues that should be considered with regard to the proposed Project and permit action.

Because this is a joint National Environmental Policy Act/Hawaii Environmental Policy Act document, all comments submitted in response to the USFWS Notice of Intent to Prepare an EIS and HCP issued in the Federal Register on November 5, 2013 (78 FR 214) and all comments subsequently submitted in response to this EISPN will be fully considered. Comments may be resubmitted in response to this notice; however, this is not required or necessary. A Draft EIS and Draft HCP will be published subsequently with a comment period to follow. Notice of these drafts will be made simultaneously in both the Federal Register and OEQC Bulletin.

ADDRESSES:
Please provide your email address with your electronic and written comments if possible. Electronic inquiries and comments are preferred and may be sent to: NaPuaMakanihcp@fws.gov.

All written inquiries and comments may be sent to: Mike Cutbirth, C/O Tetra Tech, Inc., 737 Bishop St., Suite 2340, Mauka Tower, Honolulu, HI 96813

A public scoping meeting will be held at Kahuku Village Association Community Center, 56576 Kamehameha Highway, Kahuku, Hawaii 96731.

FOR FURTHER INFORMATION CONTACT:
Brita Woeck, Tetra Tech, Inc., 737 Bishop St., Suite 2340, Mauka Tower, Honolulu, HI 96813; (808) 441-6600

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

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

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Curtails the range of beneficial uses of the environment;

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

Based on the established significance criteria, the description of the proposed project provided above, and input received from the local community during preliminary outreach efforts it is anticipated that the proposed action may result in a significant impact to the human and/or natural environment. Therefore, under the provisions of Act 172 (12), the DLNR has determined from the outset that an EIS is required for the Na Pua Makani wind project.

Background

Existing Conditions

The Project lies on 685 ac (277 ha) of land in Kahuku, Oahu. The operational Kahuku Wind Power facility abuts the Project area to the northwest (Figure 1). It is surrounded by agricultural farm lands to the north; residential housing, community infrastructure, and agricultural farm lands to the east; a mixture of agricultural farm lands and undeveloped forest lands to the south; and undeveloped forest lands to the west. James Campbell National Wildlife Refuge (JCNWR) is approximately 0.75 miles to the north and Malaekahana State Recreation area is 0.1 miles to the east.

The Project area consists of steep, dissected ridges surrounding gently sloping valleys (Hobdy 2013). Elevations range from approximately 3 ft (1 m) above mean sea level (amsl) on the northern edge to 614 ft (187 m) amsl on the southern edge. Soils include Kaena Stony Clay, 12 – 20% slopes, Paumalu Badlands Complex which is highly dissected and steep, and with coral outcrops at elevations below 100 ft amsl (30 m; Foote et al. 1972, Hobdy 2013).

The Project area is located within the 7.1 square mi (18.5 square km) Malaekahana Stream watershed. There are three streams within the Project boundary include: `Ohi`a Stream on the northern border; Kea`aulu Stream which runs through the middle of the Project, and Malaekahana Stream is on the southern border. A preliminary wetlands/waters assessment was completed in June 2013, indicating that these streams qualify as Jurisdictional Waters of the U.S. (Hobdy 2013a). Should impacts to these streams be unavoidable, they may be subject to jurisdiction under Section 404 of the Clean Water Act.

The vegetation within the Project area is dominated by a mixture of aggressive non-native weedy species that took over following the abandonment of sugar cane (*Saccharum officinarum*) agriculture. Several common native species occupy some of the ridge tops. The most abundant species in the Project area is the common ironwood (*Casuarina equisetifolia*). Native species are largely intermixed with non-native species with the exception of a few ridge tops where the native `ulei (*Osteomeles anthyllidifolia*), forms large monotypic patches. Other common native species included `uhaloa (*Waltheria indica*) and `akia (*Wikstroemia oahuensis*). A general biological survey of the Project area was completed in June 2013 (Hobdy 2013b). No threatened, endangered, candidate, or proposed plant species were detected.

A preliminary archeological assessment, consisting of archival and background research and a brief field inspection of the Project area, was conducted in 2013 (Pacific Legacy 2013). The results of this assessment indicate that there appears to be a very low probability of encountering any significant cultural resources within the Project area, and that there is a low likelihood that the Project area contains potentially significant archaeological remains that would preclude wind farm development (Pacific Legacy 2013).

Community Outreach

Community outreach has included attendance at several Kahuku Community Association (KCA) Board meetings, KCA General membership meetings, meetings with individual stakeholders, meetings with organizations within Kahuku and Laie and distribution of a project fact sheet. A scoping meeting for the National Environmental Policy Act process was

held on November 13, 2013, at the Kahuku Community Center. The Applicant continues to engage the agencies, the public, and other stakeholders.

National Environmental Policy Act/Hawaii Environmental Policy Act EIS

The following issues will be addressed in the EIS:

Physical Environment

- Soils/Geology
- Water Quality
- Air quality/Climate

Biological Environment

- Wildlife
- Vegetation
- Threatened and Endangered Species

Social Environment

- Visual Resources
- Noise
- Health Impacts
- Traffic/Transportation
- Archaeological and Cultural Resources
- Socioeconomics/Environmental Justice

The following are additional studies that will be completed as part of the EIS:

- In compliance with the requirements of HAR § 13-276-4, a more detailed Archaeological Inventory Assessment, entailing a summary of the traditional and historic activities and uses of the area and field work (pedestrian survey of previously unsurveyed areas, selected backhoe trenching, and hand excavation of test units) will be completed for the project and submitted to the State Historic Preservation District (SHPD) for approval. The AIS will be incorporated into the EIS.
- Pursuant to HRS Chapter 6E, a cultural impact assessment will be conducted to identify the effects of the Project on the cultural practices of the community and State.
- Visual simulation analyses will be completed to demonstrate the visibility of the proposed turbines and other Project components.
- A noise analysis will be completed to compare the predicted noise levels associated with the turbines and the associated facilities to the applicable noise standards.
-

References

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens. 1972. Soil survey of the islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. US Department of Agriculture. Washington, D.C.: U.S. Government Printing Office.

Hobdy, R. 2013a. Wetlands and Waters of the U.S. Assessment and Determination for the Na Pua Makani Wind Project, Kahuku, Ko`olauloa, Oahu, Hawaii, Kokomo, Maui. Na Pua Makani Power, LLC.

Hobdy, R. 2013b. Biological resources survey Na Pua Makani Wind Project, Kahuku, Ko`olauloa, Oahu, Hawaii. Kokomo, Maui. Na Pua Makani Power, LLC.

Pacific Legacy. 2013. Archaeological Assessment for the Proposed Na Pua Makani Wind Farm in the lands of Kahuku, Island of Oahu. Prepared for Champlin/GEI Wind Holdings, LLC.

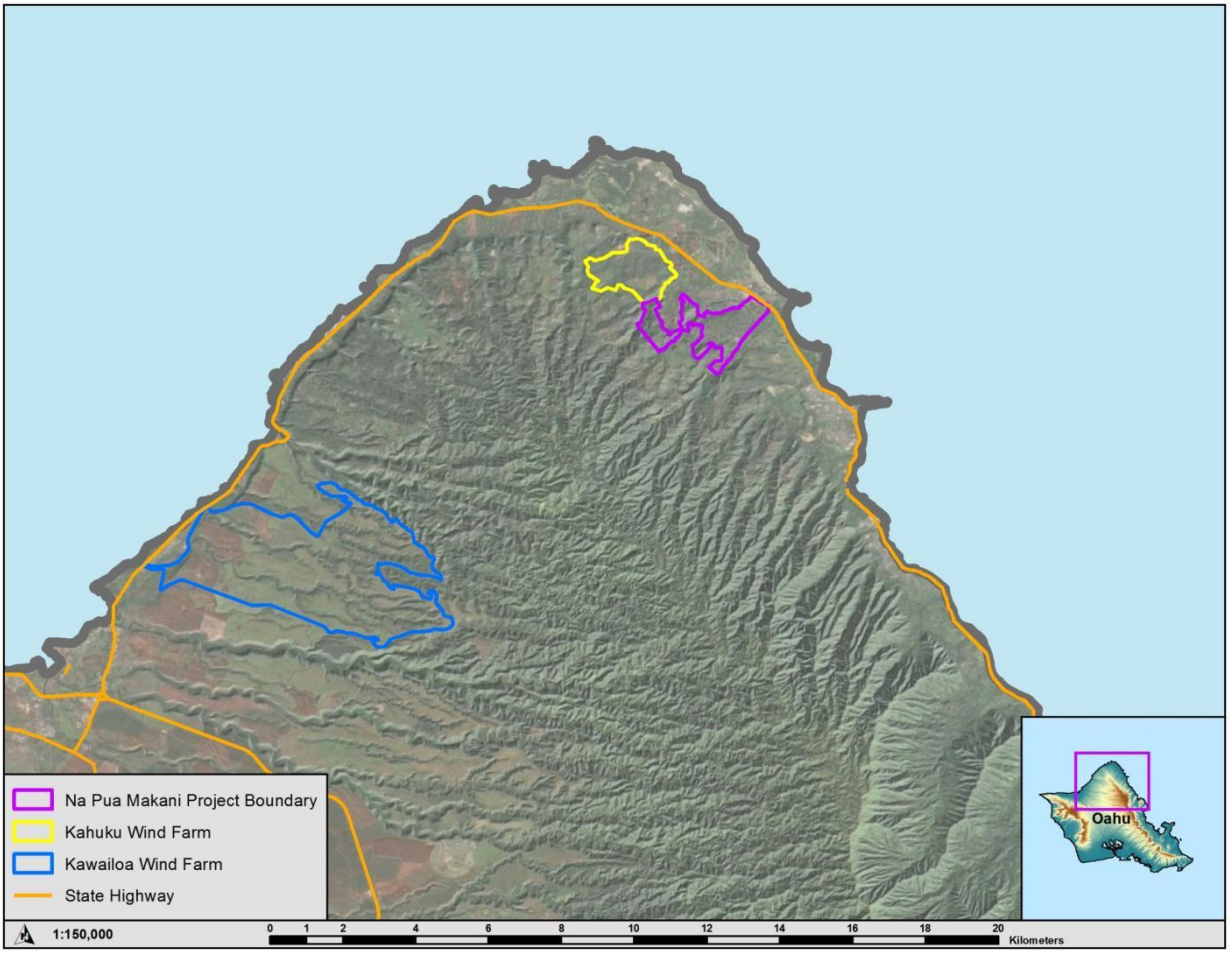

Figure 1. Napua Makani Project Vicinity Map

APPENDIX B
PUBLIC MEETING NOTICES

NOTICE OF PUBLIC SCOPING MEETING

Notice is hereby given that the
U.S. FISH & WILDLIFE SERVICE
will conduct a Public Scoping Meeting
for the
PROPOSED NA PUA MAKANI WIND PROJECT
Kahuku, Island of Oahu

Date: Wednesday, November 13, 2013
Time: 5:30 pm to 9:00 pm
Location: Kahuku Community Center
56-576 Kamehameha Hwy
Kahuku, HI 96731

The U.S. Fish and Wildlife Service (Service) is conducting a public scoping meeting associated with Champlin Hawaii Wind Holdings, LLC's (Champlin) proposed Na Pua Makani Wind Project located near the town of Kahuku, City and County of Honolulu, on the island of Oahu, Hawaii.

The Service is gathering information to prepare a draft environmental impact statement (EIS) to analyze the potential impacts of the issuance of an incidental take permit (ITP) under the Endangered Species Act (ESA). The ITP would authorize the incidental take of listed species caused by the construction and operation of the proposed project. In accordance with requirements of the ESA for an ITP, Champlin is preparing a habitat conservation plan to minimize and mitigate the impacts of take of listed species likely to be caused by the proposed project.

The proposed project would be located on State of Hawaii (Department of Land and Natural Resources) and leased private lands, located adjacent to the existing Kahuku Wind Farm. The proposed project will provide up to 45 megawatt capacity of renewable wind-generated electricity to the island of Oahu. Supporting infrastructure for the proposed project currently includes access roads, wind turbine assembly lay down areas, overhead and underground transmission and collector lines, and may also include an on-site substation, and an operations and maintenance building.

The scoping meeting provides an opportunity to express your views and offers information on the scope of issues and alternatives that should be addressed in the EIS. Comments concerning the preparation of the EIS should be identified as such, and may be submitted in person at the public scoping meeting or by one of the following methods:

- Email: NaPuaMakanihcp@fws.gov. Include "Na Pua Makani HCP and EIS" in the subject line of the message;
- U.S. Mail: Loyal Mehrhoff, Field Supervisor, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3-122, Honolulu, Hawaii 96850;
- In-Person Drop-off, Viewing, or Pickup: Written comments will be accepted at the public scoping meeting on November 13, 2013, or can be dropped off during regular business hours at the above address; or
- Fax: (808) 792-9581, Attn.: Loyal Mehrhoff.

For more information regarding the meeting, please contact Mr. Loyal Mehrhoff or Aaron Nadig, U.S. Fish and Wildlife Service (see address above); by telephone (808) 792-9400; or by email at NaPuaMakanihcp@fws.gov.

Persons needing reasonable accommodations to attend and participate in the public meeting should contact Loyal Mehrhoff or Aaron Nadig (see contact information above). Please note that the meeting location is accessible to wheelchair users. To allow sufficient time to process requests, please call no later than one week in advance of the meeting.
(SA573428 11/7/13)

Na Pua Makani Wind Project

Public Meeting

The public is invited to attend an informational meeting concerning the preparation of the Environmental Impact Statement for the proposed Na Pua Makani Wind Project located in Kahuku, Oahu

Friday, Jan. 10, 2014 at 6:30 pm to 8:00 pm
Kahuku Community Center, 56-576 Kamehameha Hwy
Kahuku, Hawaii 96731

NOTICE OF PUBLIC SCOPING MEETING

Notice is hereby given that
CHAMPLIN HAWAII WIND HOLDINGS, LLC
will conduct a Public Scoping Meeting
for the
PROPOSED NA PUA MAKANI WIND PROJECT
Kahuku, Island of Oahu

Date: Friday, January 10, 2014
Time: 6:30 pm to 8:00 pm
Location: Kahuku Community Center
56-576 Kamehameha Hwy
Kahuku, HI 96731

Champlin Hawaii Wind Holdings, LLC (Champlin) is conducting a second public scoping meeting associated with the proposed Na Pua Makani Wind Project located near the town of Kahuku, City and County of Honolulu, on the island of Oahu, Hawaii.

Champlin is gathering information to prepare a draft environmental impact statement (EIS) to analyze the potential impacts caused by the proposed project.

The proposed project would be located on State of Hawaii (Department of Land and Natural Resources) and leased private lands, located adjacent to the existing Kahuku Wind Farm. The proposed project will provide up to 45 megawatt capacity of renewable wind-generated electricity to the island of Oahu. Supporting infrastructure for the proposed project currently includes access roads, wind turbine assembly lay down areas, overhead and underground transmission and collector lines, and may also include an on-site substation, and an operations and maintenance building.

The scoping meeting provides an opportunity to express your views and offers information on the scope of issues and alternatives that should be addressed in the EIS. Comments concerning the preparation of the EIS should be identified as such, and may be submitted in person at the public scoping meeting or by one of the following methods:

- Email: NaPuaMakanihcp@fws.gov. Include "Na Pua Makani HCP and EIS" in the subject line of the message;
- U.S. Mail: Mike Cutbirth, c/o Tetra Tech 737 Bishop Street, Suite 2340, Honolulu, Hawaii 96813
- In-Person Drop-off, Viewing, or Pickup: Written comments will be accepted at the public scoping meeting on January 10, 2014, or can be dropped off during regular business hours at the above address; or
- Fax: (808) 836-1689, Attn.: Mike Cutbirth.

For more information regarding the meeting, please contact Tessa Munekiyo Ng at (808) 983-1233.

Persons needing reasonable accommodations to attend and participate in the public meeting should contact Tessa Munekiyo Ng at (808) 983-1233. Please note that the meeting location is accessible to wheelchair users. To allow sufficient time to process requests, please call no later than one week in advance of the meeting.
(SA589087 1/2/14)

APPENDIX C
MEETING TRANSCRIPTS

1 NEPA PUBLIC SCOPING MEETING

ORIGINAL

2

3 NA PUA MAKANI WIND PROJECT

4 IN RE: Habitat Conservation Plan

5 IN RE: Environmenal Impact Statement

6

7

8 PLACE: Kahuku Community Building

9 56-576 Kamehameha Highway

10 Kahuku, Hawaii

11 DATE: November 13, 2013

12 TIME: 5:30 p.m.

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21 Reported by: Kathryn Plizga,

22 Hawaii CSR No. 497

23

24

25

1 APPEARANCES:

2 FOR THE U.S FISH AND WILDLIFE SERVICE:

3 Aaron Nadig

4

5 FOR CHAMPLIN WIND:

6 Mike Cutbirth

7

8 FOR MUNEKIYO & HIRAGA, INC..

9 Lelani Pulmano

10 Tessa Munekiyo

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1 I N D E X

2	PRESENTATION SPEAKERS:	PAGE:
3	Aaron Nadig	4
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6	PUBLIC AUDIENCE COMMENTS:	
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11	PUBLIC AUDIENCE QUESTION AND ANSWER:	
12	Kent Konomoana	25
13	Junior Primacio	40
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15	Mr. Tablin	45
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22	CLOSING REMARKS:	
23	Aaron Nadig	63

24

25

(6:20 p.m.)

P R O C E E D I N G S

MR. NADIG: Thanks, everyone, for coming.

I am Aaron Nadig with the U.S. Fish and Wildlife Service. This is the Scoping Meeting for Champlin Wind, this project, Na Pua Makani.

Mike Cutbirth is here to talk about the details of the project. Munekiyo & Hiraga have been out here doing media outreach on the Habitat Conservation Plan, trying to help us do the paperwork on the regulatory actions.

Basically, Fish and Wildlife Service is supporting alternative energy, and we're trying to set it in responsible areas and to responsibly offer conservation for precious resources. That's the reason that the EIS is seeking an incident permit and that's the reason we're here tonight, because the Federal energy compliance is part of that.

This is a scoping process. Tonight, we are going to focus on public comment. We will be up here after the presentation, we will give you guys an opportunity to come up and speak.

I would like everyone to be cognizant about the time mentioned and basically give other people

1 comment, and that will be provided later. If you
2 wish to comment, we have an e-mail address comment
3 for the scope of the process.
4 Everyone, I assume, signed in at the front
5 desk, with Lelani. Like I said, we will be taking
6 written comments as well for those who aren't able to
7 speak tonight. We have a court reporter right here
8 and she'll be taking a transcript of tonight's
9 hearing so that we will have a record.
10 This is, like I said, this is the Federal
11 portion of working on the Na Pua Makani project. We
12 are working in conjunction with the state of Hawaii.
13 They are a little bit behind us in the process and I
14 think that they'll be having their scoping meeting
15 probably a month after ours, sometime in December.
16 So you will have another opportunity for a
17 scoping meeting at the time that the EPA process
18 kicks in for the state. That triggers, like I said,
19 for the issue of our permit, protecting threatened
20 species related to this project; and triggers for
21 the state's environmental process the fact that the
22 Na Pua Makani will be situated on state lands.
23 Tonight, we want to give you an opportunity
24 as a public to ask questions and try to provide
25 answers to your questions. This is the start of the

1 process, so we are just beginning. So we might not
2 be able to answer all of those questions. We have a
3 lot of work still ahead of us. It is a long process.
4 There will be another opportunity to comment, like I
5 said, in December for scoping process.
6 And then when we have draft documents, more
7 information on the project, on the siting and the
8 effects of the project, they will be released in a
9 public meeting that will also be open for public
10 review.
11 So this is just a slide. There's also one
12 over here, shows where we are in the process. So,
13 like I said, on the EIS side of things, we were at
14 least knowing tonight it was part of the scoping
15 process.
16 The state, it's pretty close to us right
17 now. We are dovetailing more as we work towards
18 completing the project. It will be both state and
19 Federal funded.
20 So we are ready for Mike Cutbirth from
21 Champlin to discuss more about the project with us.
22 MR. CUTBIRTH: Thank you, everyone, good
23 evening. My name is Mike Cutbirth. I am the manager
24 of Champlin Wind Holdings, sponsor of the project.
25 Appreciate all of you coming out to this

1 public scoping meeting. This is the first couple of
2 meetings.
3 Just by way of background, I have been in
4 the wind industry about 18 years. Our management
5 team has developed over a dozen wind projects over
6 the years in the United States. And we are not
7 affiliated with First Wind, this is not a First Wind
8 project. So, why are we here?
9 We're proposing a wind energy project
10 because the state of Hawaii has passed two laws that
11 require 70 percent clean energy and require
12 40 percent of the electricity generated to be
13 generated from renewable sources. This project will
14 help achieve those goals and meet those laws.
15 Additionally, Hawaii has the highest
16 electricity costs in the nation. And renewable
17 energy projects generate electricity at a fraction of
18 the cost of burning oil. Currently, Hawaii imports
19 about four and a half billion dollars of oil from
20 foreign countries each year, and that represents
21 about eight percent of Hawaii's economy. So every
22 renewable project that is brought on line helps
23 reduce that dependence on oil and it helps to drive
24 down the cost of the electricity for all the
25 customers in Hawaii.

1 customers in Hawaii.

2 So the project is proposed on the North

3 Shore. And the area in yellow is the First Wind

4 Kahuku project and the area in purple is our proposed

5 project.

6 MR. KONOMOANA: Question?

7 MR. CUTBIRTH: Sir?

8 MR. KONOMOANA: Can you go back a slide?

9 Where is the Kahuku community located? Can you point

10 to it on the map, where the Kahuku community is, a

11 residential community?

12 I've got a real good map that demonstrates

13 where the Kahuku Community is between those two

14 projects. If you can't do it, I can.

15 MR. CUTBIRTH: Well, if you have a better

16 map later --

17 MR. KONOMOANA: I have a real good one,

18 because this map here doesn't show the other project

19 as well as the Kahuku Community property, for all

20 those who may not know where we live.

21 MR. CUTBIRTH: Well, Ken, I think you may be

22 a little generous on that. I think there's a

23 subdivision, and you live kind of right in this area

24 right here, and the community is down around the

25 Kamehameha Highway.

1 it would be built on both state land, which is
2 managed by the Department of Natural Land and Natural
3 Resources and also on private land. The project is
4 proposed in two phases.
5 The first phase would be eight turbines, the
6 second phase up to seven turbines. Some of the
7 additional infrastructure would include access roads,
8 transmission lines, potentially an on-site substation
9 and another building.
10 This is a layout of the project, the
11 location of the wind turbines as well as access
12 roads, and in-ground transportation lines.
13 As a part of the permitting process, we'll
14 prepare in conjunction with the State and Federal
15 agencies a Habitat Conservation Plan. And we do that
16 because there are five Federally listed endangered
17 species and one state listed endangered species.
18 The Habit Conservation Plan will be a joint
19 document, both Federal and State, and will cover both
20 the construction and operation of the project.
21 And we're currently working with the
22 agencies to develop estimates and litigation plans
23 and strategies. And we expect that the HCP for the
24 project will be similar to other HCP's that have been
25 prepared on other projects here in Hawaii.

1 So, over the course of the last nine months,
2 we have had a number of meetings with the community
3 and we've gotten a lot of good comments and questions
4 and input. And tonight is important because this is
5 an opportunity to provide your input and comments in
6 particular matters that are important to you to be
7 evaluated and studied as a part of the preparation of
8 an Environmental Impact Study. So your input here is
9 actually going to become a part of the official
10 project record.
11 And while we've had over the months some
12 very good comments, very good questions related to
13 what health and safety impacts this project and wind
14 turbines generally have, what length of additional
15 fire leads, whether the project designed to withstand
16 hurricanes, what sort of noise levels, clients we
17 have.
18 It's important that you give those comments
19 tonight because this is where they become a part of
20 the official record. And this comment period is open
21 through the 5th of December.
22 And if I could, turn over the balance of the
23 process to Aaron. Thank you.
24 MR. NADIG: So again, this is a scoping
25 process. So this is the beginning of the process.

1 Obviously, the state isn't here so there still is
2 continued scoping necessary with EPA.
3 The draft EIS and draft HCP, at the time
4 they are released they will be a joint document for
5 both agencies. And there will be another public
6 comment period in 2014, and you'll have more
7 information to answer your questions, and to see what
8 the project is as it develops.
9 So, like I side, the deadline for the
10 scoping process for the Federal side is December 5.
11 Obviously, it's going to be open also for the state.
12 And both those comment periods will be provided in
13 the document.
14 Tonight, we have the mikes and I guess we
15 have the court reporter. The oral comments will be
16 recorded. Again, for those that don't necessarily
17 feel comfortable speaking, you will have an
18 opportunity for written comments as well as the
19 e-mail addresses here. I believe you guys have a
20 hand-out, correct?
21 So there will be a hand-out that will have
22 your e-mail address on it and you'll be able to do
23 that. Again, on the Federal side we have a fax
24 number if you want to submit a fax letter. We also
25 have an address if you want to submit it through

1 traditional mail.

2 So, thank you for coming. And I would like

3 to open up the mikes now. Please step up, please

4 make sure you say your name, say your name clearly so

5 the reporter can get that. And then we'll proceed

6 with comments.

7 MR. HO: My is Carl Ho, I live in Laie.

8 I understand we need some renewable energy.

9 I understand that. But I am born and raised here,

10 Hawaiian. My mistake, I will live with that. I have

11 been an American and I am a proud vet. I also am

12 Hawaiian. And now, seeing for the first time going

13 over towards which Waialua and standing at the 18th

14 hole of the golf course, seeing the wind mills, it's

15 an eyesore. This is a beautiful state, this is our

16 land.

17 Everything is done in ways -- everybody

18 wants to get paid. You here for money. You're not

19 here for our this or that. You know, you're trying

20 to do something, everybody is here for money. You

21 want money. You want to get while the getting is

22 good. I understand that too. I have got to live

23 with it.

24 But it's still hard to swallow. Waimea Bay,

25 we have gone to sleep on that. I kind to like to

1 sleep on this one too. You know, I wasn't really an
2 activist, but I do have a say. Some of these wind
3 mills are a little close for the children, for the
4 elders. But it is convenience that you put a way
5 for. And I mean, there is a lot into it --
6 You put a Hawaiian name on this project.
7 Why don't you put your own name on it, you know.
8 Don't put something that's Hawaiian that is
9 Caucasian. We need it, yes, I understand. We can do
10 better, we can make better choices.
11 One on the back side, we were talking to
12 Joe, I don't mind if it's further away. I understand
13 we need it. But if some of those blades come off on
14 some high winds -- and the school is right in the
15 area -- I mean -- everyone is going to get disaster
16 anyway if we get a hurricane like the Philippines
17 just had. But I lived through Hurricane Eva. Even
18 this part of the island got as bad as the other side
19 on Waianae. This side barely got touched.
20 But Eva, we don't have a little bit -- all
21 the blades are gone. We were out of electricity for
22 six weeks, but that was play time costs. It was fine
23 with me.
24 But, there's certain things we need, I
25 understand. My say is the one that's too close, put

1 them back farther. Figure out a way. I don't know,
2 you're still going to do what you're going to do.
3 You're going to get your approval, you're going to
4 get your permits, I understand. But I don't know,
5 the people got a say for it, yay or nay. And that's
6 really all I have to say.
7 MR. FONOIMOANA: My name is Kurt Fonoimoana.
8 I have been involved with gathering information with
9 this project since its inception.
10 During the first phase, a gentleman came
11 through, his name was Keith Avery. Keith Avery made
12 several representations to our community, I was in
13 total support at that time. When they first brought
14 in the original project, they were going to put --
15 unfortunately I don't have fancy maps so I can find
16 it on this one though -- they were going to put four
17 turbines right about there, right in here.
18 (Indicating) And we stood up and said we don't want
19 them there. And we appreciate the fact that they
20 took them out.
21 However, there's more than that argument
22 about the close proximity. And we have this in the
23 proximity. If we were to put the same layout of
24 these turbines around the James Campbell Wildlife
25 Refuse, you guys would all scream.

1 Refuse, you guys would all scream.

2 But we can do it to us, humans. Mike has

3 had several conversations with me regarding the --

4 about Dr. Pierpont's theory of turbine syndrome.

5 He can argue from a scientific point of

6 view. He was also on the committee that -- part of

7 the agencies that came up with the information to

8 debunk Pierpont's theories of turbine syndrome.

9 Personally, I don't want -- I supported the

10 First Wind project when they came in, after many

11 weeks of talking to whoever I can, including my

12 maker, to see if that was the right thing to do for

13 our community.

14 Renewable energy, you heard my buddy Carl

15 say we need it, I support renewable energy. I would

16 like to add a word in there, responsible. In my book

17 it is irresponsible to completely surround the Kahuku

18 Community on three sides with turbines.

19 We have done our share for this island.

20 7,000 homes are being powered now that they got First

21 Wind back up on line, and I am glad that they did.

22 Where's Caroline? Caroline shared that with

23 Brandon and the other guys. I'm glad to see you guys

24 back on line. Now we are producing juice. However,

25 I didn't particularly want them here either. But not

1 finding a good enough argument to argue against them,
2 I had nothing else to do but try to support the
3 bigger picture.
4 However, the bigger picture in my book
5 includes human beings at this point when we're
6 surrounding ourselves, the Kahuku Community. Since
7 we're providing 7,000 -- well -- on its optimum
8 energy output -- 7,000 homes are getting energy due
9 to Kahuku's good will. We've done our share. Kahuku
10 quote/unquote has done our share as a local.
11 Waialua has done their share.
12 I am waiting to see them pop up in East
13 Honolulu. If they can put them up over here, they
14 can put them up over there. Kailua, Nanakuli, which
15 was the original place they were supposed to put
16 these turbines. However, their community objected
17 and our former leaders in government leadership said,
18 oh, let's put them in Kahuku because they're not
19 organized.
20 This is a personal issue to me. I live up
21 there where I will be impacted.
22 Our elementary school is 1,200, 1,300 feet
23 away from the closest turbine. Our high school the
24 same, police, fire station the same distance.
25 The problem is not only the distance, the

1 It's upwind of the -- normally normal trade
2 winds upwind. Our students are already struggling,
3 you want to give them more distractions? This isn't
4 entirely a hurricane safety-type issue.
5 When the big storm comes, I am sure it's
6 possible that one such as that hit the Philippines
7 will hit us. I think one of those 150-foot long,
8 7-ton blades could do quite a bit of damage if it
9 landed in the wrong spot. I don't know if there
10 would be a right spot.
11 I'm not against renewable energy, but I
12 certainly am against this project. Keith Avery, when
13 he first came to Kahuko, promised us if your
14 community says they don't want it, we're not going to
15 build it.
16 Well, we organized and we let him know we
17 didn't want it. I walked personally my entire
18 community. And I have been lucky if I found two
19 people who said, oh, well, it's not that bad. But
20 every person that I talked to, up and down the
21 roads said, no, we don't want any more, and those
22 over there are too close.
23 I didn't have to say anything, oh, by the
24 way, I kind of voted for those. I felt bad. I
25 regret that decision sometimes.

1 regret that decision sometimes.

2 I want accountability. Fish and Wildlife,

3 you, the Federal Government and State, all this other

4 stuff, you guys are going about your business as if

5 it's already a done deal. You are going to make the

6 community, which is not exactly informed, because I

7 know there's public information person, they are not

8 doing their job. How many people are from Kahuku?

9 One, two, three, four, five, six, seven or so.

10 My goodness, there's more people in Kahuku

11 than that. How many people are not from Kahuku,

12 raise your hands. I want to see everybody.

13 No shame in the back, you're not from

14 Kahuku, I don't recognize some of you guys, we're out

15 numbered. We are being kind of told what to do.

16 And I'm telling you that I am going to spend

17 a lot of my time and energy, Mike, to try to guide

18 the community through a responsible process of

19 bringing energy to the people. And in my honest

20 opinion, no problem with wind energy, we need wind

21 energy -- to me is a scam -- close to it.

22 The longer that we defray from focusing on

23 true answers for this particular state -- wind energy

24 is good in other parts of the country, don't get me

25 wrong -- I am not anti-wind. But in this particular

1 state we're sitting on a resource that we're not
2 using that could provide 24/7, 365 consistent power
3 all the time.
4 And that will be geothermal. And any more
5 focus on going after wind is putting -- is punting
6 that ball down the road, geothermal ball. In my
7 book, I'm opposed. Thank you for your time.
8 MR. PRIMACIO: My name is Junior Primacio.
9 I am a long-time resident in Kahuku, born and raised
10 in Kahuku. Graduated from Kahuku High School, worked
11 for the plantation, and raised my family here. The
12 only time I was not in Kahuku is when I went to
13 Vietnam.
14 I'm here to let you all know where Kahuku is
15 coming from. Kahuku is a deprived community,
16 deprived in many ways. Talking about the hurricanes
17 that occurred in Kahuku two times. We were the last
18 to be served, including our elderly housing,
19 including our hospital. We were without water, we
20 were without electricity. We managed. We managed.
21 We had our people go to the mill, the sugar
22 mill, where we had a potable water well that was
23 acceptable for drinking. People with buckets had to
24 come to the mill and get water. We had to get the
25 National Guard to provide water for the hospital and

1 also the elderly housing.

2 It wasn't easy, but we survived. And if

3 you're going further back, when the plantation left

4 Kahuku, we were dominantly independent in Kahuku with

5 no help from nobody. But we had one hotel that was

6 going to be built, being built.

7 And a lot of the things we said that we are

8 going to do, we did. We decided that, okay, the

9 plantation is closing down, we better do something

10 about that hotel. We were the only community that

11 supported that hotel. And it's unfortunate, but we

12 had to survive.

13 And again, if you look at today's situation,

14 Kahuku has problems with the bridge, Kahuku has

15 problems with our elderly, our Kahuku Housing area,

16 Kahuku has problems with our district both. All that

17 wasn't there, we put it together. And yet we needed

18 the support of the community to survive and the

19 support of the government to help us endure

20 ourselves, which was not in prevail.

21 What I'm getting at here, here we have

22 Kahuku's wind energy is one of the best on this

23 island. We have got 12 wind mills that first we put

24 up, and we can put up to another 15, I think, in our

25 area, to be sustainable.

1 And we had denied First Wind, they wanted to
2 put five more wind mills along Kam Highway which we
3 denied vehemently.
4 We are now supporting our effort to get this
5 wind project going. Now, let me tell you, why do we
6 feel the way we do?
7 Look at our gas price right across the
8 street here. That's $4.20, that's higher than any
9 other place in our neighboring communities and up in
10 Kaaawa, likewise in Waialua. Why? Is it harder to
11 bring gas to Kahuku? But we had to live with that.
12 That's one true fact that exists. Who hurts? Our
13 community.
14 Okay, we talk about having wind farm, we put
15 up 12 wind farm, we supported that. We hope that
16 some day our electric bill going down. Never going
17 to happen, never going to happen.
18 I don't think it will ever come about where
19 our electric bill will go down. Unfortunately,
20 that's the way I feel.
21 So I am taking a different view with this
22 wind farm. I'm saying, yeah, we can put up to 15
23 or -- I am not sure what the number -- 15 or 20 more
24 wind mills in our area.
25 And I cannot speak for our neighboring

1 can put up about 15 more wind mills, and we will,
2 without interference from people who are not
3 undesirable or just don't want wind mills or don't
4 want turbines or don't want nothing to be developed.
5 We are going to pursue this because -- let
6 me tell you this -- I want our people -- not their
7 electric bill going down because that will never
8 happen -- even if we go to Hawaiian Electric or even
9 we go with the City or the State to get monies to
10 help our community, that will never happen.
11 I know that's the developer, he is going to
12 give this community monies. And somehow, some way we
13 are going to put it together so that our people in
14 our community can benefit. And I'm sincere in that
15 effort.
16 These guys are not going to get a free ride
17 this time. What they are proposing to do is give us,
18 per turbine, $10,000 per turbine. That's $80,000
19 that we don't have and our school can use, that the
20 community can use in their endeavor.
21 Maybe I should stop. Thank you.
22 MR. REED: My name is Tanoai Reed and I am
23 born and raised in this community and five
24 generations deep we are family. I just came back
25 from living on the mainland for 15 years. Returned

1 home with my wife and my son. And I am proud to come
2 back to Kahuko where I went to, and wanted him to be
3 raised here like I did.
4 And, you know, it's happening. But this
5 really breaks my heart to see this area and the fact
6 that this community is getting money -- it also
7 breaks my heart because it seems like this company is
8 dangling a carrot in front of a low-income area. You
9 never see this thing be put up in Hawaii Kai or in
10 Kailua; there is a reason why these aren't near big
11 cities, because it's dangerous.
12 If you want to put these up, fine, it is
13 sustainable energy, good, all that is good. Move it
14 back, spend the extra couple million, build the roads
15 and make it safe. Because when they say billboards,
16 these things are not going to benefit the community,
17 billboards will not benefit the community, only the
18 people putting them up.
19 If you're going to put these up, would you
20 put these in your backyard? Would you put these with
21 the kids in school? That has to stay behind like
22 this. No, you get a job, the wind here is making all
23 this money and spread a couple of dollars at us and
24 expect us to be happy at that with the long-term
25 effects of this.

1 There are studies out there people getting
2 affected, physically not sleeping because of the
3 sound of this. You guys are supposed to go to every
4 community that has turbine engines, and turbine wind
5 turbines that are near communities, find out there is
6 any other kind of complaint of what they are before
7 you can consider putting these things in our area.
8 Thank you.
9 MR. CUTBIRTH: Do we have time for Q and A?
10 I was just wondering if there was anyone else that
11 wants to make comments on the scoping meeting before
12 we move on to Q and A session.
13 Is there anybody else that wants to make
14 comments on the EIS for the scoping meeting portion?
15 MR. NADIG: Okay, Mike, we can close that
16 comment period.
17 MR. HO: Everyone is going with solar now
18 and that impacts us right away as a home owner.
19 You know, I am going -- one of my friends
20 had proposed to me already that I wouldn't pay more
21 than what I've already paid in order to get a system
22 set up. And within five years, it will be done. I
23 don't have to pay nothing, I pay nobody nothing. In
24 fact, when I'm backwards -- I mean, I have got to do
25 my roof and stuff like that.

1 my roof and stuff like that.

2 But, you know, so if everybody goes with

3 solar, you guys are out. So is that the push or

4 what? No? What do you mean no?

5 No? No, I see you shaking your head no.

6 That doesn't -- like he said -- if we've done our

7 share, 7,000 homes, why does it have to be here?

8 You can choose somewhere else. But you want

9 to push it on the people that don't fight as hard.

10 But now we're fighting. Waimea was kind of the last

11 straw for me. Turning on Waimea now. So I'm on

12 board for no. I don't know, push it back farther.

13 MR. NADIG: Does anybody have any other

14 comments for the EIS scoping portion of the meeting?

15 Okay, Mike, do you want to answer some

16 questions?

17 MR. CUTBIRTH: Sure.

18 MR. NADIG: So we'll close the public

19 portion. Thank you, everybody, for coming for this.

20 (QUESTION AND ANSWER PERIOD)

21 MR. KONOMOANA: Thank you, Mike. It will be

22 more amenable for me to ask you a few questions. I

23 will be nicer than I was the last time, I promise.

24 The last time you presented to the Kahuku

25 Community Association, when I was here. That was

1 September, I believe it was. September, correct?
2 MR. CUTBIRTH: I think it was August.
3 MR. KONOMOANA: Oh, no, August. August,
4 that's right, I'm sorry. Jet lag, I hadn't been on a
5 flight for a while.
6 In August, one of the most important -- you
7 gave us a whole bunch of -- answered a whole bunch of
8 questions for the community. But one question I had
9 asked you in public prior to that that you didn't
10 answer was, are we going to uphold the commitment
11 that Keith Avery made to this community by him
12 saying, if the community says no, we're not going to
13 move forward with this project?
14 Are we going to honor that? As a man to a
15 man, he's a man. He sat here, he mentioned that.
16 It's in print by the way on the Star advertiser, his
17 comments.
18 MR. CUTBIRTH: So I wasn't here when the
19 discussion occurred. I did ask Keith about that.
20 And so, what he told me was that when we first
21 identified this site as a good potential wind site --
22 and I would tell you that we're looking at a site in
23 Kahuku because of the wind resource and the fact that
24 there's transmission capacity --
25 MR. KONOMOANA: That's not my question.

1 MR. KONOMOANA: That wasn't my question.
2 Sorry, you're doing the same thing as last time and
3 that's why I had to step on you. I tried to be more
4 respectful than that, but please --
5 MR. CUTBIRTH: Let me finish.
6 MR. KONOMOANA: The flesh of the question
7 was --
8 MR. CUTBIRTH: Yeah, so I asked Keith what
9 the discussion was, what the commitment was.
10 And he started working on this project, I
11 think, in 2008.
12 MR. KONOMOANA: Correct.
13 MR. CUTBIRTH: When he identified the land,
14 it was land that was in the state --
15 MR. KONOMOANA: State agricultural park.
16 MR. CUTBIRTH: And what he told me was --
17 MR. KONOMOANA: Mike, I'm sorry, not to cut
18 you off. I don't want to be up here all night. It's
19 the same thing you did the last time. I told you I
20 would be nicer.
21 Can you at least respect my question and
22 answer the question with a simple yes or no?
23 MR. CUTBIRTH: I'm trying to answer your
24 question.
25 MR. KONOMOANA: Yes or no; are we going to

1 MR. KONOMOANA: Yes or no; are we going to
2 honor the agreement that Keith Avery, your
3 prospector, made with this Community? If the
4 Community says we don't want to move forward with
5 this project, then we will not is exactly what he
6 said.
7 Now that he has got all the -- his ducks
8 lined up -- he steps out of the project and they
9 bring you in. Now, you can deny that he made those
10 representations to the Kahuku Community, but I am
11 here to tell you that he did.
12 MR. CUTBIRTH: Okay, let me just tell you --
13 MR. KONOMOANA: That's my first question.
14 MR. CUTBIRTH: So, first of all, he's not a
15 prospector of ours, we weren't involved with him in
16 this project when he first started in 2008.
17 But he told me that before he asked the
18 state to remove this property from the Governor's
19 executive order, that he went to the Community to ask
20 for their support and that he would not ask the State
21 to remove it from the executive order --
22 MR. KONOMOANA: That's the point. He did
23 not get the support is what I'm trying to tell you.
24 MR. CUTBIRTH: His version of the story,
25 Kent, is that he got the Community's support and he

1 did get the property removed from the Executive
2 Order.
3 And again, recognizing I wasn't there --
4 MR. KONOMOANA: I would like to see a vote
5 from the Kahuku Community Association, since the
6 president of the KCA Board is here tonight -- do you
7 happen to know, Melissa, has the Kahuku Community
8 Association come out with a position positive to
9 support this project?
10 MS. MELISSA PRIMACIO: It's still in
11 Planning.
12 MR. KONOMOANA: It has not, is that correct?
13 It has not, is that correct?
14 MS. MELISSA PRIMACIO: What was your
15 question?
16 MR. KONOMOANA: Has the KCA approved this
17 project?
18 MS. MELISSA PRIMACIO: It's still in
19 discussion.
20 MR. KONOMOANA: It has not. It is either it
21 has or it has not been approved.
22 MS. MELISSA PRIMACIO: It has not.
23 MR. KONOMOANA: It has not been approved.
24 Thank you, Melissa. It has not.
25 The Kahuku Community Association is

1 can tell you this because I live in the community and
2 I'm in touch -- there are several other folks in the
3 community are now thinking, oh, a wonderful thing for
4 me to do, run for the community association, I will
5 get on the board so that I can get access to that
6 money so I can probably do my foundation -- but even
7 if it goes to the Hawaii Foundation.
8 So it's created some kind of issue within
9 the community, this promise of money. It has. I
10 came here to tell you that, plain and simple; people
11 want money for their own foundation, their own pet
12 projects I call them. I understand that.
13 If there's some good that you want to do,
14 it's going to take money and I understand that.
15 That's all good.
16 However, when you circumvent the Community,
17 who I have walked up here and talked to most of my
18 neighbors. And I'm telling you, to a person, most of
19 them say we don't want any more. You're not
20 respecting the host community, although you can hear
21 one from a previous generation that worked in the
22 plantation. When we first -- I'll give some dirty
23 history -- I hate to do this. Well, maybe I better
24 not. I better save that.
25 Question: 70 percent renewable energy by

1 2015 -- 2030 -- 2015 -- how many wind mills would
2 that translate into? Of the amount of megawatts this
3 island uses, how many wind turbines does that
4 translate into? I know it's got to be more than 400.
5 MR. CUTBIRTH: So, Kent, you know, I think
6 it's actually 40 percent of electricity from
7 renewable generation, and that's the thing that would
8 drive what the number of mill projects are.
9 And it's, you know, it kind of depends on
10 what happens in the future because you probably know
11 there are off island projects that are proposed for
12 the cable to Oahu.
13 But I would tell you just from the couple of
14 years that we have looked at wind sites on Oahu --
15 MR. KONOMOANA: How many turbines does that
16 translate into? Again, I don't need a real long
17 answer. I don't want to be disrespectful to you,
18 Mike.
19 MR. CUTBIRTH: But it's not feasible --
20 MR. KONOMOANA: Out of concern for her
21 typing fingers -- how many does it -- if you don't
22 know, just say you don't know.
23 MR. CUTBIRTH: Well, I can't tell you off
24 the top of my head.
25 MR. KONOMOANA: It's going to be more than

1 MR. KONOMOANA: It's going to be more than
2 this island can handle.
3 MR. CUTBIRTH: You're not going to get all
4 wind turbines to satisfy the requirement. That is
5 going to be a combination of technologies, and it may
6 be a combination of off-island projects as well.
7 But you're not going to get 40 percent of
8 electricity generated from Oahu from wind turbines on
9 Oahu, it's just not feasible. There are not enough
10 wind sites that are viable to do that.
11 MR. KONOMOANA: When you first came to Maui,
12 they were responsible enough to build a road high
13 mountain on -- I think it was over -- First Wind. I
14 am not on their side either too much.
15 When they built that road, it cost
16 $8 million was the number that was told to me.
17 One of their project managers mentioned to
18 me that they learned a lesson to not build so far up.
19 We've got Kahuku right next to the main highway.
20 Now, we have you coming in here, want to surround us
21 on the other two sides. We have our sunsets, our
22 napooana o ka la, and now our sunrises are going to
23 be the same thing.
24 These huge industrial turbines that we have
25 to look at -- are you willing to give up your sunrise

house, 20 questions? What is the closest turbine to your house? That's a good question.

MR. CUTBIRTH: Where I live, there aren't any turbines.

MR. KONOMOANA: Why not?

MR. CUTBIRTH: Well, there are a number of reasons for that. But it's not really a viable wind area.

MR. KONOMOANA: As mentioned before, turbines may be appropriate some places, but they're not here. We have had enough of them already, somebody else needs to step up.

What is the acceptable -- you do realize that you guys are going to be upwind from our community -- upwind versus downwind. I can hear the ones that are almost a mile away from my house and they're downwind.

I understand Mr. Primacio's reasons for wanting to support this plan, they're not going to impact him.

He's one of the folks that may have -- but it's not going to impact him as much as it is other people like myself.

MR. CUTBIRTH: I can tell you that one of the issues that was raised, I think, in our first

1 the issues that was raised, I think, in our first
2 community meeting at the KCA Board meeting in May was
3 noise. And since that meeting, we did noise studies.
4 And first of all, the State has a noise
5 ordinance, and we comply with that ordinance. The
6 studies we completed, and that will be supplemented
7 in the Environmental Impact Study, show that the
8 people that live in the subdivision you're referring
9 to down here are going to have noise levels of
10 45 decibels, which is a quiet residential
11 neighborhood.
12 What that translates to me is you won't hear
13 the wind turbines. And that's based on studies we
14 have done to indicate that.
15 MR. KONOMOANA: We can already hear the ones
16 that are farther away and downwind, you're going to
17 tell me, after I can hear you the ones that are
18 closer and upwind, that just does not compute, no
19 matter what you say.
20 MR. CUTBIRTH: I would be happy to share the
21 study with you.
22 MR. KONOMOANA: If you're telling me that
23 you can't hear them, I'm telling you you're wrong.
24 If you come up with the decibel levels of 40 or 60 or
25 whatever is acceptable with the state, then I can

1 bringing up hustle and bustle of Waikiki and putting
2 it out here in Kahuko.
3 MR. CUTBIRTH: Forty-five decibels is a
4 quiet residential street, an area. It's no different
5 than if you're out in your community and you will
6 hear the wind blow, you will hear the palm trees
7 sway. But you're not going to hear --
8 MR. KONOMOANA: But the monies that are
9 being promised to the community by your firm,
10 $10,000 per turbine, that will be -- well, first it
11 was $180,000 because you were proposing 18. Now, you
12 changed, you're down-sizing to 15, so now it's down
13 to $150,000 for the community's benefit.
14 Somehow -- how are you going to get that
15 money to someone like me? How is that going to
16 benefit me? Not that I want to be benefited from
17 this, but how would it benefit the average everyday
18 Kahuko citizen?
19 MR. CUTBIRTH: So, I would tell you that
20 first of all, this proposal to provide a community
21 benefit fund of $10,000 per turbine per year over the
22 life of the project was Keith Avery's proposal. And
23 our company is honoring that proposal. And I would
24 tell you that --
25 MR. KONOMOANA: You're picking and choosing

1 which one you want to honor. Again, that's the same
2 point that we had the last time. You put up all the
3 nice stuff but you're not honoring the main one that
4 he will not -- and you guys will respect the
5 Community's desire to say we have these here already,
6 we're doing our share for the rest of the island --
7 go somewhere else, respectfully.
8 MR. CUTBIRTH: Well, Kent, I think I
9 answered your question before, and Keith's version of
10 the story is very different from yours. I wasn't
11 there.
12 MR. KONOMOANA: That's what they call a
13 fed-up man.
14 MR. CUTBIRTH: But I would say that from our
15 standpoint, this is a unique idea. We've never had a
16 Community benefit fund in any project we developed in
17 the 18 years I have been in this business. And to
18 us, we really look at it as giving back to the
19 Community.
20 And frankly, we appreciate the community
21 considering hosting this project here. I would tell
22 you that I really enjoyed meeting some of the folks
23 here in this Community, and many of whom I would feel
24 like I could have them over for dinner.
25 It's been a really terrific experience from

1 my standpoint. And there's been a lot of very good
2 ideas on how that community fund should be
3 administered and what the priorities ought to be.
4 This is something that we don't want to try
5 and tell the Community how to administer it or what
6 the priorities are. But we've heard everything from
7 assistance with special projects that the community
8 needs done to support of the schools -- again,
9 everything from special projects for the schools,
10 vocational training, jobs training, support for the
11 high school's booster club, support for some of the
12 new facilities planned at the high school.
13 We even had a comment from one person that
14 maybe this should just be a direct rebate to the
15 Community that would act kind of like a rebate on the
16 electricity cost. All of these are very good ideas,
17 but we're not the party that should try and set the
18 priorities for this Community. The Community knows
19 better than we do what the needs are.
20 MR. KONOMOANA: A couple more questions real
21 quick. And I apologize for asking this.
22 Did you not yourself, Keith Avery and
23 myself, the three of us, have lunch one day at out at
24 Turtle Bay discussing this matter?
25 MR. CUTBIRTH: Discussing the project?

1 MR. CUTBIRTH: Discussing the project?
2 MR. KONOMOANA: Yes.
3 MR. CUTBIRTH: Yes.
4 MR. KONOMOANA: We did. We did have lunch.
5 MR. CUTBIRTH: We did.
6 MR. KONOMOANA: I had a hot sandwich.
7 During that lunch, was it not mentioned -- you can
8 confirm or deny, that's up to you -- Keith Avery and
9 yourself mentioned to me that there was an
10 opportunity for me to be part of this money fund that
11 would actually be a booster club for Kahuku High
12 School Raiders, which I support with all my -- every
13 atom of my body -- if I would be agreeable to the
14 project?
15 Now, you can confirm or deny that. That I
16 was there.
17 MR. CUTBIRTH: I would absolutely disagree
18 with that statement.
19 MR. KONOMOANA: Did you not mention our
20 football team, our football program and all that?
21 I am just laying it out there and being honest --
22 MR. CUTBIRTH: Absolutely, I did. Let me
23 just explain. That's not our idea.
24 MR. KONOMOANA: That was your idea at the
25 time.

1 MR. CUTBIRTH: That was one of the local
2 Community leader's idea to help support the booster
3 club. And this is a good example of why we shouldn't
4 be the ones to try and set the priorities for the
5 Community.
6 Because when I first started working in this
7 area two years ago, I thought, well, maybe what would
8 be good was to provide scholarships at the high
9 school or computers at the high school. But, you
10 know, a lot of the feedback that I've heard from
11 folks here in town is that the high school needs
12 support. But one of the things that's really
13 important to the Community is the athletic teams.
14 MR. KONOMOANA: There's no argument from me
15 that we need support with our high school. I agree
16 with Mr. Primacio regarding that issue and other
17 community members in Kahuku who would like to have
18 some support. But I personally don't want hand-outs.
19 But what I'm referring to is we need the assistance,
20 yes.
21 Now, wouldn't it behoove the community and
22 you, and these guys, and the James Campbell, whatever
23 else, to simply invest the money that you would be
24 giving to the Community, instead put that in a road
25 and put it farther up? Because one of them is going

1 to cost you less, and that's buying the Community
2 off, than building a road.
3 And I take issue with that, especially when
4 they have a huge area right up there where these 12
5 First Wind -- when they came in, I told Ray, if
6 you're going to put 12 -- Ray Westin from First Wind
7 for anybody who's taking notes -- I said, if you're
8 going to put 12 and take the view from us over here,
9 you might as well keep going up that ridge because
10 then they're there already. Now you can have free
11 license to knock yourselves out.
12 Because the Federal Government -- which
13 you guys -- some of you folks in this room work for,
14 are really not interested in partnering with the
15 maka ainana. We're commoners, we're working class.
16 It makes more sense to me to take this
17 project and put it somewhere else and you can give
18 some other community the same amount of money that
19 you're promising Kahuku if you can find somebody else
20 to take it. I'm wondering if there's -- that is the
21 end of the discussion.
22 MS. LEILANI PULMANO: Is there anybody else
23 that has any questions for Mike?
24 MR. PRIMACIO: I would like to rebut that.
25 MR. KONOMOANA: We are going to have

1 rebuttals. I am going to ask to be rebutted and
2 rebutted.
3 MR. PRIMACIO: I will say some more. A lot
4 of the discussion is on why we want the wind farm
5 here. And it's obvious that some people don't want
6 the wind farm here.
7 But, you know, the saying, the saying is I
8 support the wind energy process, but don't put in it
9 my back yard, put it someplace else. We have the
10 ability because we've got the wind. Thanks to God's
11 blessing, Kahuku has the wind energy to provide that
12 kind of resources.
13 When those wind mills at First Wind stops, I
14 am the first one to make noise and I call Carol.
15 Calling Carol, hey, what's happening to the wind
16 farm, why the turbines are not turning?
17 The thrust -- the more it turns, the better
18 the state would be in wind energy and reduce the
19 purchasing of oil.
20 So, you know, I have 46 grandchildren and
21 52 great-grandchildren. And somehow, someway, it's
22 my responsibility to help them better themselves when
23 they grow up in this Community. They want to stay in
24 this Community.
25 My five sons are all in Seattle. And I've

1 got a couple in Guam and a couple in Texas.
2 But that's not going to the point, we don't
3 want to leave here. We want to share -- when
4 Kahuku -- when the plantation closed we had no fire
5 station, we had no police station, we had no
6 elementary school. All of that was put together by
7 our community with the help of Campbell Estate, who
8 was the land owner then, the City and County of
9 Honolulu, we made them help us. We made them help
10 us.
11 MR. CUTBIRTH: Okay, thank you.
12 MR. PRIMACIO: Turtle Bay has been
13 supportive to this community. Christmas,
14 Thanksgiving, just to name a few, the Kahuku School
15 and Athletic program. So, you know, we need to have
16 more institute built in this community that can help
17 us.
18 If we depend entirely on low-income housing,
19 we're not going to be able to survive in this
20 Community. So we depend a lot on the surrounding
21 businesses that prevails in this Community. And I
22 can see that this is one of them.
23 First Wind has been favorable in
24 contributing to this Community, which I appreciate
25 and I'm quite sure everyone -- even Kent appreciates

1 that.

2 But, you know, that's not the end to it.

3 We've got to help each other out here. And

4 nobody should tell us what's good for our back yard.

5 We supported the First Wind because we supported wind

6 energy.

7 Other communities said, no, we support wind

8 energy but not in my back yard. Kahuku was the first

9 that said, we support them and we'll put them in our

10 back yard. Now, what's wrong with 15 more, which is

11 the maximum they can put up out here. And we need

12 them wind mills to survive in this Community.

13 And that's where I'm coming from. Now I ask

14 you, yourself, where are the people in this, where

15 are the people from this Community? Why are they not

16 here? Why are they not here? They're frustrated,

17 they're disgusted. They feel that government going

18 to let them down, which they have.

19 The best thing we did in this Community is

20 build our elderly housing.

21 Our elderly housing is built with a subsidy

22 from HUD. And that's why we get good people living

23 there today. And I hope we can continue on that way.

24 Thank you.

25 MR. REED: The question is, with this

1 effect on the community, whether people can't sleep
2 at night or if somebody is injured from something,
3 will you guys be willing to take more down and move
4 them?
5 What would it take? Put this up, who knows
6 what it is going to do. But there are adverse
7 reactions like there are other communities that have
8 these near, that have adverse reaction. And there
9 are people writing about it all the time.
10 Wind turbines, we don't want this stuff. We
11 experience that here. We have people coming down,
12 take them down? What's it going to take, people
13 dying or sick people or --
14 MR. CUTBIRTH: Well, I can tell you that the
15 first company I joined in the wind industry has
16 projects that have been operating for more than 30
17 years. There are currently over 225,000 wind
18 turbines across our globe in 70 countries.
19 And I'm not aware of one instance where
20 anyone has been injured or has gotten sick as a
21 result of being around a wind turbine.
22 I can tell you that there are more than a
23 dozen independent scientific reports that have been
24 done to address that very subject. And just to
25 correct the comment that Kent made earlier, I've

1 never been involved in any of those studies as the
2 chair or a contributor or anything else.
3 But as a part of the Environmental Impact
4 Statement that will be prepared for this project,
5 those issues are issues that will be addressed. So I
6 can tell you that the issue of wind turbine syndrome,
7 the issue of noise, the issue of shadow figure, all
8 of those issues will be addressed. And those will be
9 important components to ultimately what gets approved
10 or not for this project.
11 MR. REED: Is it an option to move them
12 farther back for you guys? Is that option there?
13 MR. CUTBIRTH: I would tell you what, you
14 know, two of the biggest constraints for wind is
15 finding a windy site and finding a site with
16 transmission. And we've looked at a lot of sites out
17 on the North Shore, around the point.
18 And behind this project, proposed site area,
19 is primarily government land. And the problem is,
20 we're not going to be able to develop anything on
21 that land. I think the bulk of that is for training
22 and other purposes, but it's just not a viable option
23 to develop on U.S. Government land.
24 MR. REED: Why in Hawaii? I mean,
25 government is only there?

1 MR. CUTBIRTH: Well, I believe they use the
2 area for training, helicopter training and other
3 uses.
4 MS. LEILANI PULMANO: Does anybody have any
5 other questions? Okay, thanks.
6 MR. TABLIN: I have just got a couple of
7 questions for you. You say you have been in business
8 for over 30 years?
9 MR. CUTBIRTH: What I said was the company
10 that I first joined in the wind industry has projects
11 that have been operating for 30 years.
12 MR. TABLIN: You said that nobody ever got
13 hurt on those studies?
14 MR. CUTBIRTH: I am not personally aware of
15 any member of the public ever being hurt with a wind
16 project. Now, I would say that there is maintenance
17 that's done on them and I'm sure there has been
18 accidents that have occurred when people that climb
19 the towers and service the machines.
20 But in terms of a member of the public, I am
21 not aware of any member of the public being hurt.
22 MR. TABLIN: Have you ever lived in
23 California before?
24 MR. CUTBIRTH: I'm sorry?
25 MR. TABLIN: Have you ever lived in

1 California before?

2 MR. CUTBIRTH: In California, yes. I'm from

3 California.

4 MR. TABLIN: Okay. I lived in California

5 for about 18 years, come back here now.

6 In California, when you drive up the coast,

7 see the coast highway or going to Malibu, Hollywood,

8 and Beverly hills, all the way down to close to the

9 end of the bay where you're going to -- all those

10 areas along the coast -- you don't see no wind mill.

11 The only place I saw a wind mill over there

12 is in Bakersville, and that's up in the mountains.

13 When we drive along the highway, nobody live around.

14 So that's why nobody got hurt. I mean, from

15 my experience from what I see, you know, they don't

16 put wind mills in these neighborhoods for a reason.

17 They put it up in the mountains or independent land.

18 That's my point, you know, what I saw. I

19 lived in California, that's why I notice it. And now

20 you guys are putting a wind mill right there near

21 people's house over there -- that's not right.

22 You know, there's a reason why they're not

23 putting them in Malibu, they're not putting Beverly

24 Hills. They have got hills up there, plenty of

25 winds. I worked in Kahala, Hawaii Kai, there is

1 plenty of wind coming through there, I don't know why
2 it's not there.
3 MR. CUTBIRTH: Well, I think I can address
4 that, because the company I joined when I first got
5 into the industry actually was one of first companies
6 to develop projects in some of those areas. And
7 there's three main wind areas of California,
8 Tehachapi is one, Palm Springs is the other, and
9 there's an area up near the Bay Area also.
10 And the reason projects were developed there
11 was because the winds was really good and there was
12 transmission capacity.
13 MR. TABLIN: I don't see no wind mill; I
14 mean, that is wind -- I understand your point about
15 the wind but they're not putting right behind
16 people's back yard either.
17 MR. CUTBIRTH: Well, I would say that in
18 projects throughout the United States, wind turbines
19 operate on farms and on ranches. I can tell you that
20 the County of Honolulu has adopted set-back
21 requirements for wind turbines. And the set-back
22 requirements that we have, or the actual setbacks
23 we've proposed here are per those requirements.
24 So, you know --
25 MR. TABLIN: They are not to me, like a scam

1 act.

2 MR. MARVIS: My name is Scott Marvis. I had

3 a question on the design of these wind mills.

4 Are they designed for a specific wind? And

5 what kind of a procedures do they do if there's a

6 pending hurricane?

7 MR. CUTBIRTH: So wind turbines are designed

8 to withstand hurricane strength winds, and it's part

9 of the engineering process that manufacturers go

10 through. I am not an engineer, but I can tell you

11 that the machines are engineered to withstand

12 hurricane winds. And they go through a certification

13 and testing process, a very thorough process.

14 And they have engineering design and

15 construction standards. But again, that's not really

16 my area of expertise.

17 MR. MARVIS: The hurricanes seem to be

18 getting worse or stronger winds. So that's going to

19 cause them to destruct?

20 MR. CUTBIRTH: You know, again, I don't know

21 what the wind design is on them, but I can tell you

22 that all of the engineering that I'm familiar with,

23 they design them for certain maximum winds. And then

24 there's a safety factor built in above that as well.

25 MR. MARVIS: Thank you.

1 MS. LEILANI PULMANO: Anybody else, any more
2 questions? We are going to be around.
3 MR. KONOMOANA: I have got a question, just
4 a small one, rebuttal to a comment that he just made.
5 He was asked the question about if he's aware of
6 anyone getting sick.
7 If you read -- had you been on the internet
8 researching your own technology, probably get a
9 different perspective. Because if you do go on the
10 internet, which is a wonderful tool to provide
11 unbiased information and to do some research, you
12 mentioned that you were not on the body when actually
13 your bio is on your web site says you were.
14 I read it. I read. I study before I open
15 my mouth.
16 You mentioned that no one got sick. Well, I
17 have to argue with you on that point. Because when
18 you're being impacted by low impulse sounds that you
19 can't hear yourself -- sound which these blades have
20 been proven to generate -- that there is some
21 negative impact on people's sleeping patterns -- on
22 whether they're getting quality good night's sleep
23 which can in turn manifest itself in your health.
24 Which is actually -- I don't know -- I don't even
25 want to argue that point.

1 So I think that you're being disingenuous
2 with the audience and with our Community by not
3 acknowledging the fact that, yes, there have been
4 some reports of negative impacts on communities where
5 the wind turbines are placed in close proximity to
6 someone's residence.
7 And you can't really say no, it doesn't,
8 because I've seen the videos myself. I've looked at
9 people, I've heard their testimony on line.
10 Farmers who have lost their farms because
11 they had to move. Not because they didn't own the
12 land anymore, but they got tired of dealing with the
13 impacts as well as the wind developers.
14 The East Coast is where most of the problems
15 are occurring as far as proximity and certain
16 agricultural areas where they are placing them on
17 farms. The West Coast seems to be doing it smarter
18 by putting it away from communities.
19 Now, if we emulate what the West Coast is
20 doing, then we may not have so much opposition within
21 the Community.
22 The question then is, are you aware of the
23 other side's opinions and have you done any
24 fact-finding of your own besides just being fed from
25 one source?

1 It's important to have a diverse amount of
2 information to come up with a proposal that's going
3 to impact supporters and opposers to this particular
4 project. And we're asking, like we did before, is to
5 move them back away from the Community.
6 Then you can -- then the noise will more
7 than likely go away. But I am stubborn and
8 motivated. And I'm telling you, I don't have the
9 resources that you do. But I am going to fight for
10 this Community, which I believe the Community --
11 because I have walked my Community and talked to most
12 I can -- I am not going to go into it.
13 I run into a few here and there who think
14 this is a good thing. It is a good thing. But, like
15 I mentioned to someone else earlier, if I have a rose
16 growing out of my ear, it's a beautiful rose but it's
17 in the wrong place. Let's take it out and put it
18 where it belongs. Would you consider that again?
19 I am going to ask it public like I did
20 with -- the first time -- will you consider honoring
21 the representation that Mr. Avery made to this
22 community; that if the community says we don't want
23 it, then you'll pack up your bags and put it where
24 Mr. Avery was living for a point, which was in
25 Waialula.

1 Waialula.

2 MR. CUTBIRTH: Well, I think I've already

3 responded to that same question earlier.

4 MR. KONOMOANA: Can I get it in writing?

5 MRS. BROWN: And I would tell you too

6 that -- want to say something -- because I don't

7 this, do I have time?

8 MR. CUTBIRTH: Sure.

9 MRS. BROWN: You know, I'm like him, I live

10 under -- my name is Mrs. Brown. I live underneath

11 those turbines, right underneath.

12 And I've been studying, and there's so many

13 lawsuits like this one, Massachusetts. And I mean,

14 do you guys consider us underneath the turbines with

15 these health issues like from these residents? Do

16 you guys run lawsuits?

17 I'm just asking because I live underneath

18 them. They're ugly. Every time I come in I hate it,

19 like I'm looking at some kind of alien. They're

20 ugly, quite ugly.

21 I call them research. There is a lot of

22 companies suing everywhere. You guys responsible?

23 Because you don't live here, but I do, I live

24 underneath. I look up, it's right there.

25 So do you guys consider people like us when

1 thing, take it somewhere else like Latoo said, take
2 it somewhere where there's no one. Why Kahuko?
3 MR. CUTBIRTH: Because of the transmission
4 available, wind source.
5 MRS. BROWN: Because we need to sign
6 something that if we ever sick, cancer, everything.
7 Of course you guys would blame cancer for that. But,
8 do you guys want to like sign something, you're
9 liable? And if it happens to us underneath those
10 ugly --
11 MR. CUTBIRTH: Well, as I mentioned, the
12 whole issue of wind turbine syndrome or turbines
13 making people sick is something that's been studied
14 extensively. And that's something that will be
15 looked at again in the Environmental Impact
16 Statement.
17 And I actually think the setbacks we have,
18 they're a multiple of the county's requirements. And
19 I have not seen anything so far on any studies we've
20 done that makes me think anyone will be harmed by
21 this proposed project.
22 MRS. BROWN: Damn, you're like the governor,
23 useless.
24 MR. CUTBIRTH: Name, please?
25 MR. FONOIMOANA: My name is Kurt Fonoimoana.

1 I am not the talker. He can talk, my friend. But I
2 am the one that actually -- I just wanted to see your
3 face.
4 Health wise, is it going to affect my
5 grand-kids? Listen, is it going to affect my
6 grand-kids?
7 MR. CUTBIRTH: I don't believe so.
8 MR. FONOIMOANA: You don't believe so? I
9 would like to know. I'm putting a face so I know who
10 to go after.
11 MR. CUTBIRTH: I don't believe so.
12 MR. FONOIMOANA: You don't believe so? You
13 don't know?
14 MR. CUTBIRTH: From everything --
15 MR. FONOIMOANA: I want to know.
16 MR. CUTBIRTH: -- everything I've read --
17 MR. FONOIMOANA: I don't believe? I would
18 like to know.
19 MR. CUTBIRTH: From decades of experience in
20 the industry, I don't think there's any health --
21 negative health impacts and will not be from --
22 MR. FONOIMOANA: Just remember, I'm old
23 school. My kids not for sale, my grand-kids.
24 MR. CUTBIRTH: Nor mine.
25 MR. FONOIMOANA: But you just gave them a

1 MR. FONOIMOANA: But you just gave them a
2 price of what you're going to give to our community.
3 I finally thought of an intelligent
4 question. Should this project move forward as it's
5 planned to, as you're planning and hoping to, should
6 the project move forward, and you will install your
7 15 more turbines, are you going to be putting some
8 funds into an escrow account like they do other
9 projects across the United States, into a fund for
10 anyone in Kahuku who owns a home who says, "I don't
11 want to live here anymore, I am going to sell my
12 home."
13 Are you guys going to be putting money into
14 an escrow account that's going to cover the cost of
15 that person's home when they can't sell it because no
16 one else wants to live around a wind turbine? And
17 these are what other companies across the United
18 States have been doing, is putting money into an
19 escrow account, not the total value of 400 houses,
20 there are up there because that's roughly
21 200 million, all of that is a good place to start for
22 me.
23 But that's a little unfair. We'll say it's
24 a percentage, five percent or whatever. Are you guys
25 going to be ponying up? Because my girlfriend and I

1 have been talking about this, we don't want to live
2 around here, that's how adamant I am about it, is
3 that we're going to have to move because you're
4 moving in.
5 So, since you're moving in we've got to move
6 out because we object to the close proximity of these
7 machines. Are you -- I am thinking of the name of
8 the company -- I was going to call it Champlin -- I
9 know you were with the ones that made these up
10 here -- what is the name of that company?
11 MR. CUTBIRTH: Clipper Wind Power.
12 MR. FONOIMOANA: Clipper, I know it started
13 with a "C." Is Champlin going to be putting money
14 into an escrow account to cover however many people
15 say we're moving. Because that's what other
16 companies are doing and that is the responsible thing
17 to do.
18 If you can't sell your house within "X"
19 amount of time in these other projects and your house
20 doesn't sell, the company that came in has to buy it,
21 has to pay for it. And I suggest that you put some
22 homework to that and think about it. Because that
23 money will tell you everybody in Kahuku they are
24 going to be buying their houses pretty soon. Let's
25 put them all for sale.

1 the system out -- but the short question is, are you
2 going to be putting money into an escrow account to
3 cover the folks who are impacted to a point where
4 they choose to move and you guys will buy that person
5 out basically?
6 MR. CUTBIRTH: And none of the companies
7 I've ever been with have done that.
8 MR. FONOIMOANA: You haven't been reading
9 the internet like I have. And if it's all false
10 information, if that's what you're telling me, that
11 all the companies that you know about -- well, that
12 could be two or three for all I know. Is that true?
13 That's true? I do think that -- I think
14 that that falls --
15 MR. CUTBIRTH: I haven't heard of that in
16 all the years I have been in the industry.
17 MS. LEILANI PULMANO: Does anybody else have
18 any questions or comments?
19 MR. WASSON: Oh, I came in late but my name
20 is Harry Wasson. I would like to know if you guys
21 have plenty house sites, like other places. That's
22 where you guys like to build them winds mills and
23 stuff. Today plenty cultural sites, stay there. You
24 guys want to address that about the sanctity of those
25 sites? Or about plans, plans -- plans --

1 MR. CUTBIRTH: So part of the EIS will cover
2 archeological cultural sites -- archeological is not
3 like dating people who know the place, not like from
4 an academic standing. We're talking about people who
5 actually take plants from the mountain, medicine,
6 plants for their burials or, you know, traditional
7 like caves and stuff like that.
8 We've done an initial archeological and
9 cultural survey and found no artifacts of interest.
10 There will be additional studies done.
11 MR. WASSON: I worked on the coconut tree
12 area and the farm cultural effects. And they said
13 the first time they ever found anything up there. I
14 never found sites.
15 Then they said, they are only going to limit
16 them to this immediate area, they're not going to
17 include the native plants which is up there or the --
18 up there they have bats, Hawaiian bats in that area,
19 it comes down to the bridge sanctuary in the
20 summertime.
21 Are you guys addressing that too?
22 MR. CUTBIRTH: Bats are one of the species
23 that will be studied as a part of the habitat
24 conservation plan and that's something that we do in
25 conjunction with the State and Federal agencies. So

1 those will be evaluated.

2 MR. WASSON: But that still don't address

3 the part of the Hawaiians is the one that's the main

4 agreement for this stuff, not archaeologists and

5 Federal agencies because they are not -- Hawaiian

6 plants and Hawaiian cultural places and plants and

7 animals up there.

8 So I don't know you're talking about

9 archaeologists -- I worked with them -- they only

10 know the academia part. When I tell them about the

11 history of the plants they say, oh, we don't know

12 that. I am the Hawaiian practitioner, cultural

13 monitor. You guys only do the paperwork.

14 So, you guys not -- you guys not interested

15 in doing Hawaiian stuff because that area get plenty

16 of plants. You guys asking for plenty of trouble

17 because right next to you guys going to be the -- we

18 tired of looking at these stupid turbines. The

19 better they burn the better -- and was how many

20 times -- about four times.

21 It was crazy. But, I can see this stuff

22 within -- it's not going to benefit us -- you're

23 going to make money. You guys take off, we're stuck

24 looking at the thing.

25 The frequency from turbines is the stuff

1 that caused the syndrome, that people getting sick.
2 So you guys should just beat it. We don't
3 need this kind of stuff. If you guys need more
4 power, turn off -- you know -- turn off till you save
5 some, save money. Don't need to build this stuff
6 that it's not for -- you guys going to make this
7 place look more ugly.
8 The trees going to get down on that side,
9 the first ridge or whatever, then you're going to get
10 this one. Then that's going to be right around
11 Kailua Town and right next to Hawaii Kai -- don't get
12 that, whatever, development stuff.
13 It's way ugly. People don't like coming
14 here and see those ugly wind mills. Like both you
15 guys can shove it up your ass.
16 MRS. REED: My name is Suzanne Reed. I
17 know you said you haven't heard of any deaths. But
18 the Forbes Magazine published that there were 14
19 deaths in England in 2011 from incidences of wind
20 power.
21 Like I said, I am not sure whether those
22 were just maintenance workers or the people living
23 around. But there were also other instances, I
24 believe it was Pocatello and San Diego where the
25 blade had fallen off and it weighs about 100 tons.

1 blade had fallen off and it weighs about 100 tons.
2 It was near homes when it was discovered. And I
3 think they tried to cover it up.
4 But that same company had also -- it was
5 Simons I believe, they have been having other issues,
6 apparently. And it also happened again in Idaho.
7 So I mean, it's not unheard of that these
8 blades fall off. And this one in particular
9 apparently had fallen off in winds that night that
10 averaged 19 to 20 miles an hour. Now, according to
11 the article these, well -- the winds that we sustain
12 here from Hurricane Iniki -- I am not sure what the
13 miles per hour of was -- but that would be a
14 concern.
15 SPEAKER: 234 miles an hour sustained wind
16 on Kauai.
17 MRS. REED: When they had checked the blades
18 on these wind mills it was -- I believe they said all
19 75 blades had to be replaced on 25 of their turbines.
20 So that was -- just wanted to give you
21 thought about that it does occur.
22 MS. LEILANI PULMANO: Well, we will be
23 around if anybody else has any more questions to ask.
24 We really appreciate you guys coming out and taking
25 the time and providing us with some comments and some

1 Aaron, did you want to say any closing
2 remarks?
3 MR. NADIG: Again, the public comment period
4 is open till December 5 for those that feel
5 uncomfortable speaking, there's an opportunity to do
6 it from your e-mail. And they have graphic cards for
7 contact information; that is address and e-mail
8 address and we'll address all comments in our
9 documentation.
10 Thank you for coming.
11 (The Public Hearing was concluded at
12 7:49 p.m.)
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1

2 C E R T I F I C A T E

3

4 I, KATHRYN PLIZGA, do hereby

5 certify that the proceedings are contained fully and

6 accurately in the notes taken by me during the

7 hearing of the foregoing cause, to the best of my

8 ability, and that this copy is a correct transcript

9 of the same.

10

11

12 Kathryn Plizga

13 Kathryn Plizga,
Certified Shorthand Reporter

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HEPA PUBLIC SCOPING MEETING

NA PUA MAKANI WIND PROJECT

(SCOPING COMMENTS PORTION)

PLACE: Kahuku Community Center
56-576 Kamehameha Highway
Kahuku, Hawaii
DATE: January 10, 2014
TIME: 6:30 p.m.

Reported by:
Kathryn Plizga, RPR
Hawaii CSR No. 497

APPEARANCES:

Leland Chang, Mediator/Facilitator

Ned Busch, Mediator
Mediation Center of the Pacific
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Amy Rosenthal
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(6:35 P.M.)

P R O C E E D I N G S

MR. CUTBIRTH: Good evening. My name is Mike Cutbirth, I am the manager of Champlin Wind, and we're the sponsor of the proposed Na Pua Makani Wind Project.

I want to thank you all for coming tonight to the HEPA scoping meeting. And I would like to introduce Leland Chang, our moderator, for the meeting.

13 MR. CHANG: Thanks, Mike.

14 Good evening. Aloha, welcome.

15 I know that this is the start of the weekend

16 for everybody, so we're really appreciative that you

17 took the time to come out and join us tonight. As

18 Mike said, it's my pleasure to be serving as your

19 facilitator this evening.

20 It is my job to sort of pass through the

21 agenda for tonight and to encourage you to

22 participate; and also to sort of manage the time and

23 flow of this discussion so that everybody that wants

24 to make a contribution has a chance to do that.

25 It's also a very important part of our role

1 today to stay completely neutral. I'm not taking any

2 stand on the proposed plans one way or the other. In

3 fact, in 30 years of marriage, I've lost a lot of

4 arguments with my wife because I refuse to take a

5 position on things.

6 So I am very comfortable serving in this

7 neutral role. I have been doing this for about 28

8 years. That includes eight years as the executive

9 director of what was then called the Neighborhood

10 Justice Center in Honolulu. They have since changed

11 their name to the Mediation Center of the Pacific.

12 And as a mediator, I've done a lot of

13 divorce cases; and things get a little heated there.

14 So I learned to sort of -- to be comfortable with

15 that level of conflict.

16 On the community liaison facilitator side, I

17 have been able to work on a number of projects
18 including the Hawaii Community Foundation and the
19 Convention Center, the State Hospital, Sandy Creek,
20 and more recently the Hawaii 2050 Sustainability
21 Plan, and working with all of the consulting and
22 conciliative parties that work on the historic
23 ramifications of the rail project.
24 I've also led community groups that have
25 developed waste water management plans, both for your

1 neighbors on the North Shore as well as Maui County.
2 So I'm very glad to be here with you. And
3 again, I thank you for being here.
4 The agenda tonight here is very straight
5 forward. First of all, I wanted to mention -- you
6 heard from Mike Cutbirth -- but we also have folks
7 from Munekiyo & Hiraga, community relations for this
8 project as well as Tetra Tech, Brita Woeck, who later
9 will be doing one of these presentations.
10 Based on our agenda, again, it's very
11 straight forward. I'm sorry, I must apologize.
12 Hopefully, you've signed in. And there are comment
13 sheets there that you can submit comments either at
14 the end of the meeting or submit it some time after
15 the meeting.
16 And the EIS spoken portion of this meeting
17 is -- because it's a formal part of the EIS
18 process -- we have a court reporter, Kathy, who is a
19 certified court reporter, who will be recording that

20 portion.
21 So, we will be turning over the session to
22 Mike and to Brita for two presentations, very brief
23 presentations; mike, on the proposed wind energy
24 project and Brita on the EIS process and the EIS time
25 line.

1 And then we'll sort of open things up for
2 the formal scoping portion where we will be inviting
3 you to tell us what you think should be studied as
4 part of the EIS process. For example, those studies
5 are always planned to handle things like
6 environmental impacts, noise impacts, effects on
7 endangered species, traffic and those kinds -- and
8 health impacts.
9 So we will be looking to you to tell us in
10 greater detail and greater depth what kind of things
11 are really important that should be covered as part
12 of the EIS evaluation.
13 Following the scoping comments, we will take
14 a quick break and then we'll reconvene, and we'll
15 open things up for sort of more general discussion
16 and Q and A.
17 Then we'll talk a little bit about next
18 steps and we'll set it off with our final aloha. So
19 that we can have as productive a discussion as
20 possible, we do have a few simple ground rules that
21 we would like to ask people to "kokua."
22 Throughout the evening, Ned Busch is going
23 to be coordinating all of your comments on this pad

24 here. So if he doesn't quite capture something that
25 you told us, be sure to point that out, and he will

1 make the appropriate comment. Ned is a trained and
2 experienced mediator with the Mediation Center of the
3 Pacific and I've worked with him before.
4 A summary of Ned's notes are also going to
5 be posted on Champlin Wind's web site.
6 Let's see. We would like to, as much as
7 possible, have only one person speaking at a time so
8 everybody can hear what's being said. And it also
9 allows me as a facilitator to try to keep better
10 track of what's going on.
11 I will recognize you by bringing this
12 microphone over to you. When I do that, please
13 introduce yourself and then proceed with your
14 comments.
15 I would like to share the speaking time. So
16 if you can try to be concise and to the point. And
17 I'll call on the people that haven't taken a turn yet
18 before I return to folks who have already had a
19 chance to speak.
20 And lastly, this is not really a ground
21 rule, it's more just kind of a request. I realize
22 that projects like this -- and this project in
23 particular, you know, may engender some strong
24 opinions and strong feelings, and people have really
25 big questions about this project. And that's fine,

we can't capture all that.

I am just going to ask people to respect the process, respect each other and, you know, treat each other with aloha.

All right.

With that, I guess I'll turn things over to Mike and then Brita. Thank you.

MR. CUTBIRTH: Thank you, Leland.

So why are we here proposing the wind project? The state of Hawaii has passed two laws that require 70 percent clean energy and 40 percent electricity from renewable sources. Those laws are the Clean Energy Initiative and the Renewable Portfolio Standard.

The state has a goal to reduce the cost of electricity to its rate payers and to achieve energy and independence. Currently, Hawaii imports four billion dollars of oil from foreign countries. Wind generates clean renewable energy at about half the cost of burning oil.

So the project is being proposed up to 45 megawatts in size located approximately adjacent to the existing Kahuku wind project. The first phase is planned for approximately 24 megawatts. The second phase, up to another 21 megawatts.

Currently, the Phase I project is the only project that is pending approval with the State

Public Utility Commission. The Phase II project is not something that would be built concurrently. And because of additional transmission upgrades that HECO would be required to make, would be expected to be built several years after the first phase of the project.

The project is proposed to be built on both state land managed by the DLNR and also private land. Additional infrastructure will include a permanent (inaudible) tower, access roads, assembly, (inaudible) during construction; and transmission and collector lines as well as a potential substation and maintenance building.

This is the current layout of the project, the Phase I project, which is the only project pending before the PUC at this point. You'll notice that there's eight turbines proposed.

We have also shown white and black circles around each proposed turbine location. Those are setback areas that are required by county code. And we've also shown the setbacks, proposed setbacks, from key points of the community, both residential areas as well as the high school and elementary

school.

This is a layout that includes both the Phase I and the Phase II project, also with setbacks shown.

Part of the permitting process will include

the preparation of a Habitat Conservation Plan, and this really addresses potential (inaudible)of endangered species. And those species are listed up here.

So I would like to introduce Brita Woeck from Tetra Tech to continue the presentation.

Thank you, Mike.

MS. WOECK: Hi, everybody. My name is Brita Woeck. I see a lot of familiar faces from last night.

So I just want to talk you through -- some of you kind of already heard this -- sort of the process we are going through now for the environmental analysis. I work for Tetra Tech. And so we have been asked to do the environmental analysis for the wind project and prepare an Environmental Impact Statement.

So the reason we're here tonight is we are sort of starting the official State Environmental Review Period. So when we say scoping, we're

basically scoping out the issues and things that you're concerned about or want to see us address in our analysis.

So I know that many of you were at a similar scoping meeting that was held in November. That one was hosted by the Fish and Wildlife Service. As Mike mentioned, the project needs a Habitat Conservation Plan, so that triggers the Federal review. For tonight, we're talking about the State review, which

is triggered by a portion of the project being on state land.

So back in November, the State process and the Federal process weren't quite aligned yet. So just to meet our State requirements, we have to hold a second scoping meeting.

So tonight, the purpose of the meeting, as Leland said, is to basically get comments and feedback from you that will help inform how we put that Environmental Analysis together.

So we strongly encourage you to provide comments on like the scope of the analysis, if you have ideas on alternatives or just other concerns that you haven't voiced already, this is the time to do that, and that's going to go right into that public record.

So many of you saw this slide last night. This kind of depicts the State and the Federal process. We're up here at Scoping, and so we have -- you know, we have to kind of wait until that Environmental Analysis is completed. The yellow box here indicates where we're going to have an opportunity to provide input. So part of that is now we're in scoping. But once the draft Environmental Impact Statement is released, that is another great opportunity for you to provide feedback.

You can review the document, review all the different studies in the analysis, and then we'll

13 have another set of meetings where you can come and
14 you can ask us questions about the specific studies
15 themselves.
16 Based on meetings that we've had so far, the
17 Federal Scoping meeting as well as other community
18 meetings, here are some of the issues that we know
19 that your community wants to have us evaluate. And
20 so when we prepare that draft EIS, look for those
21 issues because those will be addressed in there.
22 So, as I mentioned, the next step in this
23 process is once the scoping period ends, which is
24 January 22, you know, we take your comments and your
25 feedback, put our environmental analysis together,

1 then we'll hold another set of meetings.
2 We will give you a chance to ask some
3 questions about the specific studies.
4 So in talking about (inaudible) comments, I
5 know many of you have already made some comments.
6 You know, Leland said you can make them tonight via
7 the microphone. If you're not comfortable doing
8 that, please grab a blue piece of paper out there.
9 It outlines all the options you have.
10 You can submit via e-mail, via fax, letter,
11 you can hand deliver a letter to our office in
12 Honolulu, whatever works best. If you know somebody
13 that wasn't able to make it any of these meetings,
14 please share that, have them send an e-mail comment
15 in. That's a great way to have your feedback
16 (inaudible). We are at the (inaudible) process right

now --

MR. KENT FONOIMOANA: Excuse me. Where is your e-mail address? Is it on this piece of paper?

MS. WOECK: It's actually still going to --

MR. KENT FONOIMOANA: Still the Fish and Wildlife Service?

MS. WOECK: It is actually -- I'll just clarify -- so we have these two scoping meetings. But after tonight, everything is going to be sort of

like a parallel process.

So one EIS, one -- you know, our next set of comment periods will be one set of meetings -- so yeah -- that e-mail address is something that the Fish and Wildlife Service put together.

And they're taking comments on all aspects of the project. So that's a significant question.

MR. CHANG: Thank you, Brita. All right. So, this is the official formal scoping portion of the agenda.

And again, as Brita mentioned a few times previously -- hold on a second -- we're asking that you focus your comments on issues that you believe should be studied as part of the EIS.

So if you can try to frame these comments during this portion, you know, in terms of this EIS study, look at these types of impacts and study these issues, study these types of alternatives. That is the kind of thing that we are looking for in this

portion.

The other "Questions and Comments" if you could hold until the agenda and -- that portion -- that would be great.

Yes, sir.

MR. CURTIS: You're merging documents or

having them go with parallel (inaudible)?

MS. WOECK: Just one document.

MR. CURTIS: So who is the accepting agency?

MS. WOECK: For the state, it's DLR. And then on the Federal side, it's the Fish and Wildlife Service.

MR. CURTIS: So two accepting agencies for one document?

MS. WOECK: One document, yes.

* * * * *

MR. CHANG: All right, Scoping comments. I will bring the microphone to you, just let me know.

So if you just introduce yourself for the benefit of Kathy, our court reporter, and then provide your comments.

MS. MOORE: Verla Moore, Koolauloa Neighborhood Board.

I think I heard in your comment that you said between Phases I and II that HECO may have to do some type of upgrading before you proceed with II, I believe that's what I heard.

My question is because -- I think I'm focusing from the impact on solar -- is what type of

upgrades are they planning to do during that phase? And how will that affect this overall process?

MR. CHANG: Okay, so the types of upgrades that will be -- that HECO will be required -- one of the things that is to be studied in greater depth as part of the EIS.

MS. MILLER: Kela Miller, Koolauloa Neighborhood Board.

Just wanted to ask, why are the wind mills so close to the community and the school, and what is the benefit part of it for the community?

What kind of benefit does the Community get?

MR. CHANG: So one thing that you're -- you want to study -- is the types of impacts of having the turbines located where they are relative to the schools?

MS. MILLER: (Nodding head)

MR. CHANG: And also question -- I'm not sure if EIS is studying about the community benefits package.

But you want to know what the package will look like?

MS. MILLER: Yes, sir.

MR. KENT FONOIMOANA: One of many more, probably.

I would like to know that when you folks do the study on the value that should be assigned to the

loss of our business and the impact that it has of the industrializing to our rural community by surrounding them on three sides by what you can term as asset or what I can term a liability. But it could be an asset in the right spot. And I would like to know if you guys can put a financial number as well as a social and economic and psychological evaluation of the entire community, on how that impacts the Community.

MR. CHANG: So the economic and -- what I'm hearing -- so the non-tangible impacts or losses that might accrue to public --

MR. KENT FONOIMOANA: They're fairly tangible from what I look at.

MR. CHANG: You mentioned psychological -- or losses --

MR. KENT FONOIMOANA: Just us being enclosed and surrounded by wind mills.

MR. CHANG: Hopefully everybody signed in so we can get the spellings of their names. Thank you.

MR. MAKAIAU: Ralph Makaiau, and I have three comments.

I am going to piggy-back on the regulation -- and I know that you have a foyer of regulation of a safe buffer zone. From our

experience, there is a quote of the safe buffer zone for agriculture zoned lands, but not necessarily

residentially zoned lands.

So as a Community, we have been participating in regulations that has changed for land zoning, that included residential zoning. That's point number one.

The second impact that I'm concerned about is that for this area, particularly the sub-district one, when an industrial alternative energy comes in, they fulfill -- as I understand it -- they fulfill the HECO quota of alternative energy, which competes with the residential quorum of alternative energy. So, being a part of quote/unquote sub-district one, we learned that exercise from First Wind's project.

Now we're in this, and about to be a second industrial wind project. And this resident has less of a chance to apply for alternative energy benefits from the overall regional program for sub-issues on the program. So, to me that's a significant impact, okay? Especially when they haven't charged me less.

My third concern is that we have, for the area of sub-district one, we have on an ongoing basis studied our quality as a result of alternative energy. Particularly industrial wind turbines.

And as we understand it, they can fluctuate and fluctuate significantly. Therefore, we would like to at least understand that with some reasonable confidence that we -- that this output can control or show us quality -- yet you're going to defend the

outcome by saying -- oh, we're going on HECO's grid; therefore, it's their responsibility in cost cutting -- not fair.

Because if you guys come with lower voltage to us, our toasters burn out prematurely. If you guys come out with significant variance in a frequency and sign wave, our T.V. burns out prematurely. And poor John Q. Public doesn't understand any of this. And my wall-mounted T.V. blows up.

So it's a matter of the impact of the life cycle from my investigation, is what I'm speaking of. So I think they belong in that consideration in the environmental impact.

MR. CHANG: Thank you, Ralph.

So, the quality of the power and the impact of possible fluctuations, the impacts of this project on opportunities for residents to, you know, initiate their own clarifications like he did. And then the first one was agriculture versus --

MR. MAKAIAU: State buffer zone. We are aware of regulations within agricultural zoning area, we are not aware of any safe buffer regulation at the point of the residential zoning.

Recognizing that the windmill planning be built in an agricultural zone, but it doesn't necessarily help the values in this origination.

MR. CHANG: Thank you, Ralph.

All right. Who else hasn't had a chance to

comment?

Your name, sir?

MR. BROWN: My name is Harry Brown, Kahuku Community member. Mine is a simple one. I'm not sure what the health and safety impacts are. And in terms of the power generated by the windmill, how does it affect (inaudible) directly or indirectly to those within our vicinity -- and danger to the plants -- the electrical power to make that -- plus the safety issue in case of a storm, a hurricane speed.

What is going to happen to those blades, where are they going to go? How strong can it stand the power of the winds? What is the rating on that, that kind of thing?

MR. CHANG: Thank you, Harry.

So all the potential defects or part defects possibly of -- in terms of the health and safety type of project.

Anybody else who hasn't had a chance to talk yet, want to take over here?

Thank you.

MS. PONDER: I am Aliitasi Ponder. I have a number of questions and comments, but I'll just start with wanting to understand why there wasn't -- or if there was a location considered that was farther away from the community, and why was it chosen -- why was this particular location chosen? Why take on the

13 health and danger factors involved with being this
14 close?
15 MR. CHANG: Thank you, I didn't quite get
16 the first --
17 MS. PONDER: Allitasi.
18 MR. CHANG: So the concern is, were other
19 alternatives considered for a site --
20 MS. PONDER: Farther away.
21 MR. CHANG: -- farther away, were they
22 considered?
23 MS. PONDER: And why were they not
24 considered if they were considered.
25 Anybody else? Yes, sir.

1 MR. BROWN: If this project is -- what do I
2 want to say -- a Phase I, whatever the maximum
3 generation is 45 megawatts, what is the anticipated
4 overall production on a day-to-day basis.
5 Secondly, what is the cost that's going to
6 be passed on to consumers versus other forms of
7 electricity? That is my question.
8 MR. CHANG: Okay, so cost that get passed
9 through to consumers directly as a function of this
10 project?
11 MR. BROWN: Yes.
12 MR. CHANG: And also, are you talking
13 about --
14 MR. BROWN: Cost of electricity generated.
15 Will it have any impacts on rates?
16 MR. CHANG: Rates.

MR. BROWN: And then also the --

MR. CHANG: The anticipated --

MR. BROWN: -- the anticipated average production. Because it will be something less than 45 megawatts, right?

MR. CHANG: I am not sure.

Yes, sir.

MR. HUBBELL: My name is Carl Hubbell, and I just wanted to know, First Wind is up, are they using

all the power that's being output? And if not, where is it being held to?

So, if they're not using it or if they're using it, what kind of impact by not using it, where they're dumping it. And with them putting out 45 megawatts is HECO -- I mean, these are all statistics of what kind of having included in this impact. Because if HECO is not a hundred percent going to use the power, and big business is just coming in because of financial gain.

The impact that it has, it's on site obviously, on the 18, looking at the windmill on Kahuku Golf Course, which we play all the time. So that's an impact, you know, looking at them, they're unsightly. And they're not even using all -- that's just hearsay. I mean, that's just people saying. So, why am I dealing with this if they're only using 25 percent of what they're putting out.

It's hearsay. But that doesn't make sense.

20 So if you're -- I want statistics written in it -- if
21 First Wind is not using all their power and you're
22 going to tap into the power over here, and HECO is
23 now going to pass on the cost, obviously, if they
24 have to upgrade.
25 They are not going to feel it, we're going

1 to feel it. And then it impacts us obviously. So I
2 want that in the impact statement.
3 Like if they're obligated to use it first,
4 you understand what I mean? Because why have it
5 there if they're not going to use it, and why do we
6 have to put up with it if they're not going to use it
7 all.
8 MR. CHANG: So will the power -- will all
9 power generated as a result of this project and
10 what's already on tap --
11 MR. HUBBELL: Existing, yeah.
12 MR. CHANG: Will it all be utilized?
13 You also mentioned impacts on rates to the
14 consumer --
15 MR. HUBBELL: Excuse me?
16 MR. CHANG: You mentioned about the impact
17 of all this on your rates --
18 MS. ROSENTHAL: Well, visual -- there was a
19 visual impact too.
20 MR. HUBBELL: There's obviously a visual
21 impact.
22 And, yes, rates. The Hawaiian card, yes,
23 it's bad enough.

24 MR. CHANG: Rates as in --

25 MR. HUBBELL: People.

1 MR. CHANG: Yes, sir?

2 MR. CURTIS: Henry Curtis, Life of the Land.

3 What percentage of the community would have

4 to oppose the project for the developer to leave?

5 MR. CHANG: Is that something that -- say

6 you want sort of looked at in the EIS?

7 MR. CURTIS: Sure.

8 MR. CHANG: How would you phrase that so

9 that it's something that they study?

10 MR. CURTIS: Some developers say if a

11 community opposes us, we'll leave, and we'll work

12 with the community and try to reach a common

13 understanding. But if they say no, we'll leave.

14 Other developers say we're here no matter what. I'm

15 curious what this developer thinks and how they have

16 handled other projects where there has been

17 opposition.

18 MR. CHANG: Okay. But is there a suggestion

19 then that this study should examine sort of the level

20 of community support or lack of support?

21 MR. CURTIS: No, it should answer the

22 question of the developer, whether the developer

23 would leave at some point if there were a sizeable

24 opposition they could not overcome.

25 MR. CHANG: Okay, thank you.

Verla, you've had a chance. Anybody not have a chance yet? And then there are one or two others who wanted to comment.

MS. VASA TAVALII: What I would like to know is -- I'm Vasa Tavalii -- what I would like to know is the direct impact financially on the community. How does the community benefit in any way, shape or form? And what is your data to support this? This is your immediate community in this room.

MR. CHANG: Thank you.

Make sure that if you haven't already signed in, that you sign in so we get all the names correct.

Anybody else not have a chance? You've had a chance so we are going to go to -- anybody else?

MR. KENT FONOIMOANA: My girlfriend -- ladies first.

MS. ALLITASI PONDER: What other instances have they -- has this developer placed a project of this magnitude this close to a community, this close to a school? And what has been the resulting reaction from that community?

MR. CHANG: So precedence in terms of the effects of proximity of projects like this to like schools and houses and so on and so forth?

MS. MOORE: Just a feedback onto -- he was asking what would make the developer stop the

project. What impact indicators with the environmental study would actually stop this project?

MR. CHANG: Thank you. Kent?

MR. KENT FONOIMOANA: I'm going to piggy-back on what Mr. Curtis mentioned. What is it going to take for the amount of opposition within a community to stop a project? I'm going to speak from a historical perspective, but there's going to be a question in here --

MR. CHANG: Perfect, perfect.

MR. KENT FONOIMOANA: -- as short as I can.

I am a former member of the Kahuku Community Association, current member again as of this month.

It is my understanding from dealing with the previous predecessor -- which I am going to consider them one and the same company because evidently the state is doing the same thing by transferring the lease to this gentleman here -- and so back in 2006 when they first came -- and I've got a copy of it -- actually I forgot it at home but I can provide a copy to everyone if they want -- the developer first came and said that if the community doesn't want this project, we won't build it.

In response to that, down the line in 2010, while the gentleman sitting behind me was leading -- was the president of the Kahuku Community Association -- we did come out with a statement and a position on wind mills. We said no more wind mills

be installed in Kahuku -- installed.

However, another gentleman on the Board has continued to open the door to Mike and other companies to try to install wind mills in this input.

We have generated several petitions from several points of view -- it's my way of polling the community -- one of them was asking for a three-quarter mile set-back, and one of them was saying none at all. And I can tell you, the "none at all" is easy to get signatures.

I have a hundred and something signatures in here that took me less than an hour and a half to get by walking and talking. So the opposition is there.

So Mike -- or anyone else listening to this EIS -- as a matter of fact, I am going to make a comment on that picture right there -- Habitat Conservation Plan -- and I'll make the same statement, we need to do a Habitat Conservation Plan that applies to human beings.

Are you going to provide us that?

Also, before this EIS process moves forward, the Community needs to be provided with a 360-degree virtual images of what this project will look like.

Also, this project needs to do a study on what may happen to a community that's surrounded on three sides by these large industrial wind turbines should an Iniki-type hurricane event strike this area. It is good for wind, it's even better in a hurricane. And I am quite concerned about large

debris flying through the air.

There is a reason why they place the turbines so far apart. It's to avoid the domino effect should one of them fail and take out another wind turbine. Yet they don't have -- the same distance doesn't apply to a residential community -- and I would like to know why.

MR. CHANG: You're going beyond my ability to summarize. But the things I picked up on were impacts on not only creatures, but also the human creature in determining habitat, and also the impact in terms of a natural disaster like a hurricane.

Did I miss anything else?

MR. KENT FONOIMOANA: You got it.

MR. CHANG: Thank you.

MS. MILLER: Just one more thing, is what

kind of impact would this have on -- we understand that it will affect the rest of the communities like Laie, Hauula, Pupukea -- what kind of impact is it going to have.

And on the cultural side, what about all of the native plants, the animals that we have, the Kahoalawe, you know, things like this that it's up there?

What has taken place to see that that doesn't get harmed? So that's one of my questions. Thank you.

MR. CHANG: So I think -- when I saw you

first and then come back to Henry.

MR. CURTIS: My understanding was that when Keith Avery was involved in the project, there was reached an understanding that if the community didn't want it, the developer would leave.

When the new developer acquired the rights from Keith Avery and from others, did those conditions go with it or not? And if not, why not?

MR. CHANG: Okay, is that something again that EIS normally would assess?

MR. BROWN: That is something that the developer may decide whether or not to stick it in the EIS. And the community may or may not decide to

call up DLNR and say why is it not there? So I would think the developer would want to stick it in the EIS. Thank you.

MR. CHANG: Thank you, Harry.

MS. MILLER: This is an expansion of my earlier comment on the health and on the plants effects as well as what Kela said on the -- mine is what kind of impact would it have as well on the cultural side, on the native Hawaiian -- on the native Hawaiian's ability to exercise their gathering rights if need be, to give up to areas where it is, and pick up those native plants or plants that are -- (inaudible) Or whatever -- cultural.

MR. CHANG: To study the impact on traditional cultural practices. This is great, you guys are doing fantastic. They are getting lots of

17 stuff that they know they are going to need to work
18 on.
19 Anybody else not have a chance yet?
20 If not, Ralph, did you have --
21 MR. MAKAIAU: Ralph Makaiau. Again, when we
22 had the fire up at First Winds, it was very --
23 obviously everybody responded to the environmental
24 impact of that disaster, if you will.
25 But, in following the process of Department

1 of Health, and the monitoring that the First Wind
2 people did, they hired (inaudible) and contractors as
3 such.
4 One data that we did not see -- we saw all
5 of the proof measurements, downstream measurements of
6 the wind, and we saw all of the data represented in
7 the ground contamination.
8 But at the time of the fire, as the fire
9 department was trying to at least control the
10 perimeter burn, nobody was able to give us
11 information on the downstream impact of Pahipahialua
12 Stream and (inaudible) Stream, both of which cross
13 agricultural areas, both of which settle a
14 preservation lands wildlife. And it was interesting
15 for us that DLH didn't even think about it. And they
16 are updating just the mere reporting from the
17 contractor. That wasn't comfortable with me either.
18 MR. CHANG: Okay, so see if I understand.
19 So, the EIS -- you would like the EIs to look at the

need for environmental data in case of things like the First Wind fire if something goes wrong with the infrastructure?

MR. MAKAIAU: Why don't they establish a baseline like that (inaudible) stream or even the adjacent farm water run-off path. Establish a

baseline so that when they come back in an emergency, we know if there's any impacts.

MR. CHANG: Thank you for helping me out on that.

Who did I miss over here?

MS. PONDER: The notes that are coming out of this meeting, will they be -- will we be provided a copy of those notes, all of our questions, our collective questions? Are you taking these notes in order to also share the result of this meeting with -- the contents of this meetings with us? That's one question.

Another question, the past fires that we experienced here from First Wind resulted in a lot of the awareness that we were under-equipped in terms of our fire department capabilities, our emergency response capabilities.

What additional resources will you be providing or be required by the city in order to respond?

MR. KENT FONOIMOANA: What is the developer's share?

MS. PONDER: Right. What will the developer

be providing, and then what will be left over for someone to provide in order to adequately meet those

emergencies?

That's the second question.

I forgot my third question. I'll come back.

MR. CHANG: So the suggestion is to study the need for additional emergency responses as a result of these projects.

MS. PONDER: The first one was about the notes.

MR. CHANG: The notes, yes.

As I understand it, the scoping notes get summarized, get posted on this project web site. Am I correct that the recording here goes -- becomes part of the document or --

MS. WOECK: It will be part of -- the transcripts from this meeting and from the NEPA meeting that was in November will be part of a scoping report, which will be an appendix of the EIS -- draft EIS -- and we can also discuss posting them on the Champlin web site once they're available. But they will definitely be in the draft EIS.

MS. PONDER: When is that?

MS. WOECK: Mid year -- this year, mid year.

MR. CHANG: Does anyone else have a comment that begins with study this, we want you to study this?

Thank you.

MS. BORGES: My name is Ghia. And I just wanted to touch on the other fact of acquiring access rights and gathering rights. I think it's important also to look at the effect of the native Hawaiians as a people and their cultural aspects since -- if we are not able to -- if we are to be surrounded by these wind mills, if we're not able to access it. Because once the wind mills are up, it would be developed land.

And native Hawaiians have access rights to under-developed land and land that is not fully developed so --

MR. CHANG: Got that? The impact of developing this particular parcel on native Hawaiians' gathering rights.

MR. BROWN: You said to us as personal study this, but before I want to ask that for anybody asks, I wanted to know how are you guys study this? I mean, are you actually on land or you just look on the screen or how are you guys really study this project? I mean, are you actually walking up there and check the land or --

MR. CHANG: Maybe we can respond to that in the general portion. Yeah, great question.

Anyone else? Study this. Evaluate that?

Kent, you got one?

MR. KENT FONOIMOANA: I got plenty of stuff.

MR. CHANG: You got one that you can share right now?

MR. KENT FONOIMOANA: I got about four or five.

I would like them to study the impacts on the near shore waters, they will be installing roads up there. Roads will create more run-off. I would also like you to study the community sentiment involved in -- through that in your report.

I would like you to study the impacts of infrasound. Low sub-sonic sounds caused by wind turbines moving at 159 or 80 miles an hour at the wind turbine tips and blades and the effect on infrasound on critters as well as human beings.

MR. CHANG: Thanks, Kent. Anyone else?

Going once --

MS. MILLER: What we need to study the people of the areas, the communities, study the people, what are their needs? What are some of the things that we need? I think that's one of the things you guys should consider to do.

MR. CHANG: Human and social impacts.

MS. PONDER: And to reply to what my third question was, I would like to know how well the developer knows our community in terms of demographic break-down.

How many youngsters, kapuna, people who are

health challenged, have they taken those things into consideration. And we would like them to take those things into consideration.

I would like to understand the individuals and the groups that they have approached and motivated through offers of support.

I know they approached Kent and he was quick to turn them down. So I would like to know who else in our community, on our board, our immediate community, outside of our community, is being incentivicized in any way; current support, offers of future support, anyone that they have approached, I think that should be public knowledge.

MR. CHANG: Anyone else?

MS. MOORE: I want a study comparison -- we have a lot of wind mills, I think -- I've seen there is -- it's great because it's wide-spread, and up and down this coast line we have a variety of wind mills.

So I would like a study and comparison on the wind mills per square miles, the output it does

and compare it to something at this site. If you were to consider this all one project, and you took another project of this same scope including all these -- what is the output -- are we producing more than what this island needs?

Are we storing -- I mean -- there's got to be a limit as to when enough is too much. So I want a study and comparison to something -- comparison of this side from Waimea down to this side.

Is that the function of the ESI?

MR. CHANG: All right. Yes?

MR. MAKAIAU: I think this is all in addition to the study Kent had some of the studies on this, on these within the floods, in going to build whatever they want to build, you know, they are going to grade some of the mountainside, or what are they going to do that is going to change what's already there.

It may have a negative impact followed by what nature wants to do. Just in the case, I don't want any negative impacts on the land in addition to questions that Kent mentioned about erosion and run-off.

MR. CHANG: Okay. Anything else?

All right, can we take like five minutes and

then we will come back and then we will open things up and we can talk some more with Brita, with Michael a little bit more. Five minutes.

(HEPA Public Meeting Scoping Comments concluded at 7:25 p.m.)

C E R T I F I C A T E

STATE OF HAWAII)
CITY AND COUNTY OF HONOLULU)

I, KATHRYN PLIZGA, RPR, CSR NO. 497, State of Hawaii, hereby certify:

That the proceedings herein were by me taken down in machine shorthand and thereafter reduced to print via computer-aided transcription; that the foregoing represents, to the best of my ability, a complete and accurate transcription of said proceeding.

DATED: Honolulu, Hawaii, _____

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19 KATHRYN PLIZGA

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1 HEPA PUBLIC SCOPING MEETING

2

3 NA PUA MAKANI WIND PROJECT

4

5 (QUESTION AND ANSWER PORTION)

6

7

8

9 PLACE: Kahuku Community Center

10 56-576 Kamehameha Highway

11 Kahuku, Hawaii

12 DATE: January 10, 2014

13 TIME: 7:35 p.m.

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Reported by:
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(7:35 p.m.)

P R O C E E D I N G S

MR. CHANG: Okay, so for the next 30 minutes or so, you know, it's a chance for you folks to ask questions that you might have, the right people here in terms of Mike and Brita. They'll do their best to respond. If they can't, at the very least, they will encourage you -- they'll take it back and they'll consider it further.

So who would like to go first? Does anybody have a question?

Okay, Carl?

MR. HUBBELL: Carl Hubbell. I have a question for Mike.

MR. CUTBIRTH: Yes, sir.

MR. HUBBELL: So you're going to saturate the system and we're not going to be able to put in our own solar panels if you go up first. Is that a true statement?

MR. CUTBIRTH: So, I don't think that's a true statement. And I asked the folks at HECO transmission about this question.

And the existing wind projects and our proposed project connects to the high voltage

distribution line, the 46 kv main. Rooftop solar connects to the residential feeder lines, the low

voltage residential feeder lines. So, the issue of capacity on the distribution lines is really a separate issue for how much rooftop solar can be built.

This is something that I've asked HECO if they could address this issue to the community because I understand it's an important issue. And they indicated they are going to work on putting together a statement. And potentially we could organize a meeting with someone from HECO to better address that question.

MR. HUBBELL: Will that happen on Wednesday?

MR. CUTBIRTH: I don't know that that could be done unless we -- the Wednesday meeting is really oriented for its health impacts of wind turbines.

One of the issues that we've heard from the Community is a concern about health impacts. And there's going to be a presentation on what the research and data and reports have shown.

MR. CHANG: Okay. Thank you, Carl.

MR. HUBBELL: One more question. When we contacted the representative, he said that HECO would be able to answer those questions. Isn't he supposed

to be hosting this meeting along with you guys?

MR. CUTBIRTH: Well, he may have a representative from HECO here, but I haven't talked to him directly about that, so I don't know.

MR. CHANG: The question is noted. Next

question.
MR. HUBBELL: I thought that was the purpose.
MR. RIVIERE: Thanks, my name is Gil Riviere.
Is this a 20-year project and then you take them down at the end of 20 years or what happens when it's done? Will you restore the ground and what happens then?
MR. CUTBIRTH: So, the project will have a 20-year power contract. So we would expect the project to go for at least 20 years. If there's no further agreements to purchase power, then our obligations would be to restore the land to the condition that it was in before the project was built.
MR. RIVIERE: Does that include removing the entire concrete pads?
MR. KENT FONOIMOANA: No, they take up the top three feet. I'm just answering.

MR. CUTBIRTH: I mean, my understanding is we remove the improvements that we put in there.
MR. KENT FONOIMOANA: Except for the top three feet of the concrete when you pass, which your engineers shared with me.
MR. CHANG: Yes, ma'am.
MS. MILLER: Mike, Kela Miller.
What kind of impact do you see happening on not only Kahuku but on Laie, Pupukea, you know

further on down the coast line? What kind of impact do you see it would have on the rest of the communities?

MR. CUTBIRTH: Well, I think the most obvious impact is just the visual impact. The Environmental Impact Statement that will be prepared will address all of the impacts of the project. And to me, that's the most obvious, is that you could see the turbines once they're up.

MS. MILLER: Who needs to be able to see it?

MR. CHANG: I guess the EIS -- if that's what is suggested -- needs to look at the impacts on either side of the Leeward communities.

Kent, question?

MR. KENT FONOIMOANA: Question. If everyone between Kahuku and Pupukea or Waialua installed solar

panels on their homes, everyone, and took advantage of the tax credits being available for them, would that impact your tax credits negatively?

MR. CUTBIRTH: No.

MR. KENT FONOIMOANA: And would this project still be feasible?

MR. CUTBIRTH: Yes.

MR. KENT FONOIMOANA: We need to have HECO here to answer that question honestly.

MS. MOORE: I am going to ask the question that was asked last night over and over, and they waited for you to come before them.

What would it take for you to stop this project should the people decide they overwhelmingly don't want it? Are you willing to give this up? And at what point would you determine that it is still no go?

MR. CUTBIRTH: Well, our company has made a commitment to Hawaiian Electric and the state to build a renewable project here, and to generate power at about half the cost of burning oil.

Any decision to not honor those commitments that we've made is something that would have to be from our management. So I don't have any specific criteria that I can give you for that.

I think what we really would like to do though is to work with the Community to make sure that we address the issues. To the extent that there are issues of concern, that we can address, we would like to try and do that.

And as an example, since we started working with the Community about nine months ago, we have actually modified the proposed plan, the layout of the project, removed four proposed turbines from -- (Cross Hill) -- and relocated one turbine from the adjacent site.

And this really is trying to address the issue and concern about setbacks as well as noise. So that's really our preferred approach. That's typically what we've done on other projects; trying to work with the Community, identify what the issues

are, and actually try and work with them to see if we can get them figured out.

MS. MOORE: Okay.

MR. CURTIS: Henry Curtis. I know from sitting on the Public Utilities Commission Reliability Standards Working Group, that wind fluctuates and that the utility grid has to fluctuate in reverse to offset the impact of wind. And, therefore, the cost to a wind is both the direct cost

at the wind site and also the system costs to adjust, to deal with the winds coming in. And therefore, your component is half the cost of the grid. But what is the other component cost?

MR. CUTBIRTH: Again, that's probably a question better asked to HECO, that's not really something that I could address.

MR. CURTIS: They haven't either.

MR. CHANG: Put that in to them when they come.

Next.

MS. VASA TAVALII: Vasa Tavalii.

I have a question for you. If the approval for this project was given to you by the City, the State, then why are we having this discussion? If you're pushing the project forward with adjustments, with the determination to implement the project -- because the question still hasn't been answered -- what would it take for you to discontinue the

project?

MR. CHANG: Do you recall your prior --

MR. CUTBIRTH: I don't know that I've got anything additional to add other than what I already stated to that question.

MR. CHANG: Okay, so one of the recurrent

themes we're getting is what would it take for this project to basically have it bungled?

MS. VASA TAVALII: Would the land owners keep --

MR. CHANG: Anybody else not have a chance? Hold on.

MR. BROWN: Aloha. I'm looking in your brochure. And it says "How will the Project Benefit Us?" And I'm not seeing us being (inaudible) Community or people of Hawaii. Most likely at this point, here Kahuku. How would it benefit us? As I read some of these things in here, I'm not sure that any of them -- some of them is true -- like will it benefit us by bringing our electricity rate down?

You don't control that. That's HECO and them, they saying to that. So to me I'm kind of thinking it's on here, because it is going to benefit package. And if there is a benefit package to the Community, what are they looking at? What are you talking about? What figures came over, you know, can we talk?

MR. CUTBIRTH: Right. So, with regards to the cost of the electricity, the state has got a goal

24 to reduce the cost of the electricity to rate payers.
25 And this project will cost about half of what burning

1 oil to generate electricity costs. And Hawaiian
2 Electric included in their filings for the state a
3 statement to the effect that by adding this project,
4 it will avoid spending millions of dollars in
5 purchasing oil. So I think they've tried to, at
6 least, put some kind of quantification on this.
7 So, with regards to benefits, I think that
8 you can look at benefits from a number of levels.
9 You can look at it from a state standpoint, the
10 standpoint of trying to reduce the cost of the
11 electricity; of helping to reduce the imports of
12 foreign oil. The State currently spends over
13 four million dollars buying oil from foreign
14 countries. And that's money right out of the economy
15 of Hawaii.
16 Additionally, because a portion of this land
17 is State land, the State would receive revenues, base
18 revenues, for 20 years. Additionally, there are jobs
19 that will be created from the project, short-term
20 construction jobs as well as long-term operations
21 jobs. I believe the First Wind project employs about
22 50 percent locally, and we think we can do at least
23 that well.
24 Additionally, the original developer of this
25 project had proposed to the Community a Community

benefit fund. And that was $10,000 per wind turbine per year over the life of the project. So, if you look at that in terms of the Phase I project, that would be $80,000 over a 20-year life or about $1.6 million. If the second phase project was built, that would be $150,000 per year over the 20-year life or $3 million.

This concept is something that's unique for our company, we have not had a Community Benefit Fund for any of our other projects. But this is something that we propose to honor, a commitment that was made by the prior developer.

So those are a few of what we think are pretty tangible benefits. Thank you.

MR. CHANG: Kent, I know you have a question. Anybody else have a chance to raise a question yet?

MR. REED MATSUURA: My name is Reed Matsuura. Last night there was a question about the agreement that was signed with the windmill project.

My question is, the agreement is between you and the private owner of the property or the City? And if this owner somehow renig on this agreement or whatever, are you still planning -- because this is property -- but I have from my understanding is most

of the property is owned by the private owner -- we not focus on wind mills. So I just want to know if

the agreement was with you, your company, or with the City or -- and then the other part is, does that interfere with you stopping the project? No?

I'm trying to, you know, rephrase the question earlier, that what it takes for you to stop the project. If that's why you cannot stop the project because of the agreement?

MR. CHANG: I guess the essential question is about the ownership of the land. If something happened with that, you know, the agreement with that, would that be enough to, you know, change direction?

MR. CUTBIRTH: So, a portion of the project is planned on State land. And that would be five turbines, and if just the first phase project was built, there would be three additional turbines on the adjacent private land.

The State land agreements are with our company, and it's actually the project company which we own. And likewise, the lease on the private land is a different land owner than our project land.

MR. CHANG: Thank you.

MR. KENT FONOIMOANA: The first question

real quick, are you not the CEO of Champlin Wind Energy?

MR. CUTBIRTH: I am.

MR. KENT FONOIMOANA: So you are part of the management. Should the management make a decision to

stop the project, you are the top.

MR. CUTBIRTH: I report to a board, and I am the CEO. But that board is actually the group that makes major decisions.

MS. PONDER: I would like to know, Mike, your job project history in terms of like what you've done in wind development in the last 10 years; and what projects you oversee of this magnitude or close to this magnitude in that time frame.

That's one question. And then I have another.

MR. CHANG: Track record.

MR. CUTBIRTH: So just kind of a brief history, I got into the wind industry about 18 years ago and joined a company called Zond Corporation. Zond was one of the pioneers in wind energy, they built one of the first projects to sell electricity to Southern California Edison.

While I've been in the wind industry, I've personally been involved in over 750 megawatts of

projects, development projects. And our company management team has been involved with about double that amount.

My role over the years, I've had different hats. When I first got into the industry, my responsibilities were in the area of finance. And over time, took the lead on the development of projects.

I personally have not had any involvement in

the operations and maintenance of the projects.

MS. PONDER: So none here in Hawaii?

MR. CUTBIRTH: While Zond and Enron Wind worked on a number of projects -- and in fact, the original developer of this project was a colleague of mine at Zond and Enron -- and he's been involved in a number of projects that were developed here in Hawaii. This is my first -- personally my first experience in Hawaii.

MS. MOORE: I would like to ask one last question before I have to leave. And this may come as part of a study. You mentioned the Community set this package up at about $10,000 per turbine. I put up a PV system on my home a year ago. It saved me $400 a month. Times that by 12, it's $4,800 just the past year. Two households of HV system would equate

to a benefits package of one turbine.

My question is -- well -- actually my statement is in comparison, if we had 1,000 homes with PV systems on their homes, multiply that by savings of $400, this is a direct savings to the customer, that's a benefits package of $400,000 a year -- a benefit, that's huge. So I think the benefits package pales in comparison. There's never been a comparison study with PV, individual PV versus all these turbines.

I understand people wanting to get off the fossil fuel, I totally understand that. But when you

generate that energy and you redistribute the cost to Oahu to one million customers or whatever we have, I think that's a savings of about one and half cents a year. That's nothing. It's negligible.

So something really has to be addressed. If we're going to pull through with this, there's no turn-around in this project -- if I was the community leader I would up the ante for every single one of those turbines that go up so that it equates to the number of the homes in this Community -- let's start with this Community alone -- that at least $400 go back in their pocket on a monthly basis. To me that's fair.

If we're going to move and there is no point of return, what is fair is to put the savings right in their pockets. And don't tell them we're going to save because HECO is going to save. Because there is no reason for limiting this -- I apologize, but I have to leave.

MR. CHANG: Thank you.

Do you have a comment, Mike?

MR. CUTBIRTH: Well, I would just say the one comment is that rooftop solar and an additional wind project are not mutually exclusive. Additional rooftop solar as well as wind projects and utility sides of solar is part of the energy plan for Hawaii.

So, the fact that individuals want to add solar is not something that -- from what I understand and from what I have been told from HECO -- is that

is going to be impacted by this project.

MS. PONDER: Well, it is, and it's on your site -- it is on HECO's site -- that it is a direct correlation between these wind projects and the number of households that can have it. You will have to address that issue.

MR. CUTBIRTH: We'll try and help facilitate getting someone from HECO to address that because I know this is an important issue to everyone.

MR. CHANG: Thank you. Thank you, Mike.

MS. MILLER: Do we know, since First Wind went up, that there was a decrease in electric bills in any of communities here, the residents?

And do we see in the future, with this other wind mill that's going to go up, that there will definitely be a decrease in electric, in our electric bills?

Is there something that we can truly say, HECO will actually decrease our electric bill? Because we have not seen one bit of decrease -- I don't think so -- anybody have. So that would be something of a concern, that if we do this -- if -- that there will definitely be a decrease in our electric bill.

I know we all pay the price on electric. And so, I think that's a really big concern for all the Community. Thank you guys, so much.

MR. CHANG: Thank you, Ms. Kela.

20 So the question has to do with at what point
21 do people actually see a reduction or lowering of
22 their light bills because of alternative energy.
23 MR. CUTBIRTH: Just a couple of comments. I
24 would just say that this is an important goal for the
25 state. In HECO'S filings with the State, they have

1 indicated that this project will save millions of
2 dollars over time.
3 I realize that it's frustrating to have a
4 renewable project go on line and then not be able to
5 look at your bill and see a reduction. And I think
6 that one of the issues is that the cost of
7 electricity that everyone pays is an average. And
8 there's -- I don't know what the number is -- that
9 1,200 megawatts of total generation on the island.
10 And right now there's just a very small percentage of
11 renewables.
12 As that percentage increases over time to
13 meet the State's laws for renewables, it seems
14 logical that the bills would go down. But I think
15 this is really a better question for HECO to have
16 them actually try and give you an estimate on that.
17 MR. CHANG: I'll take one question. I see
18 two people. Three more, and then we are going to ask
19 Mike to say aloha and mahalo and good night.
20 MR. KENT FONOIMOANA: Three quick rapid-fire
21 questions since my time is short, maybe four.
22 Has the Kahuku Community Association --
23 you're sitting in right now -- have they endorsed

this project?

MR. CUTBIRTH: I don't think that the

association -- the KC Board -- is that what you're referring to?

MR. KENT FONOIMOANA: The association, have they endorsed this project through a general membership meeting or any forum?

MR. CUTBIRTH: You're not referring to the KC Board?

MR. KENT FONOIMOANA: I am.

MR. CUTBIRTH: So I don't believe the Board has endorsed it.

MR. KENT FONOIMOANA: Thank you. That's my first question.

Are you -- because we are short on time I'm just trying to --

MR. CHANG: Thank you, appreciate it.

MR. KENT FONOIMOANA: Are you aware that last night the Kahuku Neighborhood voted down the resolution to increase the amount of setbacks from the current one-time item turbine to the three-quarters of a mile is what this Kahuku Neighborhood Board, which represents the entire community -- are you aware of that?

MR. CUTBIRTH: Yes.

MR. KENT FONOIMOANA: Are you aware that when First Wind proposed to put five more turbines on

the stretch here right before you got -- right across the street from our -- that the Kahuku Community Association in response to Keith Avery, your partner or your prospector as I prefer to call him -- although you don't like that term, that is exactly what he does -- that we, in response to his request to put this other project up here as well as First Wind's which we gave out the -- the Kahuku Association came out with our position saying we don't want any more.

And this is back in 2010. Are you aware of that?

MR. CUTBIRTH: I'm not.

MR. KENT FONOIMOANA: I have a copy for you, I can provide that for you.

MR. CHANG: Next question.

MR. KENT FONOIMOANA: Last question.

In jumping through all these hoops with this EIS process that we're doing right now, the process up at the PUC, you guys filing for a non-competition clause with other vendors, don't you think the first move that you should clear would be the Community?

MR. CUTBIRTH: Kent, well, like I said, we have been -- I think we started talking to the Community about this project more than nine months

ago; had our first meeting in front of the KC Board, I believe that was in May of last year.

So we've actually -- we've started that work -- we know we have more work to do. But we sincerely do want to try and -- as best as we can -- address any issues that the Community has.

MR. KENT FONOIMOANA: Like no?

MR. CURTIS: One of the things that Champlin Wind Holdings is fond of using is reference to the energy agreement of the Hawaii Clean Energy Initiative because it's often quoted but seldom read.

That document says that short-term electric bills will rise and then stabilize. The HCEI agreement says nothing about lowering costs and nothing about -- but that it's always quoted as going down.

It says that when you add wind and you add solar, you have to put in a smart grid, you have to put in batteries, it will raise the price. But since the price of oil is expected to rise also, eventually the wind and the solar will come out less than the oil. But in the short term, it will go up.

MR. CHANG: Thank you, Henry.

So our last question or comment.

MS. PONDER: Okay. The fact that this is

the last question allowed is actually part of my concern. Okay?

The tactic that I see being taken in getting this project shoved up our butts is to keep walking us along toward the Nazi showers as we make

conversation together getting our last questions in. But in actuality, we're being marched along, given very little time.

What you've said is you have been in conversation with this Community for nine months and the conversation has gone like this. You say this is what we want to do. The collective says no. You say this is what we want to do. The collective says no.

So, it's kind of like a kid asking permission but not taking in the information. We don't want this here. Okay?

The only people that I know that are even open to this -- we have been here six generations in Kahuku, my grandfather worked at the sugar mill -- okay, the only people that I know that are open to this are people who we understand have been approached by either you or someone in your group and incenticized in some way, whether it's now or in some future time.

Okay? So I have a real problem with the

tactic of making nice, but not taking in the information, not really giving us the answer, but passing the buck. Passing on the question to people that are not here in this room like HECO or the management, you know. So the same thing that happened to us last night.

Having meetings on Friday nights when you know that is very -- you know -- what do they say in the business? The best time to give out bad news is

on a Friday night.

So, it's not -- you're making it look like you're talking to us -- but you're really not. It's not a two-way conversation.

Okay, I have a question.

How much have you or other projects of this size paid out to those whose medical conditions existing were new, have been impacted by projects like this? I would like to know that. Have you been approached by people in those areas? Have you had to pay out in like projects?

So, I want to know in another project where you are this close to the community -- that's two-part -- and in those communities, how long have they been putting up with the wind turbine, the turbine syndrome as we all know it, is called.

And if they put up with it for one year, the project being there 10 years, during the course of that time what has been the reporting of medical conditions?

How have you collected the information? So that you can't say, oh, no one has reported it because there's no place to report it.

MR. CHANG: Thank you.

So as I understand it, next Wednesday is about the research. Sort of health events.

But the other question is, you know, in your experience, have there been claims brought because

of, you know, health impacts as a function of these projects?

MR. CUTBIRTH: So, I've been with four wind companies over the last 18 years; and I'm not aware of any claims that were paid to anyone claiming to be sick as a result of it.

And with regards to your question about addressing the issues, the focus of the meeting plan next Wednesday is to actually provide the community with the data and research and surveys in a summary form by a Harvard medical physician who is an expert in this area, and give the Community an opportunity to talk to him about this so called wind turbine

syndrome.

MS. PONDER: But not somebody paid for -- just someone who's on their own just coming on their own defense?

MR. CUTBIRTH: I'm not aware of anybody that would come to Hawaii for that purpose on their own nickle.

MS. PONDER: So a disinterested party is coming?

MR. CUTBIRTH: An individual physician that has been involved in this area for years.

MS. PONDER: In other projects?

MR. CUTBIRTH: No, no, in this area of research and health impacts of wind turbines.

MS. PONDER: And who is that person? I would like to know that.

MR. CHANG: Come next Wednesday, you will find out.

MS. PONDER: No, I would like to know the name of that person, so we can be prepared.

MR. CUTBIRTH: Dr. Robert McCunney, M-C-C-U-N-N-E-Y.

MR. CURTIS: Robert what?

MR. CUTBIRTH: McCunney, M-C-C-U-N-N-E-Y.

MR. CHANG: Okay, so just for myself, I want

to say that how appreciative I am of the input you provided and you're a great group to work with. And I am going to just turn this over to Mike, send you off to begin your weekend. So I will say aloha for myself and mahalo.

MR. CUTBIRTH: Thank you so much for attending tonight and all your good questions. We appreciate you coming out.

(The Question and Answer Portion of the Kahuku Scoping Meeting was concluded at 8:12 p.m.)

* * * *

C E R T I F I C A T E

STATE OF HAWAII)
CITY AND COUNTY OF HONOLULU)

I, KATHRYN PLIZGA, RPR, CSR No. 497, State of Hawaii, hereby certify:

That the proceedings herein were by me taken down in machine shorthand and thereafter reduced to print via computer-aided transcription; that the foregoing represents, to the best of my ability, a complete and accurate transcription of said proceeding.

DATED: Honolulu, Hawaii, _____

_____
KATHRYN PLIZGA

24

25

APPENDIX D
PUBLIC COMMENTS AND RESPONSES

Appendix D

This appendix includes each of the submissions received during the HEPA and NEPA scoping periods and associated responses. Each response letter included the following list of Issue Categories and Summary Statements as an attachment which corresponds to the three-letter issue code assigned to each substantive comment within the submission (identified by brackets). A summary statement was developed for each issue code to reflect how it was incorporated in the draft EIS.

Issue Categories and Summary Statements

Comment Acknowledged (ACK) – Comments that were received and noted, including general comments, expressions of opinion, and comments that do not fall within the scope of analysis for this EIS.

Air Quality (AIR) – Comments related to air quality impacts (criteria pollutants), climate change, and emission of greenhouse gases by the Project; comments related to meteorology; comments related to renewable energy standards.

- **AIR 1**: Air quality impacts (criteria pollutants) and greenhouse gases resulting from construction and operation of the Project, and how impacts will be calculated and mitigated.
- **AIR 2**: Impacts to meteorology (at the meso-scale and micro-scale) resulting from the Project.
- **AIR 3**: Impacts related to climate change should be identified and analyzed.

Alternatives (ALT) – References to any alternative that could be evaluated through the NEPA/HEPA process, including comments on the range of alternatives to be considered.

- **ALT 1**: Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- **ALT 2**: An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- **ALT 3**: The alternatives analysis should include a reasonable range of alternatives, and should describe how alternatives were developed and also how they were eliminated from further analysis.

Cultural Resources (CUL) – Concerns over impacts to cultural and archaeological resources; concerns over impacts to Native Hawaiian access to land.

- **CUL 1**: Protection of Native Hawaiian cultural sites and burial grounds, and preservation of culturally-significant lands.
- **CUL 2**: Native Hawaiian land access and gathering rights being restricted as a result of the Project.
- **CUL 3**: Proper consultation is conducted between the USFWS and Native Hawaiian people and mitigation measures are developed for potential impacts to cultural resources.

Data (DAT) – Data that were put forth for inclusion in the EIS, including reference materials and scientific papers that were attached to comment letters and emails.

- **DAT 1**: Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- **DAT 2**: Recommended visual simulations of the Project be included in the EIS.

Direct, Indirect, and Cumulative Impacts (DSC) – Comments related to any potential impact of the EIS alternatives that would have direct, indirect, or contribute to cumulative impacts to local communities, fish and wildlife, or the economy; identification of reasonably foreseeable future actions to be considered in the analysis of cumulative effects.

- **DSC 1**: Direct, indirect, and cumulative impacts to public health, visual resources, and socioeconomics for communities nearby.
- **DSC 2**: Direct, indirect, and cumulative impacts to aquatic and terrestrial ecosystems, habitat, native plants, wildlife, bat, and avian species.
- **DSC 3**: The EIS should utilize a clear methodology for analyzing direct, indirect, and cumulative impacts; proposed mitigation measures should be identified and analyzed; and past, present, and future actions should be analyzed as part of the cumulative impact analysis.
- **DSC 4**: Cumulative impacts associated with power generation of the Project when combined with other nearby wind farms, and whether the power being produced is more than is needed.

Environmental Justice (ENJ) – Issues pertaining to compliance with the Executive Order on Environmental Justice; comments related to the evaluation of environmental justice populations.

- **ENJ 1**: The EIS should address any disproportionate adverse impacts to minority and low-income populations, and should reflect coordination with those affected populations.

Public Health and Safety (HAS) – Comments related to potential health and safety-related impacts of the Project, including wind turbine syndrome, noise-caused health effects, blade throw, turbine collapse, shadow flicker, and fire.

- **HAS 1**: Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- **HAS 2**: Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.
- **HAS 3**: Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.

Natural and Man-Made Hazards (HAZ) – Concerns over how the Project will be impacted by natural disasters; comments related to hazardous materials that are associated with the construction and operation

of the Project.

- **HAZ 1**: The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- **HAZ 2**: Hazardous wastes, chemicals, and pesticides that will be produced or used by the Project, and how they will be stored, disposed of, and managed.

Land Use (LAN) – Concerns about potential changes to existing land uses; comments about current or future land uses; right-of-way issues; military land uses; agriculture.

- **LAN 1**: The existing condition of the land and land uses within the wind farm site.
- **LAN 2**: The status and value of agricultural lands within the wind farm site.
- **LAN 3**: Potential negative impacts to U.S. Army training facilities located adjacent to the wind farm site.
- **LAN 4**: Potential impacts to agriculture and how any impacts may be mitigated.

Mitigation (MIT) – Types of mitigation measures associated with the Project and the HCP for inclusion in the EIS.

- **MIT 1**: Would like to see mitigation measures included in the analysis to reduce impacts to biological resources such as ecosystems, habitat, native plants, wildlife, bird and avian species.
- **MIT 2**: Would like to see mitigation measures and BMPs related to water resources, including water quality, landscape irrigation, and stormwater management.
- **MIT 3**: Would like to see mitigation measures designed to minimize traffic impacts during construction.
- **MIT 4**: Would like to see mitigation measures constructed to use less hazardous materials during construction and operation.
- **MIT 5**: Suggested a specific mitigation measure for inclusion in the impact analysis in the EIS.

Noise (NOI) – Concerns over potential impacts related to noise during construction and operation of the Project.

- **NOI 1**: Noise from the wind turbines associated with construction and operation of the Project impacting sensitive receptors.

Proposed Project (PRO) – Comments related to the Project's purpose and need, or description of the Proposed Action; comments related to potential impacts during construction, operation, or decommissioning; specific criteria related to Project design, such as the number or location of turbines.

- **PRO 1**: The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- **PRO 2**: Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.

- **PRO 3**: Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.
- **PRO 4**: Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.

Recreation and Tourism (REC) – Concerns over impacts to recreation activities, including surfing, hiking, wildlife viewing opportunities; concerns over a potential loss in tourism to the area as a result of the Project.

- **REC 1**: Potential decreases in tourism to the area could occur as a result of the change to the visual landscape from the Project.

Regulatory (REG) – Comments related to the adherence to state and federal laws, including NEPA, HEPA, ESA; coordination with state and federal agencies and local governments; permitting and zoning requirements; compatibility with other adjacent land use plans.

- **REG 1**: Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- **REG 2**: The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.
- **REG 3**: The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.
- **REG 4**: Would like to see the development of a scientifically-supportable Habitat Conservation Plan (HCP), and a description of how the HCP will be implemented.

Socioeconomics (SOC) – Concerns over the economic viability of the Project; comments related to job creation and economic development; concern over impacts to local community stability and quality of life; comments about the community benefits package associated with the Project.

- **SOC 1**: Concerned about the details of the community benefits package.
- **SOC 2**: How the Project would affect homeowners' ability to install photovoltaic systems.
- **SOC 3**: Concern that the Project would impact the quality of life for nearby communities.
- **SOC 4**: How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.
- **SOC 5**: Concern that the Project would lower property values and make it harder for homeowners to sell homes that are in close proximity to the turbines.
- **SOC 6**: Short- and long-term socioeconomic impacts to the community resulting from the Project.

Transportation and Traffic (TRA) – Issues identified around potential construction delays or new access roads that could be needed for the Project.

- **TRA 1**: Short- and long-term traffic impacts to the community, and what mitigation measures could be used to decrease impacts during construction.

Vegetation and Wetlands (VEG) – Types, values, functions, and potential disturbances to of wetlands and waters of the U.S. within the wind farm site; comments related to populations of vegetative communities and potential disturbances; concerns over invasive species.

- **VEG 1**: Potential impacts to Native plant communities located within the wind farm site, and how any impacts would be mitigated.
- **VEG 2**: The EIS should include measures to monitor and control invasive plant species and noxious weeds.

Visual Resources (VIS) – Changes to the visual resources within and around the wind farm site.

- **VIS 1**: Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

Water Resources (WAT) – Comments associated with potential impacts to hydrology, water quality, floodplains, or groundwater.

- **WAT 1**: Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the EIS.

Wildlife (including Threatened and Endangered Species) (WIL) – Comments associated with potential disturbance of fish, avian, or other wildlife populations and/or their habitat.

- **WIL 1**: Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.
- **WIL 2**: Critical fish habitat within the wind farm site and potential impacts should be disclosed.
- **WIL 3**: Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

April 1, 2015 TTCES-4819-OUT-15-001

Lauren A
alohalaurenjoy@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Interested Stakeholder,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue topics and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- Potential decreases in tourism to the area could occur as a result of the change to the visual landscape from the Project.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

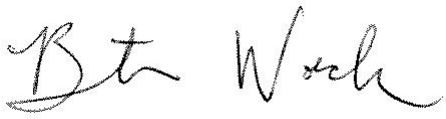
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **lauren a** <alohalaurenjoy@gmail.com>
Date: Wed, Dec 4, 2013 at 10:02 AM
Subject: no wind farm!
To: napuamakanihcp@fws.gov

HAS 3
REC 1
VIS 1
WIL 3

the wind farm is an eye soar, tourists complain, the windfarm is inefficient (the fire problems too) and also DANGEROUS to the community and to wildlife. Solar powered Germany has much to teach Hawaii.

April 1, 2015 TTCES-4819-OUT-15-002

Ann Allred
AllredA@hawaiireserves.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Allred,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

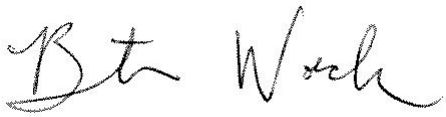
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Ann Allred** <AllredA@hawaiireserves.com>
Date: Mon, Dec 2, 2013 at 2:03 PM
Subject: Na Pua Makani HCP and DEIS
To: napuamakanihcp@fws.gov

Mr. Mehrhoff:

VIS 1
HAS 3

Our family is quite concerned about the proposed wind farm near Kahuku. The existing turbines are horrible enough to look at, and the fire that put them out of commission was frightening. These proposed ones, so close to neighborhoods, is not a good idea.

ACK

Please accept this note in opposition, and listen to the voices of our community.

Thank you.

Allred Family

Laie, Hawaii

April 1, 2015 TTCES-4819-OUT-15-003

Andrea Anixt
P.O. Box 646
Ka'a'awa, HI 96730
andreapeatmoss@yahoo.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Anixt,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submissions:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

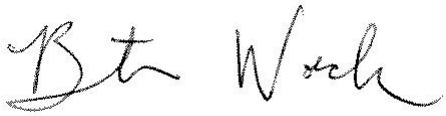
- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **andrea anixt** <andreapeatmoss@yahoo.com>
Date: Sat, Nov 16, 2013 at 9:19 AM
Subject: Na Pua MAKANI HCP DEIS Testimony
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

Andrea Anixt P.O. Box 646 Ka'a'awa, HI. 96730 808 237 8595
Aloha,

HAS 2
REG 2

I oppose more wind turbines closer than 1 mile to any inhabited area. The law in Hawaii is too lax so it is not something illegal to put them closer, but the experience in Europe I have had is that these can be blown far from origin and be destructive thereby.

HAZ 1

We are subject to hurricanes in Hawaii and it is better to be safe than sorry in that case alone. There is also the possibility of mechanical failure that could cause one of those huge blades to be where it should not be and at a very high velocity.

ALT 1
VIS 1

I also think they are not scenic and they are too visible in our scenic corridor along Kamehameha Highway in rural Windward Oahu. We depend on beauty for income thru tourism. Photovoltaic systems on rooftops are a much more aesthetic delivery system for green energy. They don't mar the landscape and take up open space land visually. Pouring a lot of money into Kahuku doesn't compensate for the damage done to the world class destination of Hawaii's beautiful Ko'olauloa and North Shore region. The scenic factor is of primary importance in this area now and into the future.

HAS 1

There are noise and flicker effects that we could all do without too while attending school nearby, or teaching there.

Regards,
Andrea Anixt

---------- Forwarded message ----------
From: **andrea anixt** <andreapeatmoss@yahoo.com>
Date: Wed, Dec 4, 2013 at 10:29 AM
Subject: Fw: TESTIMONY ON WIND TURBINES IN KAHUKUU DSEIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

On Wednesday, December 4, 2013 10:24 AM, "andreapeatmoss@yahoo.com" <andreapeatmoss@yahoo.com> wrote:

TESTIMONY ON WIND TURBINES IN KAHUKUU

Andrea Anixt Post Office Box 646 Ka'a'awa, HI. 96730 808 237 8595

Aloha,

HAS 2
HAS 3
DAT 1

I am against the 15 new 500' wind turbines in Kahuku's placement. They are the cause of @144 deaths and 1500 accidents in Europe plus 211 fires and 272 blade failures with blade pieces thrown into motion. This is documented at www.caithnesswindfarms.co.uk

HAZ 1
REG 2

Hawaii setback law is insufficient and should be changed, but in the meantime it is better to be safe than sorry. Even if the distance is legal, it is not morally or ethically acceptable to endanger people like this. The fact that Hawaii is subject to hurricanes and tsunami and earthquake alone is a red flag for this proximity to homes and schools. What are the chances that people are safe within the height alone of these towers.

PRO 1

The furthest one has become a projectile is 2 miles! The consensus in Europe is 1 mile should be the minimum from housing, etc . Why can't we learn from their experience?

HAS 1
WIL 1
DAT 1

Also, there was a recent article on the death of 600,000 bats from the wind turbines in the continental U.S. This wasn't even caused by the blades which bats can avoid by their natural 'sonar' – which won't protect other birds in Hawaii Nei. The bats died due to the "subtle changes in barometric pressure created by the rotating blades causing the bats' capillaries to burst, resulting in deadly internal hemorrhaging." So far we have not gotten into studies of this that I've found relating to people, but is it worth the chance? Again, better safe than sorry! (Honolulu Star-Advertiser –Dec.1,2013 for bat study).

WIL 1
WIL 3

This is a bad location in general for birds. The 1100 acre J. P. Campbell Wildlife Refuge is extremely close by also. There are rare and endangered species and migratory birds lured to the area who will meet their death by these blades. If you indeed are an agency to protect fish and wildlife, this should also be a reason to reject this location for yet more wind turbines. It will become the 'Bermuda Triangle' for birds and probably humans at some point.

ACK

The Ka'a'awa Community Association is taking up this matter in a week, I think it is likely that we will oppose it, but your deadline is too close to wait for the result.

Regards,

Andrea Anixt

---------- Forwarded message ----------
From: **andrea anixt** <andreapeatmoss@yahoo.com>
Date: Sat, Jan 18, 2014 at 3:40 PM
Subject: Na Pua Makani HCP and EIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

HAS 2

WIL 1
HAS 2

ALT 1

Aloha,

I have researched accidents involving wind turbines and do not want to have any wind turbines closer than 1 (one) mile away from houses, schools, or occupied structures in Hawaii at the minimum. It is not safe. This was also the consensus of a vote taken at the Ko'olauLoa Neighborhood Board January 9th, 2014.

There are plans placing them closer than this now by the developer. That also puts them on 3 sides of many Kahuku residents. This was not considered a health hazard by an 'expert' flown in by Champlin at the January 15 meeting in Kahuku. That does not discount that the wind turbines ARE an accident hazard. There are records of these accidents numbering over many thousands...and this does not include the deaths of hundreds of thousands of bats and birds. Unfortunately this project is very near an 1100 acre wildlife refuge where migratory and endangered birds are located also.

I support a large photovoltaic 'farm' of alternative energy instead on the land this company has leased. They are safe, not as view plane destructive or annoyingly noisy. The clean energy benefits are greater too.

Sincerely,
Andrea Claire Anixt
PO Box 646 Ka'a'awa, Hawaii 808 237 8595
Ka'a'awa Community Association Board of Directors member -
Disaster Preparedness team of KCA also
OahuMPO Citizen's Advisory Committee member
January 18, 2014
DEADLINE TO SUBMIT OF JANUARY 22, 2014 has been met, please acknowledge receipt of this testimony.

April 1, 2015 TTCES-4819-OUT-15-004

Leo Asuncion
Acting Director
Office of Planning
State of Hawaii
P.O. Box 2359
Honolulu, HI 96804

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Asuncion,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Potential impacts to agriculture and how any impacts may be mitigated.
- Suggested a specific mitigation measure for inclusion in the impact analysis in the EIS.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The Environmental Impact Statement should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines,

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Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

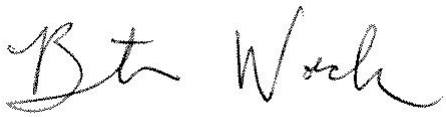
and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.

- Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

NEIL ABERCROMBIE
GOVERNOR

JESSE K. SOUKI
DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://hawaii.gov/dbedt/op/

Ref. No. P-14250

January 17, 2014

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Honolulu, Hawaii 96813

Subject: Na Pua Makani Wind Energy Facility
Environmental Impact Statement Preparation Notice
Kahuku, Oahu

Dear Mr. Cutbirth:

Thank you for the opportunity to review the subject Environmental Impact Statement Preparation Notice (EISPN) for a proposed wind power facility, meteorological tower, substation, maintenance building, and access road in Kahuku, Oahu.

According to the EISPN, a portion of the 685-acre parcel is privately owned and is classified as State Agricultural District. The remainder portion of the parcel is public land leased by the Department of Land and Natural Resources (DLNR). The project consists of a maximum of 45 megawatt wind energy facility to be generated by 15 proposed wind turbines with a peak height of 440 feet.

Due to the limited information provided, OP is unable to offer any detailed comments at this time. However, the following general comments are offered:

PRO 3

1. The EISPN did not provide adequate locational information such as Tax Map Key, address, or a clear location map. The document also lacked any reference maps for evaluating potential impacts, such as site plan/aerial maps, ownership, soils, land use, and zoning maps.

LAN 4
REG 3

2. The Draft EIS should provide an evaluation of the proposed project to address the criteria for permissible uses within the agricultural districts under Hawaii Revised Statutes (HRS) §205-4.5, including any mitigation measures to minimize impacts.

LAN 2

3. The Draft EIS should fully describe the agricultural and resource potential of the affected lands.

PRO 1

4. The Draft EIS should disclose the proximity of wind turbine facilities to residences in the area, including any associated impacts and mitigation measures.

MIT 5
REG 1

5. The Draft EIS should discuss any community consultations and any impact mitigation measures.

REG 3

6. The entire state is defined to be within the Coastal Zone Management Area, pursuant to HRS §205A-1 (definition of "coastal zone management area"). The Draft EIS should include a discussion of the proposed project's ability to meet the objectives and policies set forth in HRS §205A-2.

REG 3

7. The Draft EIS should include the Coastal Zone Management Act, HRS Chapter 205A, in a section that discusses the project's "Relationship to Land Use Plans, Policies, and Controls."

ACK

If you have any questions or comments, please contact Jenny Lee of our Land Use Division at 587-2805.

Sincerely,

Jesse K. Souki
Director

April 1, 2015 TTCES-4819-OUT-15-005

George Atta
Director, Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, HI 96813

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments, 2013/ELOG-2416(WA)

Dear Mr. Atta,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submission:

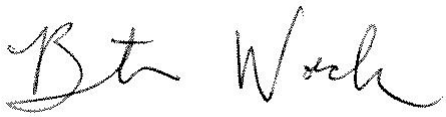
- The Project must be in compliance with all federal, state, and county regulations plans, and policies, including obtaining applicable federal, state, and county permits.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2013/ELOG-2416(WA)

January 21, 2013

Mike Cutbirth
Tetra Tech, Incorporated
737 Bishop Street, Suite 2340
Mauka Tower
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN)
for the Na Pua Makani Wind Farm Project
56-452 and 668 Kamehameha Highway - Kahuku
Tax Map Keys 5-6-6: 18 and 5-6-8: 6

This is in response to your December 20, 2013 letter, requesting comments for the proposed Na Pua Makani Wind Farm Project. We have reviewed the subject EISPN and have the following comments:

ACK

1. Development and design standards in the Land Use Ordinance Section 21-5.700(a)(b) and (c) shall apply to the proposed project.

REG 3

2. A Conditional Use Permit (CUP) No. 2013/CUP-23 approved on May 10, 2013, to establish an agribusiness activity (agricultural tour with zip line) on Parcel 18, as an accessory use to the existing crop production operations on the site. Approximately six acres of the 452.723-acre site will be used for the agribusiness activities, and 226 acres, or 50 percent of the lot area of the parcel will be dedicated for agricultural use for ten years. Compliance with Condition B of the approval should be explained.

REG 3

3. The Draft Environmental Impact Statement (DEIS) should address potential hazards to birds.

WIL 1

4. The DEIS should explain how wind energy facilities and appurtenances are compatible with agriculture uses and cause minimal impact on agricultural land pursuant to Chapter 205-4.5(a)(14) Hawaii Revised Statutes (HRS).

REG 3

5. The DEIS should address the policies and guidelines of the North Shore Sustainable Communities Plan, with respect to the following:

REG 3

(a) agriculture

(b) scenic resources.

VIS 1

The DEIS should also address how the windfarm will be situated in appropriate locations to minimize their impact on visual resources and what techniques will be used to visually blend the facilities and equipment into the natural environment.

REG 3

6. We note that the windfarm site is zoned AG-1 Restricted Agricultural District, AG-2 General Agricultual District, and R-5 Residential District. Wind machines are a permitted use with an approved CUP-minor. We further note that an approved CUP-minor for joint development of two or more adjacent lots would be required.

REG 3

7. As portions of the windfarm maybe on State Agricultural Lands, the DEIS should explain how the project is consistent with the requirements of Chapter 205, HRS.

Please contact William J. Ammons of our staff at 768-8025 if you have any questions.

Very truly yours,

for George I. Atta, FAICP
Director

GIA:nw

April 1, 2015 TTCES-4819-OUT-15-006

Ghialana Borges
ghialana@hawaii.edu

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Borges,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments and testimony from the public scoping meeting. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your comment submission and verbal testimony:

- Protection of Native Hawaiian cultural sites and burial grounds, and preservation of culturally-significant lands.
- Native Hawaiian land access and gathering rights being restricted as a result of the Project.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.

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Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

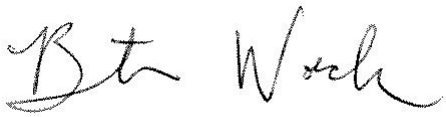
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the EIS.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Ghialana Borges** <ghialana@hawaii.edu>
Date: Thu, Dec 5, 2013 at 6:55 PM
Subject: NA PUA MAKANI HCP & DEIS
To: napuamakanihcp@fws.gov

Aloha,

CUL 1
HAS 1
PRO 1
WAT 1
WIL 3

I speak for my family and myself in strong opposition to the proposed additional windmills in our community of Kahuku. These wind turbines are 15,500' tall monstrosities and this project places them too close to our elementary, intermediate and high school, and our homes. Many independent studies have linked significant health effects to wind turbines in close proximity. Low frequency sound vibrations, noise, and shadow flicker of windmills all contribute to medical effects such as anxiety, epilepsy, cardiovascular effects, sleeping patterns, and even children's performance in school. Environmentally, sediment run-off is a potential issue, as well as the need to preserve Native Hawaiian cultural sites and burial grounds. Native birds and other animals are also a big concern for these extremely large turbines will negatively impact them.

ACK

All of these reasons should be enough for any person with sensibilities to respect the wishes of a community that opposes such a development project.

As a resident of Kahuku, I am against this wind project and I sincerely ask that Na Pua Makani HCP does not move forward with any development plans.

Mahalo,
Ghialana B.

TETRA TECH

April 1, 2015 TTCES-4819-OUT-15-007

Harry Brown
donnabrown@hawaii.rr.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Brown,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments and testimony from the public scoping meeting. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your comment submission and verbal testimony:

- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.
- The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

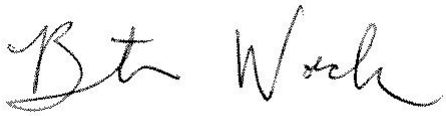
- Compliance with both the NEPA and HEPA processes for public scoping and outreach that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- The construction and operation of the Project must be in compliance with all federal, state, and county regulations; Champlin must obtain applicable federal, state, and county permits.
- How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Harry** <harrybrown@hawaii.rr.com>
Date: Wed, Dec 4, 2013 at 8:27 AM
Subject: Na Pua Makani HCP and DEIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

Aloha,

ACK

I would like to inform you of my total opposition to your windmill project that you are planning to do in our community of Kahuku (Malaekahana Windmill project).

HAS 1
HAS 2
SOC 4
VIS 1

While there are many important and pertinent reasons (such as health and safety, and financial gain and benefits for your company, with no financial relief for us, while our electric bill continues to rise despite the existing windmill that is in our community), my family and I, as well as many of my neighbors) are AGAINST having an ugly giant eyesore of a windmill being erected in our "back yard".

ACK

You can contact me via my cell phone (384-5678) should you have any questions or further clarifications. Do not respond to my email, as I am not able to receive any email due to an unresolved email problem, however, you can email me at my wife's email, which is donnabrown@hawaii.rr.com

Thank you very much,
Harry Brown
Sent from my iPad

April 1, 2015 TTCES-4819-OUT-15-008

Rebecca Carlson
55-568 Naniloa Loop Apt 4A
Laie, HI 96762
beckbj@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Carlson,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Cumulative impacts associated with power generation of the Project when combined with other nearby wind farms, and whether the power being produced is more than is needed.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

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1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

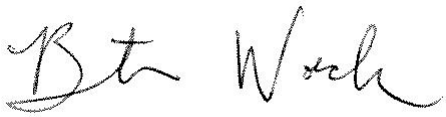
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Rebecca Carlson** <beckbj@gmail.com>
Date: Fri, Jan 17, 2014 at 10:40 PM
Subject: Na Pua Makani HCP and EIS
To: Napuamakanihcp@fws.gov

ACK

DAT 1
DSC 4
VIS 1
WIL 1

ALT 1

ACK

I am opposed to any additional wind farm development in Kahuku.

Wind farms are not a good energy solution for our area. They disrupt the natural beauty of our North Shore. They are also hazardous to our native Hawaiian hoary bats, who are being killed in disturbing numbers by the windmills that are already installed. Furthermore, windmills rely on a very unpredictable energy source, the wind! They can only operate at certain wind speeds. Too slow, no power. Too fast, they have to be shut down to avoid damaging the motors. Considering the entire picture of construction, maintenance, and eventual failure and disposal of electric power generating windmills, they are not reducing our carbon footprint. Please see this article from Denmark, perhaps the world capitol of windmills, about the problems with electrical wind farms:
http://www.thedutcheye.com/opinions/environment/why-windmills-aren-t-a-good-energy-solution.html

Instead of wind, we should be working to develop solar energy solutions. We have very good sun at this latitude, solar farms have a low profile and will not disturb the skyline, and they do not have large moving parts that pose hazard to wildlife.

Once again, I oppose wind farm development in Kahuku.

Thank you,

Rebecca J. Carlson
808-232-2329
55-568 Naniloa Loop Apt. 4A
Laie, HI 96762
beckbj@gmail.com

--
Rebecca J. Carlson

beckbj@gmail.com
http://rebeccajcarlson.blogspot.com

TETRA TECH

April 1, 2015 TTCES-4819-OUT-15-009

Aaron Mosiah Curtis
aaron.curtis@byuh.edu

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Curtis,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.
- Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.
- How the Project would affect homeowners' ability to install photovoltaic systems.
- How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.

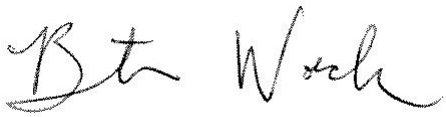
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Aaron Mosiah Curtis** <aaron.curtis@byuh.edu>
Date: Tue, Jan 21, 2014 at 9:42 PM
Subject: Na Pua Makani HCP and EIS
To: Napuamakanihcp@fws.gov

ACK

I am writing to express my concern and opposition regarding the current proposal for the Na Pua Makani windfarm in Kahuku.

In brief my concerns include the following:

WIL 1

- Insufficient controls have been proposed to mitigate the harmful effects of wind turbines on the dwindling native species such as the Hawaiian hoary bat.

SOC 2

- It is unclear how this project will affect homeowners' ability to install PV systems such as solar installations.

PRO 2

- There is insufficient evidence that the current power grid servicing the Koolauloa region would be able to provide the maximum benefit to regional residents. In other words, because of limitations to the powergrid in this region, the Koolauloa residents would bear much of the cost of this project, but not receive most of the benefits.

PRO 4

- Because of the economic and legal transfers of assets and development agreements among LLCs throughout the development of this project proposal, it is difficult for us community members to understand the full scope of what is being proposed.

SOC 4

- There is insufficient evidence that this project will actually reduce the costs of electricity to HECO customers.

Mahalo,

Aaron Curtis

April 1, 2015 TTCES-4819-OUT-15-010

Henry Curtis
Executive Director, Life of the Land
P.O. Box 37158
Honolulu, HI 96837
henry.lifeoftheland@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Curtis,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments and testimony from the public scoping meeting. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal and verbal testimony:

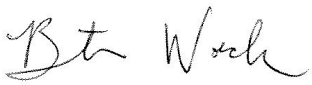
- Air quality impacts (criteria pollutants) and greenhouse gases resulting from construction and operation of the Project, and how impacts will be calculated and mitigated.
- Impacts related to climate change should be identified and analyzed.
- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- The alternatives analysis should include a reasonable range of alternatives, and should describe how alternatives were developed and also how they were eliminated from further analysis.
- Native Hawaiian land access and gathering rights being restricted as a result of the Project.

- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Recommended visual simulations of the Project be included in the EIS.
- The EIS should utilize a clear methodology for analyzing direct, indirect, and cumulative impacts; proposed mitigation measures should be identified and analyzed; and past, present, and future actions should be analyzed as part of the cumulative impact analysis.
- Hazardous wastes, chemicals, and pesticides that will be produced or used by the Project, and how they will be stored, disposed of, and managed.
- Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.
- Concerned about the details of the community benefits package.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

LIFE OF THE LAND
P.O. Box 37158, Honolulu, Hawai`i 96837-0158
Phone: 927-0709; E: henry.lifeoftheland@gmail.com

January 22, 2014

Mike Cutbirth
Champlin Hawaii Wind Holdings, LLC
<contact@champlinwind.com>

William Aila
Department of Land and Natural Resources
<william.j.aila@hawaii.gov>

Brita Woeck
Tetra Tech, Inc.
<Brita.Woeck@tetratech.com>

Loyal Mehrhoff or Aaron Nadig,
U.S. Fish and Wildlife Service
<NaPuaMakanihcp@fws.gov>

Re: Na Pua Makani Wind Project (EISPN)

ACK

Life of the Land herein submits scoping questions for the Na Pua Makani Wind Project Environmental Impact Statement Preparation Notice (EISPN)

DAT 1

1. "Figure 1. Napua Makani Project Vicinity Map" please provide one map that shows the existing and planned wind farms as well as the existing and planned residential and commercial developments including Kahuku, Malaekahana, Sunset, Haleiwa and Turtle Bay.

DAT 1
PRO 3

2. Please provide a map showing planned roads and planned turbine sites.

DAT 1

3. Please show on one color-coded map the rough area inhabited by the ‘a’o, ōpe‘ape‘a, ‘alae ke’oke’o, ‘alae ‘ula, ae’o and pueo.

ACK	4. Please provide details about how Champlin has dealt with endangered and threatened species, Incidental Take Permits and Incidental Take Licenses on its other projects, both in the U.S. and elsewhere.
PRO 2	5. What will be the capacity factor of the wind farm?
SOC 1	6. The previous developer made certain concessions to the community. Please list the ones you are aware of and specify whether you plan to adhere to each one.
HAZ 2	7. If the facility is built what pesticides (herbicides, insecticides, nemacides) will you use on a regular or irregular basis and in what quantity?
AIR 2	8. As wind farms are being to proliferate there has been some scientific analysis of impacts that were often overlooked in earlier installations. Wind farms affect local Mesoscale and Microscale meteorology. Have you calculated the impacts? If so, what are they? If not, why not?
AIR 3	9. Will the wind farm act as a heat source or a heat sink? Have you calculated the impacts? What impact will that have on the local environment?
VIS 1 DAT 2	10. How many homes (or what percentage of homes) will be able to see blinking red lights when the residents are in their homes?
PRO 3	11. What will be the upstream and downstream wake patterns?
PRO 3	12. How big will the holes be that will hold the turbine platforms?
PRO 3	13. How much material (type and weight) will need to go into each hole to support the turbine?
AIR 1	14. What is the amount of greenhouse gases released in making and then shipping the turbine base support?
AIR 1	15. Wind farms that replace fossil fuel facility result in less greenhouse gas emissions per kWh of electricity produced. The offsets are the greenhouse gases emitted during construction of the turbine, the grading and building of the roads AND the design and filing in of the hole that is used to support the turbine. What is the rough amount of greenhouse gases emitted in each phase (measured in total and per kWh of projected electricity that will be produced)?
PRO 2	16. Each turbine will, over its lifetime, produce how many kilowatt-hours of electricity?
AIR 1	17. If the above questions can't be answered, then how can the greenhouse gas emission savings are calculated?

PRO 2

18. What will be the marginal cost of the wind with and without considering the ancillary services (spinning reserves etc.) needed to incorporate the wind energy into the grid?

SOC 1

19. What is the cost of the community benefits package as a percentage of the total construction cost?

SOC 1

20. What is the cost of the community benefits package as a percentage of the anticipated annual revenue generated?

CUL 2

21. What restrictions will be placed on Native Hawaiian access?

ALT 2

22. Could the turbines be built further away from residential areas? Please detail all of Champlin's efforts to evaluate this possibility.

ALT 3

23. What options did Champlin consider in designation the No Build Alternative?

ACK

24. When did Champlin become involved with this Project?

25. When did Champlin first become involved in Hawai'i projects?

WIL 1
WIL 3

26. How has the applicant dealt with the natural annual variability of bird and wildlife habitat?

DSC 3

27. To what extent has the developer analyzed predictive and risk- assessment models of potential, cumulative impacts that include full season and multi-year pre-siting studies?

ACK

28. Please provide a Subtransmission map showing the connection between the First Wind facility and the HECO grid to the Weed Circle and Wahiawa.

PRO 3

29. Please provide a Subtransmission map showing the connection between your proposed site and Kaneohe.

PRO 3

30. Please detail at what point or under what conditions the Subtransmission system will need to be increased, either with another Subtransmission line, or a transmission line. Please cite all documents and provide web base locations?

SOC 1

31. What percentage of the community benefits package will be local to Kahuku?

Mahalo

Henry Curtis
Executive Director

April 1, 2015 TTCES-4819-OUT-15-011

Maria Feagai
maria.feagai@byuh.edu

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Feagai,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.
- Potential decreases in tourism to the area could occur as a result of the change to the visual landscape from the Project.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

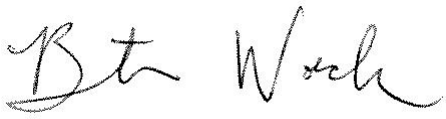
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Maria Feagai** <maria.feagai@byuh.edu>
Date: Tue, Dec 3, 2013 at 9:17 AM
Subject: I OBJECT to the New proposed wind farm in Kahuku
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

Aloha,

ACK

I'm writing to voice my objection to the proposal of the plans for another wind farm to be built in Kahuku. I am opposed to this project for many reasons.

REC 1
VIS 1

As it is, the existing wind farms are an eye sore. It breaks my heart to see how these have marred our beautiful landscape through Kahuku and Waimea. If tourism is our #1 source of income, why are we scaring the land? Perhaps they work where there are wide expanses of ranch land, but on a small island, we do not have that luxury.

HAS 1
HAS 2

Our children attend Kahuku High School, which will be in unacceptable close proximity to the huge windmills and we still do not know what the long term effects of these monstrous machines will be.

WIL 3

I am concerned about the ecosystem and the effects it has on our wildlife. I do not feel that enough has been done to study the impact on our plants and animals. We need to protect the aina from further destruction.

ACK

I would be opposed to the wind farms even if we had something to gain monetarily by having them here. Those that will benefit from the profits do not have to live with them surrounded by all sides.

ACK

The north shore of Oahu has been the so-called "country" of our island. We have been bullied enough by big developers and politicians. Please DO NOT allow this to go forward. I understand the need for alternate energy, but do not feel that this is the answer.

Thank you for your time and consideration in this matter. Have a wonderful day.

Mahalo,

Maria F. Feagai

April 1, 2015 TTCES-4819-OUT-15-012

Kent Fonoimoana
PO Box 122
Laie, HI 96762
kent@trisland.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Fonoimoana,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments and testimonies from both of the public scoping meetings. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittals and verbal testimony:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Recommended visual simulations of the Project be included in the EIS.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

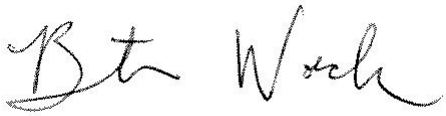
- The EIS should utilize a clear methodology for analyzing direct, indirect, and cumulative impacts; proposed mitigation measures should be identified and analyzed; and past, present, and future actions should be analyzed as part of the cumulative impact analysis.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.
- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- Noise from the wind turbines associated with construction and operation of the Project impacting sensitive receptors.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.
- Potential decreases in tourism to the area could occur as a result of the change to the visual landscape from the Project.
- Compliance with both the NEPA and HEPA processes for public scoping and outreach that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.
- How the Project would affect homeowners' ability to install photovoltaic systems.
- Concern that the Project would impact the quality of life for nearby communities.
- Short- and long-term socioeconomic impacts to the community resulting from the Project should be analyzed.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the EIS.

- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Kent Fonoimoana-TRIsland** <kent@trisland.com>
Date: Mon, Dec 2, 2013 at 1:59 PM
Subject: Na Pua Makani HCP DEIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

To whom it may concern,

ACK

I am submitting comments in strong opposition to the wind farm that is proposed for properties located at Malaekahana and the Kahuku State Agriculture Park.
In 2011, as a member of Kahuku Community Association, I and my fellow board members took a position against the installation of any more industrial sized wind turbines in the Kahuku area. The community support for this position was and is overwhelming.
The reasoning for my position are as follows:

HAZ 1
HAS 2
PRO 1
REG 2

1- Current safety zones between these machines and occupied structures are woefully inadequate. Placing 500' tall machines with moving parts 1200' upwind from Kahuku schools and community creates an untenable safety hazard. It is not if, but when a major hurricane strikes Oahu and these machines are composed of 150' blades that are designed to be light and aerodynamic. Each of the blades on a single turbine weigh in excess of 14,000 lbs. and could become windblown debris that could impact human life. To date, not one wind turbine worldwide has been subjected to an 'Iniki type event. To surround Kahuku community with these machines will likely be a life ending disaster for some of us who live here.

HAS 1

2- There are independent studies that support adverse health impacts on humans who live close proximity to these machines. Sleeplessness caused by noise and vibration has detrimental impacts on folks already living in close proximity to windmills. Others across the nation and worldwide are suffering vertigo, headaches, irritability, and a host of other ailments that they attribute to large industrial windmills.

ACK

3- This proposed project will surround Kahuku community on three sides which is unacceptable as well as irresponsible.

ACK

4- The power delivered fluctuates greatly and there is a detrimental impact on privately owned electrical devices of nearby consumers.

WIL 1

5- There is a significant impact on avian and bat species. The EIS of the First Wind project failed to address all avian species as the impacts on 'Iwa or Frigate bird was not studied.

ALT 1
SOC 2

6- There are other alternatives available that will not impact private consumers. HECO has stated that Kahuku is at or beyond the saturation rate for renewable energy. The existing wind energy facility has usurped private consumer's options for photo-voltaic panel installation. According to HECO, should a homeowner desire to install PV, there may be a discriminatory fee involved for Kahuku consumers.

ACK

7- Kahuku community has done its share for Oahu and it's time for others to do the same.

8- The state has initiated a policy to commit to renewable energy yet the state lacks committment as the vast majority of state owned buildings lack PV panels or any other renewable energy source.

ALT 2

9- The federal government has committed to green energy yet they hypocritically prohibit the installation of wind mills in close proximity to the Kahuku Army training facility.

REC 1

10- Tourists and residents do not appreciate the industrialized look that these turbines create.

DSC 3

11- Installing these unsightly machines in close proximity to communities will have an adverse impact on future projects. Proper installation of wind turbines at appropriate sites may lessen legal challenges that may/will arise.

Mahalo,

Kent Fonoimoana
Board member - Kahuku Community Association
Board member - Ko'olauloa Neighborhood Board #28

April 1, 2015 TTCES-4819-OUT-15-013

Michael D. Formby
Director
Department of Transportation Services
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments, TP12/13-542880R

Dear Mr. Formby,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

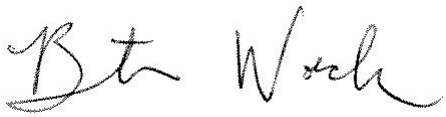
- Would like to see mitigation measures designed to minimize traffic impacts during construction.
- Compliance with both the NEPA and HEPA processes for public scoping and outreach, and that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- Short- and long-term traffic impacts to the community, and what mitigation measures could be used to decrease impacts during construction.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHAEL D. FORMBY
DIRECTOR

MARK N. GARRITY, AICP
DEPUTY DIRECTOR

TP12/13-542880R

January 22, 2014

SENT VIA EMAIL

Mr. Mike Cutbirth
NaPuaMakanihcp@fws.gov

Dear Mr. Cutbirth:

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project; Kahuku, Hawaii

In response to your memorandum dated December 20, 2013, we have the following comments:

TRA 1

1. The Draft Environmental Impact Statement (DEIS) should include a discussion of traffic impacts on the surrounding City roadways as a result of the project, including short-term impacts during construction, short and long term proposed mitigating measures, and complete streets concepts.

TRA 1
REG 1

2. The area Neighborhood Board, as well as the area residents, businesses, etc., should be kept apprised of the details of the proposed project and the impacts, particularly during construction, the project may have on the adjoining local street area network.

MIT 3

3. Any construction materials and equipment should be transferred to and from the project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets.

ACK

We reserve further comment pending submission of the DEIS.

ACK

Thank you for the opportunity to review this matter. Should you have any further questions, please contact Michael Murphy of my staff at 768-8359.

Very truly yours,

for Michael D. Formby
Director

April 1, 2015 TTCES-4819-OUT-15-014

Karen Gallagher
gallaghek007@hawaii.rr.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Gallagher,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, and personal photovoltaic systems, as part of the alternatives analysis.
- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Concern that the Project would impact the quality of life for nearby communities.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

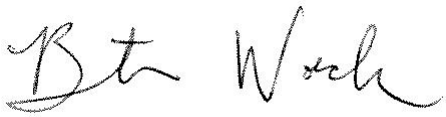
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Karen Gallagher** <gallaghek007@hawaii.rr.com>
Date: Tue, Jan 21, 2014 at 10:25 AM
Subject: Na pua Makani HCP and EIS
To: NaPuaMakanihcp@fws.gov

ACK

SOC 3
VIS 1
WIL 3

ACK

ALT 1
ALT 2

ACK

Aloha,
I am a resident of O'ahu who is very much for renewable energy.
However, I do not believe that this ought to be done in a way that destroys our beautiful landscapes,
kills our native species or diminishes the quality of life for our residents.
The Kahuku community has been used and abused enough already by the wind industry and has nothing to gain, only losses.
Placing the windmills way back in the Ko'olau Range would eliminate two of the above; placing solar panels in that area would
be even better; producing way more energy w/o the negative effects.
I am opposed to the current windmill plan.
Aloha,
Karen Gallagher

April 1, 2015 TTCES-4819-OUT-15-015

Fred Geibelt
fgeibelt@aol.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Geibelt,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

Tetra Tech, Inc.
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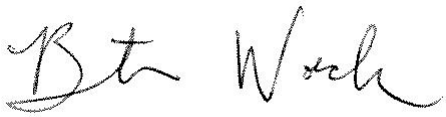
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: <fgeibelt@aol.com>
Date: Sat, Jan 18, 2014 at 4:33 PM
Subject: Naouamakani HCP & EIS
To: Napuamakanihcp@fws.gov

Dear Sirs:

ACK

Thank you very much for allowing feedback regarding the construction of a new windmill farm in Kahuku.

VIS 1

Being from Pupukea, as I round the corner of the Kam Hwy that faces toward Waimea Bay, I keep saying to myself how distracting these towers are when trying to soak in the natural beauty of the bay area. It is difficult to believe these behemoths are 400 ft tall. Before the first windmills arrived on Oahu, I don`t believe anyone realized how its appearance affects the natural beauty of our endangered pristine views of nature.

HAS 1
VIS 1

And, having spoken to some friends who live along Alapio Rd which faces the towers, they express their displeasure now that their view of Kaena Pt has been ruined. They can also hear the hum of these towers, too.

ALT 1

If you took the same area intended for these towers and built a solar panel field, you would probably produce the same or better in energy production and would not have to hear or see them.

ACK

Essentially, windmills are fine in theory. But they would be best practiced in a desert. Hawaii is known for natural beauty. Oahu has just about tipped the scales with its overbuilding. Let`s not push it over the edge.

ALT 1
PRO 4

Finally, what is the main point of windmills in Hawaii? Is it to save on energy costs? Is there a savings to the end consumer? I bet these things are very expensive to maintain. And, without outside subsides, are they economical at all? Or do we have them because of an objection to fossilized fuels? I guess no one wants to mention natural gas, but it is cheaper than renewables, it`s American, and it produces very low pollution.

ACK

So, I guess by now, you know that I would not be happy with more windmills. And, I`m sure it is one of those things where people say, "not in my back yard!." Forget these monstrocities.

Thank you for hearing me out - I hope.

Sincerely,

Fred Geibelt
Pupukea

April 1, 2015 TTCES-4819-OUT-15-016

Carter Griffin
58 Church St.
Westborough, MA 01581-1925
cartergrifin@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Interested Stakeholder,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue topics and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.

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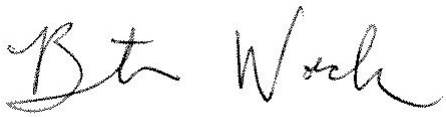
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Carter Griffin** <cartergrifin@gmail.com>
Date: Tue, Dec 3, 2013 at 9:52 AM
Subject: Na Pua Makani HCP and DEIS
To: napuamakanihcp@fws.gov

Aloha,

ACK

I would like to voice my opinion against the proposal to erect 15 500' tall towers and turbines at Malaekahana in close proximity to Kahuku schools and the Kahuku community. Please do not allow this project to move forward.

HAS 1

I live outside of Boston, MA, & for the last 4 years I have been visiting Friends Of Malaekahana campground for a yearly vacation. I will continue to visit the area yearly now. I have become friends with many Kahuku & the surrounding communities. Here in Massachusetts, we do have wind turbines in and around populated areas. The turbines DO cause health issues, continuous insomnia, headaches, psychological disturbances, dental injuries just to name a few. People in the recent past didn't realize this until the turbines are already up & running.

ALT 1

Additional turbines in Kahuku, especially in close proximity to any community will only be problematic. I understand the need to make the islands more self sustainable in power generation, but there has to be a better way to do it. I mean, look at the issues of the current turbines in Kahuku. Of the 4 years I've been I've only seen them active once and that was minimal.

ACK

Please take my concerns into consideration.

Mahalo,
Carter T. Griffin
58 Church St
Westborough, MA
01581-1925

April 1, 2015 TTCES-4819-OUT-15-017

Rolland Harvest
Assistant Chief
Honolulu Fire Department
City and County of Honolulu
636 South Street
Honolulu, HI 96813

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Harvest,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

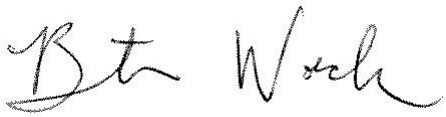
- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

December 30, 2013

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Mauka Tower
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

Subject: Environmental Impact Statement Preparation Notice
Na Pua Makani Wind Farm Project
Kahuku, Hawai'i

In response to a memorandum from Ms. Brita Woeck, dated December 20, 2013, regarding the above-mentioned subject, the Honolulu Fire Department (HFD) requires that the following be complied with:

REG 3

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (46 m) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; Uniform Fire Code [UFC]™, 2006 Edition, Section 18.2.3.2.2.)

REG 3

A fire department access road shall extend to within 50 ft (15 m) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; UFC™, 2006 Edition, Section 18.2.3.2.1.)

HAS 3
REG 3

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter

HAS 3
REG 3

REG 3

ACK

constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1; UFC™, 2006 Edition, Section 18.3.1, as amended.)

3. Submit civil drawings to the HFD for review and approval.

Should you have questions, please call Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151 or sbratakos@honolulu.gov.

Sincerely,

ROLLAND J. HARVEST
Assistant Chief

RJH/CN:bh

April 1, 2015 TTCES-4819-OUT-15-018

Larissa Hekau
hekaul@hotmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Hekau,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Concerned about the details of the community benefits package.
- Concern that the Project would impact the quality of life for nearby communities.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

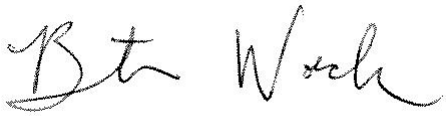
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Larissa Hekau** <hekaul@hotmail.com>
Date: Thu, Dec 5, 2013 at 3:35 PM
Subject: Na Pua Makani HCP and DEIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

Good Afternoon!

ACK

My name is Larissa and I am a resident of Kahuku. My children attend Kahuku Elementary and my husband is self employed in and around our community.

ALT 2
HAS 1
PRO 1
SOC 1
SOC 3
VIS 1
WIL 1

We are very disappointed you have chosen to install your wind turbines in our community and within close proximity to our lives. It seems very lazy/sloppy to plonk the turbines so near in everyone's view for your immediate benefit. Though we are for clean energy, measures should be taken to build the turbines much further inland (practically out of sight), or somewhere where it is not so close to a village and its schools. These massive turbines already have negative visual impact on our people. Your location is not suitable for any of us, the scale and appearance of one turbine is loathed and having 14 of the proposed and within close proximity to the schools and residents is outrageous. I fear for the community in regards to health issues that may arise, noise that we will have to bear because we are upwind. Even to deal with their revolving shadows as soon as the sun rises first thing in the morning would be devastating to wake up to. It wont feel like our tropical paradise with these turbines along our highway as we try to push for keeping our country clean, pristine and tranquil. We want our wildlife to be free to fly where they want and not have to dodge blades. Please don't try to make the excuse that it is benefiting our local area. Our cost of living is high. Many of us work two jobs trying to put food on the table. Your $10,000 per turbine a year is a slap in the face. The cost equivalents to a little more then what a BYUH student living off campus pays for a single twin bed in a room shared with other students per month. We understand there is a lot of money benefited in installing your turbines. We already sacrifice our community with the current turbines to help benefit HECO and our brothers and sisters on the island, but please don't think you can come and abuse us. We are unanimously against your wind turbines in our Kahuku community.

ACK

By the unspoken natural law of the universe, the goodwill you do to man, will reciprocate back to bless you.
\
With strong objection,

Larissa Hekau

April 1, 2015 TTCES-4819-OUT-15-019

Angela Huntemer
ahuntemer@aol.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Huntemer,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

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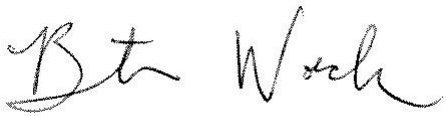
We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: <ahuntemer@aol.com>
Date: Wed, Dec 4, 2013 at 10:05 AM
Subject: Windmills on the North Shore
To: napuamakanihcp@fws.gov

WIL 1

WIL 3

Aloha,
I live a Turtle Bay and I oppose the installation of any more windmills up here.
As you know, this area is an important area for
1/ migratory birds (MBTA)
2/ Endangered waterbirds and bats
3/ native birds and unusual "blow ins".
The impact of the existing windmills in the Kahuku area and the wind farm that stretches from Haleiwa to Waimea is more than enough impact on these species.
No to more windmills.
Thank you, Angela Huntemer, M.Ed.

April 1, 2015 TTCES-4819-OUT-15-020

Choon James
56-1081 Kamehameha Highway
Kahuku, HI 96731
ChoonJamesHawaii@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Choon James,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittals:

- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Direct, indirect, and cumulative impacts to public health, visual resources, and socioeconomics for communities nearby
- Direct, indirect, and cumulative impacts to aquatic and terrestrial ecosystems, habitat, native plants, wildlife, bat, and avian species.
- The EIS should address any disproportionate adverse impacts to minority and low-income populations, and should reflect coordination with those affected populations.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect

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1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

community members who live within close proximity to the Project should be discussed and analyzed.

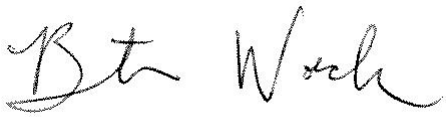
- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- Concern that the Project would impact the quality of life for nearby communities.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Choon James** <choonjamesstorage@gmail.com>
Date: Tue, Dec 3, 2013 at 1:50 PM
Subject: "Na Pua Makani HCP and DEIS" - WE STRONGLY OPPOSE MORE WIND TURBINES IN KAHUKU
To: napuamakanihcp@fws.gov

ACK

PLEASE DENY THIS PROJECT!

Loyal Mehrhoff, Field Supervisor,
U.S. Fish and Wildlife Service,
Pacific Islands Fish and Wildlife Office,
300 Ala Moana Boulevard, Room 3-122,
Honolulu, Hawaii 96850

REG 1

We're very concerned that due process, transparency has been sorely lacking in this project. People are very busy and cannot attend every meeting.

ACK

Corporations whose bottom line is PROFITS will come and go but the residents are the ones who bear the blunt of these long-term impacts and irreparable damages.

DSC 1
DSC 2
HAS 3

We're not against exploring alternative energy but there should be no sacred cows. Every project must take into serious consideration the impacts on human beings, the natural environment and social impacts. There are issues of "dirty electricity", noise, potential fire and malfunction on the human, natural and social environment that need to be studied.

ACK

A Project to erect 15 500' tall towers and turbines at Malaekahana in close proximity to Kahuku schools and the Kahuku community is a big deal to us. If this happens, the Kahuku Residential areas and farms will be surrounded on three sides by industrial sized wind mills.

HAS 1
PRO 1

Independent studies have linked wind turbines to health issues that impact humans if placed in close proximity to residential areas. The proposed wind farm will be 3 times closer to our schools and residences than the existing facility. It will also be upwind - which is significant.

ACK

Kahuku Community Association (KCA) has taken a position against any additional wind mills in our area, and yet the developer is quietly moving ahead against the wishes of the community.

Mahalo!

Choon James,
56-1081 Kam Hwy,
Kahuku, Hawaii, 96731

808 293 9111
Email: ChoonJamesHawaii@gmail.com

http://www.CountryTalkStory.com

---------- Forwarded message ----------
From: **Choon James** <choonjameshawaii@gmail.com>
Date: Wed, Jan 22, 2014 at 12:02 PM
Subject: STRONGLY OPPOSE : Na pua Makani HCP and EIS
To: NaPuaMakanihcp@fws.gov, Choon James <choonJamesHawaii@gmail.com>

STRONGLY OPPOSE : Na pua Makani HCP and EIS

Aloha.

ACK

Kahuku has two residential subdivisions of approximately 900 households, an elementary, intermediate, and high school. There are also acres of active agricultural farms as well as small businesses.

PRO 1

The overwhelming majority are against this wind turbine project. As you can see, the turbines are too close to homes, schools and farms.

ACK

Green Energy in concept is a remarkable idea.

DSC 1

However, it is imperative that you somberly include the cumulative negative impacts of wind turbines on physical and psychological health, valued view planes, environment and economic marginalization upon our area. When you do, the answer becomes very clear that this wind project is NOT SUITABLE in this area.

ACK

You must look beyond the sleek marketing from using beautiful Hawaiian names to Champlin hiring an outrageously biased "Harvard medical expert' to tell us that noise is not a disease, but only an annoyance.

ENJ 1
SOC 3

You must also note that these industrial projects are often heaved upon on poorer communities. Surely, there has to be equity in quality of life, whether one lives in Kahuku or Kahala.

DAT 1

Please also note the following links which should further adequately describe a common thread of concerns with such projects.

DAT 1

http://fairwindenergy.org/testimony.html

http://www.liverpoolecho.co.uk/news/liverpool-news/airports-object-wind-turbine-plans-6532548

ACK

We STRONGLY OPPOSE this project and request that it be decisively denied.

Mahalo,

Choon James,
56-1081 Kam Hwy
Kahuku Hawaii 96731

ChoonJamesHawaii@gmail.com

http://www.CountryTalkStory.com
Saturdays 5:00 pm Olelo TV 52

April 1, 2015 TTCES-4819-OUT-15-021

Mary Kamauoha
kanakatonk@yahoo.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Kamauoha,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- The status and value of agricultural lands within the wind farm site should be discussed and analyzed.
- Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.
- The construction and operation of the Project must be in compliance with all federal, state, and county regulations, plans, and policies; Champlin must obtain applicable federal, state, and county permits.
- Short- and long-term socioeconomic impacts to the community resulting from the Project.

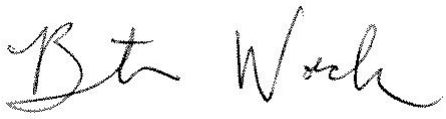
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **mary kamauoha** <kanakatonk@yahoo.com>
Date: Mon, Jan 20, 2014 at 10:25 PM
Subject: Na Pua Makani HCP and DEIS
To: "Napuamakanihcp@fws.gov" <Napuamakanihcp@fws.gov>
Cc: "Rep. Richard Lee Fale" <repfale@capitol.hawaii.gov>

REG 3

LAN 2

PRO 4

ACK

SOC 6

ACK

Gentlemen and Ladies

I am a concerned citizen of the Kawailoa ahupuaʻa district, neighbor to Koʻolauloa residents, some of whom rightfully oppose additional wind turbine construction expansion and operations above their homes and businesses. I am not an expert. Like you, I hope the experts will come forward and share their opinions of this proposed "taking" and impacting of natural land and air space for this proposed wind energy solution. I hope you also take into account the for-profit effort of these foreign (non-Hawaii) investors, and before a final decision, ensure any decision to lease agricultural land to generate wind energy is just and defensible. I am not an expert, but, very supportive of synergistic decisions, that when all options considered the decision the agreed solution is the best, with least possible, negative impacts to our ecosystem, health and economy. The investors must also be accountable to the community and government, in full compliance w/federal, state, Hawaiian, and community regulations and concerns, completing and presenting a sound and timely EIS what is the timeline??). Legislators must also seek expert advise, as well listen to all stakeholders, before making this critical decision. These are some of my questions and comments for the experts and for you:

1. What is the basis, the 232-acres of agricultural real estate, "not suitable for conventional farming practices...", and how was it acceptable? This language in the July 2012, DLNR 080D-110 document, unfairly favors WWW, LLC and itʻs subsidiariesʻ proposed wind project, before finalized EIS. All real estate can be cultivated by knowledgeable, hard-working, individual or group efforts, and the right crop or animal. The ahupuaʻa system of land cultivation and a generationally sustained ecosystem for itʻs citizens is evidenced by farmers who practice these principles. This valuable wisdom is dismissed by those who rely on western influences and their knowledge and experiences for decisions w/out seeking experts in all areas.
2. Where is HECOʻs committed support of the proposed 45MW+ wind energy solution? HECO representatives admitted no business liaisons with commercial "solar" companies, for various reasons, but notably, to consume commercial solar energy, for reserve, conversion, storage and/or disposal! HECO admitted in a news special, the solar companies out-sold HECOs capacity or readiness to consume, regenerate and disperse the new alternative energy as the infrastructure to do so is not yet funded/available. Is there an unfair advantage for the wind energy companies versus solar company market where alternate energy solutions concerned? And, if HECOʻs infrastructure is not ready, then Hawaii will be paying for wind energy that we cannot use. There needs be accountability and transparency in this effort to harness and convert useable energy.
3. Recommend seek the opinions of experts on all sides, before making decisions for citizens.
4. Recommend a true cost/benefit analysis that weighs impacts and effects of government, investors, residents, farmers, landowners, small businesses, and ALL stakeholders, across the state who will be impacted by this decision forever; positively or negatively.

Mahalo for allowing me to give my concerns. I look forward to watching the decision process. Hawaiiʻs climate and location make us unique and alternative energy advantageous. Hawaii also has a finite ecosystem to protect and nurture for generations. We need proceed thoughtfully and responsibly with implementing new solutions, to ensure sustainability and impacts to future peoples of Hawaii.

Aloha
M Kamauoha

April 1, 2015 TTCES-4819-OUT-15-022

Merania Kekaula
paitonu@msn.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Kekaula,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Hazardous wastes, chemicals, and pesticides that will be produced or used by the Project, and how they will be stored, disposed of, and managed.
- Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.
- Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

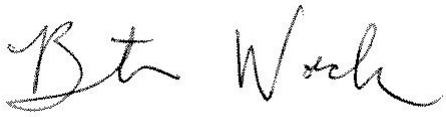
- How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Merania Kekaula** <paitonu@msn.com>
Date: Wed, Jan 22, 2014 at 7:39 PM
Subject: "Napua Makani HCP and IES"
To: "NaPuaMakanihcp@fws.gov" <napuamakanihcp@fws.gov>

ACK

SOC 4

PRO 2

PRO 4

ACK

HAZ 2

ACK

HAS 1

I am opposed to the building of windmills on and around Kahuku and in close proximity to the High School and Elementary School for the following reasons:
1. The windmills haven't reduced our electricity bills; in fact our electric bills continue to soar.
2. From observation, the windmill blades don't turn enough rpm to warrant enough electricity being generated. How much electricity actually goes on the grid? I want to know how much electricity goes to HECO and of that amount, how much stays in Kahuku and/or is banked out of state?
3. Is the company getting tax payer dollars from the Federal government? If so this company is ripping us off more than 2X, (go and build your windmills in the county and state where you live!)
4. Are these federally funded monies available to everyone or just the lobbyists of the party in power?
a. A better word for this type of dealing is a "shell game."
b. Who is going to remove the concrete and whatever else is under the windmills, (the movie I saw indicated chemicals underneath the concrete foundations), windmill blades etc.
5. I'm concerned for the community at large; your *conquer and divide* tactics are disgraceful and we're sick and tired of your pitting neighbor against neighbor.
6. You insult us by coming back to Kahuku to build more windmills, (gth somewhere else!)... then you try to "stick your finger in our eyes," by wanting to build these behemoths close to our children's schools without knowing the health risks? Here's a big fat finger in all your eyes - gth out of Hawaii and go play your ponzi schemes back in your own states ... I also wonder who the other fat devils are who are making money "hand over fist," from these turbine windmill ponzi schemes!
Kahuku has too many wind turbines already! NO MORE WIND TURBINES!!
Merania Kekaula

April 1, 2015 TTCES-4819-OUT-15-023

Ernest Lau
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Lau,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

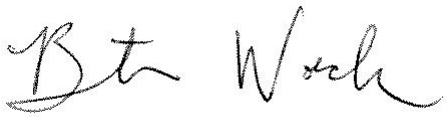
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

February 4, 2014

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ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

Subject: The Letter Dated December 20, 2013 on the Environmental Impact Statement Preparation Notice for the Na Pua Makani Wind Farm Project in Kahuku – Tax Map Key: 5-6-006:018, 5-6-008:008

Thank you for the opportunity to comment on the proposed wind farm project.

REG 3

The project is in the vicinity of Board of Water Supply (BWS) Kahuku wells, transmission mains and 228' reservoir. We have future plans to install a second reservoir at the site and will require sufficient setback around the entire facility. The construction drawings should be submitted to BWS for review.

HAS 3
REG 3

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

for ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

April 1, 2015 TTCES-4819-OUT-15-024

Susan A. Lebo, PhD
Oahu Lead Archaeologist
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments, Log No. 2013.7101, Doc No. 1402NN16

Dear Ms. Lebo,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issue was raised in your submittal:

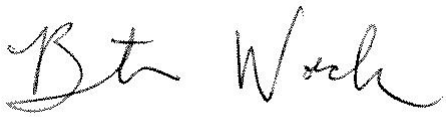
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. This topic will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ESTHER KIA`AINA
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

February 20, 2014

Brita Woeck
Tetra Tech, Inc.
737 Bishop St. Suite 2340
Honolulu, Hawaii 96813-3484

LOG NO: 2013.7101
DOC NO: 1402NN16
Archaeology

Dear Ms. Woeck,

SUBJECT: **Chapter 6E-42 Historic Preservation Review –**
Environmental Impact Statement Preparation Notice for Na Pua Makani Wind Farm
Kahuku Ahupuaʻa, Koʻolauloa District, Island of Oʻahu
TMK: (1) 5-6-008:006, 5-6-006:018

ACK

Thank you for the opportunity to review and comment of the EIS being prepared for the Na Pua Makani Wind Farm. Our office received your letter on December 20, 2013. According to the information you provided, Chaplin Hawaii Wind Holdings proposes to construct up to 15 turbines and supporting infrastructure anticipated to include met towers, access roads, wind turbine assembly lay down areas, overhead and underground transmission and collector lines, an on-site substation, and operation and maintenance buildings. The proposed EIS will analyze the potential impacts of the proposed wind farm. The project area lies on 685 acres of land in Kahuku, a portion of which is state land.

A joint Federal and State Habitat Conservation Plan will be prepared in anticipation of project proponents seeking an Incidental Take Permit from the U.S. Fish and Wildlife Service and an Incidental Take License from the State Department of Land and Natural Resources Division of Forestry and Wildlife. In addition, federal funding may be pursued as the project evolves. For these reasons, the proposed project may be a federal undertaking that may also require historic preservation review under Section 106 under the National Historic Preservation Act. Our office recommends that you conduct Section 106 consultation concurrently with Hawaii Revised Statutes (HRS) 6E-42.

Our records indicate that in 1992 Cultural Survey Hawaii (CSH) surveyed a portion of the proposed project area (Stride, Craddock and Hammatt 2003). Although sites were encountered, they were not described. This study predates the current regulations and does not conform with Hawaii Administrative Rules (HAR) §13-276. In 2009, International Archaeological Research Institute, Inc. conducted archival research for TMK: (1) 5-6-008:006 (Morrison 2009) in preparation for the Oahu Wind Partners wind farm (also called Na Pua Makani); no field work was conducted.

REG 3

SHPD recommends that an archaeological inventory survey (AIS) be conducted of the entire proposed project area in order to identify any historic properties and, if necessary, to determine an appropriate course of action. We look forward to the opportunity to review and accept an AIS report that meets the standards of HAR §13-276 and *The Secretary of the Interior's Standards for Archaeological Documentation*, which shall include information on the presence, appearance, significance, integrity and boundaries of each historic property sufficient to permit an evaluation of its significance. The identification effort should include consultation with Native Hawaiian Organizations (NHOs) pursuant to 36 CFR Part 800.4(a)(4). For the level of effort identified in 36 CFR Part 800.4(b)(1), we recommend the field survey include identification of areas of ground disturbance, and background research for areas of potential visual impacts, in addition to consultation with NHOs. We look forward to the opportunity to consult on the significance evaluations [36 CFR Part 800.4(c)], assessment of project effects [36 CFR Part 800.5] and, if necessary, resolution of adverse effects [36 CFR Part 800.6] for any historic properties located

REG 3

within the APE. Also, 36 CFR Part 800 mandates that NHOs be provided the opportunity to consult on each of these review phases.

ACK

Please contact Deona Naboa at (808) 692-8015 or at Deona.Naboa@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD
Oahu Lead Archaeologist

April 1, 2015 TTCES-4819-OUT-15-025

Dee Dee Letts
P.O. Box 524
Kaaawa, HI 96730
Ddletts@lava.net

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Letts,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- The existing condition of the land and land uses within the wind farm site should be addressed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

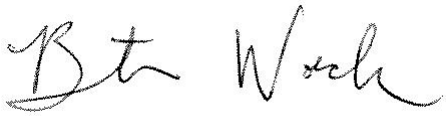
- Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Dorothy Letts** <ddletts@lava.net>
Date: Fri, Dec 6, 2013 at 6:17 AM
Subject: Napua makani
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

PRO 1
PRO 3
REG 1
WIL 1
LAN 1

This email is regarding the proposed napua makani wind farm. I am opposed to the project for the following reasons that have not been adequately addressed. One the impacts on surrounding residences and community institutions. There have been issues regarding this issue with the current wind farm and they relocated some of their windmills in the community consultation phase for this reason. Two lack on a scientifically established and adopted buffer zone between these use and residential, institutional, and commercial uses. Three Impacts on the bird sanctuary. Fourth this developer has not adequately consulted with the Neighborhood Board or the impacted community.

Dee Dee Letts
Kaaawa resident
30 year member of the Koolauloa Neighborhood Board
PO Box 524
Kaaawa, Hi 96730
Ddletts@lava.net
Sent from my iPad

April 1, 2015 TTCES-4819-OUT-15-026

Wendell Lum
Delivered in-person (no contact information available)

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Lum,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue topics. Summary response statements were then created to address the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to the summary responses.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.

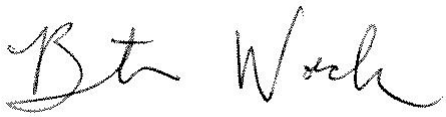
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to voice your concerns about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

Subject: Na Pua Makani HCP and EIS

To: Mike Cutbirth c/o Tetra Tech @ 737 Bishop Street, Suite 2340, Honolulu, Hi 96813

ACK

According to HB 1726 HD1 SD2 CD1 RELATING TO ENERGY Act 151 (06/25/12

Amends Act 253, session laws of 2007, establishing the energy systems development special fund to develop an integrated approach and portfolio management of renewable energy project that will reduce Hawai'i dependence on fossil fuel and imported oil and other imported energy resources and move Hawai'i toward energy self sufficiency by extending the sunset date. – HB1726 CD1

Environmental impact of wind power

copied portion of Page 6 of 10

From Wikipedia, the free encyclopedia

Noise annoyance

DAT 1

In 2011, the British Acoustics Bulletin published the 10th independent review of the evidence on wind farms causing annoyance and ill health in people. And for the 10th time it has emphasised that "annoyance has far more to do with social and psychological factors in those complaining than any direct effect from sound or inaudible infrasound emanating from wind turbines". Two factors repeatedly came up. "The first is being able to see wind turbines, which increases annoyance particularly in those who dislike or fear them. The second factor is whether people derive income from hosting turbines, which miraculously appears to be a highly effective antidote to feeling of annoyance and symptoms".

DAT 1

A 2009 expert panel review, sponsored by the Canadian Wind Energy Association and American Wind Energy Association, delved into the possible adverse health effects of those living close to wind turbines. Their 85-page report concluded that wind turbines do not directly make people ill. The study did allow that some people could experience stress or irritation caused by the swishing sounds wind turbines produce. "A small minority of those exposed report annoyance and stress associated with noise perception…"{however} "Annoyance is not a disease." The study group pointed out that similar irritations are produced by local and highway vehicles, as well as from industrial operations and aircraft.

The 2009 study panel members included: Robert Dobie, a doctor and clinical professor at the University of Texas, Geoff Leventhall, a noise vibration and acoustics expert in the United Kingdom, Bo Sondergaard, with Danish Electronics Light and Acoustics, Michael Seilo, a professor of audiology at Western Washington University, and Robert McCunney, a biological engineering scientist at the Massachusetts Institute of Technology. McCunney contested statements that infrasounds from wind turbines could Create vibrations causing ill health: "It doesn't really have much credence, at least based on the literature out there" he stated The academic and medical experts who conducted the study stated that they reached their conclusions independent of their sponsors. "We

DAT 1

were not told to find anything," said panel expert David Colby, a public health officer in Chatham-Kent and a Professor of Medicine at the University of Western Ontario, "It was completely open ended."

Eighteen research reviews about wind turbines and health, published since 2003, all showed that there was very little evidence that wind turbines were harmful in any direct way. Simon Chapman, professor of public health at Sydney University said that if wind farms did genuinely make people ill there would by now a large body of medical literature that would preclude putting them near populated areas. But this is not the case. Sickness being attributed to wind turbines is more likely to be caused by people getting alarmed at the health warnings circulated by activists. Complaints of illness were far more prevalent in communities targeted by anti-wind groups. Chapman's report concludes "that illnesses being blamed on windfarms are more than likely caused by the psychological effect of suggestions that the turbines make people ill, rather that by the turbines themselves."

Nina Pierpont, a New York pediatrician and wife of an anti-wind energy activist, states that noise can be an important disadvantage of wind turbines, especially when building the wind turbines very close to urban environments. The controversy around Pierpont's work centers around her statements made in a self-published non-peer-reviewed book that ultra-low frequency sounds affect human health, which are based on a very small sample of self-selected subjects with no control group for comparison. She asserts that wind turbines affect the mood of people and may cause physiological problems such as insomnia, headaches, tinnitus, vertigo, vertigo and nausea. Simon Chapman has said that "wind turbine syndrome" is not recognized by any database. He says that the term appears to be spread by anti-wind farm activist groups. The 2009 expert panel review found that "wind turbine syndrome" symptoms are the same as those seen in the general population due to stresses of daily life, and include headaches, insomnia, anxiety, and dizziness.

A 2007 report by the U.S. National Research Council noted that noise produced by wind turbines is generally not a major concern for humans beyond a half-mile or so. Low-frequency vibration and its effects on humans are not well understood and sensitivity to such vibration resulting from wind-turbine noise is highly variable among humans. There are opposing views on this subject, and more research needs to be done on the effects of low-frequency noise on humans.

In a 2009 report about "Rural Wind Farms", a Standing Committee of the Parliament of New South Wales, Australia, recommended a minimum setback of two kilometers between wind turbines and neighbouring houses (which can be waived by the affected neighbor) as a precautionary approach. In July 2010, Australia's National Health and Medical Research Council reported that "there is no published scientific evidence to support adverse effects of wind turbines would require a noise study.

In Ontario, Canada, the Ministry of the Environment created noise guidelines to limit wind turbine noise levels 30 metres away from a dwelling or camp site to 40

DAT 1

dB(A). These regulations also set a minimum distance of 550 metres (1800 feet) for a group of up to five relatively quiet {102 dB(A)} turbines within a 3-kilometre (1.9 mi) radius, rising to 1,500 metres (4,900 ft) for a group of 11 to 25 noisier (106-107 dB(A)) turbines. Larger facilities and noisier turbines would require a noise study.

A 2008 guest editorial in *Environmental Health Perspectives* published by the National Institute of Environmental Health Sciences, the U.S. National Institutes of Health, stated: Even seemingly clean sources of energy can have implications on human health. Wind energy will undoubtedly create noise, which increases stress, which in turn increases the risk of cardiovascular disease and cancer.

Modern wind turbines produce significantly less noise than older designs. Turbine designers work to minimize noise, as noise reflects lost energy and output. Noise levels at nearby residences may be managed through the siting of turbines, the approvals process for wind farms, and operational management of the wind farm.

In conclusion:

Because of noise annoyance the guidelines to limit wind turbine noise levels in Ontario, Canada, the Ministry of the Environment created noise guidelines to limit wind turbine noise levels 30 metres away from a dwelling or camp site to 40 dB. These regulations also set a minimum distance of 550 metres (1800 feet) for a group of up to five relatively quiet {102 dB} turbines within a 3-kilometre (1.9 mi) radius, rising to 1,500 metres (4,900 ft) for a group of 11 to 25 noisier (106-107 dB) turbines. Larger facilities and noisier turbines would require a noise study.

ACK

Note:

There is an existing 12-turbine wind farm on the north and the new proposed 15-turbine project on the south. The Koolauloa Neighborhood Board recently passed a resolution that no turbine be located closer than 3/4 mile, or about 4,000 feet from the nearest home for the proposed project.

Introduced by: Wendell Lum

Copy to Department of Planning & Permitting; Mike Cutbirth of Champlin Wind; and Rep. Richard Lee Fale; Rep. Cynthia Thielen; Rep. Chris Lee; Rep. Ty J.K. Cullen; Rep. Faye P. Hanohano; Rep. Denny Coffman; Rep. Nicole E. Lowen; Rep. Cindy Evans; Rep. Derek S.K. Kawakami

April 1, 2015 TTCES-4819-OUT-15-027

Ralph Makaiau
56134 Pualalea St
Kahuku, HI 96731
rmakaiau@hawaii.rr.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Makaiau,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comment and testimony from the public scoping meeting. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal and verbal testimony:

- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The existing condition of the land and land uses within the wind farm site.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines,

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.

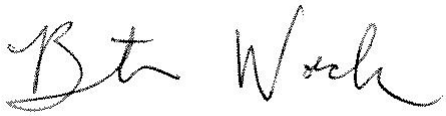
- The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.
- How the Project would affect homeowners' ability to install photovoltaic systems.
- How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the EIS.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

Na Pua Makani Wind Project EIS Public Scoping Meeting

Ways to Provide Comments

DEADLINE for submitting comments is January 22, 2014.

- Oral comments will be received at the scoping meeting
- Written comment form available at this scoping meeting
- E-mail: NaPuaMakanihcp@fws.gov
  (Include "Na Pua Makani HCP and EIS" in the subject line of the message)
- U.S. Mail: Mike Cutbirth, c/o Tetra Tech 737 Bishop Street, Suite 2340, Honolulu, Hawaii 96813
- In-Person Drop-off, Viewing, or Pickup: Written comments will be accepted at the public scoping meeting on January 10, 2014 at the Kahuku Community Center, or can be dropped off during regular business hours at the above address; or
- Fax: (808) 836-1689, Attn.: Mike Cutbirth

Ralph K. Makaian [56134 Puakea St. Kahuku 96731]
rmakaian@hawaii.rr.com [Kahuku Sub District #1 resident]

"I do not support NaPuaMakani as presented because:
1. lack of regulatory safe buffer zone to R5 zone.
2. residental application quota impact.
3. assurance of power quality."

[redacted]

4. environmental ground baseline testing at stream outlets

Ralph 01-10-14

REG 2

SOC 4

ACK

WAT 1

April 1, 2015 TTCES-4819-OUT-15-028

Kent Fonoimoana
Makani Pono ʻo Kahuku
PO Box 122
Laie, HI 96762
kent@trisland.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Fonoimoana,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period on behalf of Makani Ponoʻo Kahuku. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Proper consultation is conducted between the USFWS and Native Hawaiian people and mitigation measures are developed for potential impacts to cultural resources.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Recommended visual simulations of the Project be included in the EIS.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

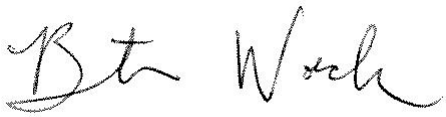
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.
- The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- Noise from the wind turbines associated with construction and operation of the Project impacting sensitive receptors.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.
- The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.
- The construction and operation of the Project must be in compliance with all federal, state, and regulations; Champlin must obtain applicable federal, state, and county permits.
- Concerned about the details of the community benefits package.
- Concern over how the Project would affect homeowners' ability to install photovoltaic systems.
- Concern that the Project would impact the quality of life for nearby communities.
- Concern that the Project would lower property values and make it harder for homeowners to sell homes that are in close proximity to the turbines.
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the EIS.
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

ACK

---------- Forwarded message ----------
From: **Kent Fonoimoana-TRIsland** <kent@trisland.com>
Date: Tue, Jan 21, 2014 at 2:44 PM
Subject: Na Pua'a Makani HCP, EIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>, "contact@champlinwind.com" <contact@champlinwind.com>, "william.j.aila@hawaii.gov" <william.j.aila@hawaii.gov>, "Brita.Woeck@tetratech.com" <Brita.Woeck@tetratech.com>

Aloha,

Please accept the comments on the proposed Kahuku Champlin Wind energy project as provided by Makani Pono 'o Kahuku.

Kent Fonoimoana
Makani Pono 'o Kahuku
#808-294-9991

January 22, 2014
EISPN response questions from Makani Pono ‘o Kahuku

Representive for Makani Pono ‘o Kahuku –
Kent Fonoimoana
PO Box 122
Laie, Hawaii 96762
Email: Kent@TRIsland.com
808-294-9991

Mike Cutbirth, Champlin Hawaii Wind Holdings, LLC
contact@champlinwind.com

William Aila, Department of Land and Natural Resources
william.j.aila@hawaii.gov

Brita Woeck, Tetra Tech, Inc.
Brita.Woeck@tetratech.com

Loyal Mehrhoff or Aaron Nadig, U.S. Fish and Wildlife Service
NaPuaMakanihcp@fws.gov

Re: Na Pua Makani Wind Project (EISPN)

ACK

Makani Pono ‘o Kahuku herein submits scoping questions for the Na Pua Makani Wind Project Environmental Impact Statement Preparation Notice

DAT 2

1. Has Champlin provided accurate renditions of the proposal from multiple view locations? If not, can they please provide the Kahuku community and the public with virtual renditions of the project from 360 degrees?

DAT 1
PRO 3

2. Please provide a map showing planned roads and planned turbine sites.

WAT 1

3. Please show on one map the projects detailed plans to mitigate flooding and runoff.

SOC 2

4. If this project moves forward, how will that impact homeowner’s ability to install PV? Please provide an explanation from HECO of the clear and accurate impacts to homeowners who wish to install PV systems.

SOC 1	5. When comparing the Champlin community benefit package to the potential private rate payer's savings lost due to HECO restrictions on renewables, which number is greater?
SOC 1	6. What is the cost of the community benefits package as a percentage of the total construction cost? Anticipated annual revenues of Champlin? Anticipated tax revenue for the state?
SOC 2	7. If every home in Ko'olauloa had PV installed, what would be the impact on this wind energy project?
SOC 2	8. What are the impacts to ratepayers who wish to install PV under current HECO restrictions identical to those imposed on communities without wind energy? Is HECO willing to substantiate your answer? According to a public statement made by Mike Cutbirth, there will be no impacts on PV installations caused by his proposal. Can Champlin's CEO Mike Cutbirth back this statement up using HECO's statistics? If not, how did he arrive at this conclusion?
PRO 3	7. In Champlin's documents, a third phase is mentioned which is an additional 45 megawatt addition to the project. Please show on a map the intended location of phase III.
DAT 1 HAZ 1	8. Please provide a computer generated video rendition of what may occur should the project be involved in an 'Iniki or 'Iwa type hurricane event. Include the existing Firstwind facility in your rendition. Also, in this rendition, please include all possible scenarios from 360 degrees. Additionally, please include scenarios where the facility has lost its ability to communicate with the control center and the turbines are unable to be manipulated.
HAZ 1	9. Champlin has stated that the turbines have been designed to withstand hurricanes. Has any of Champlin's turbines been involved in an 'Iniki of 'Iwa like hurricane?
HAZ 1 HAS 2	10. Although Champlin's Mike Cutbirth publically denies personal knowledge of a single turbine blade failure event, what is the possible distance turbine blades or any turbine component can travel in the event of a hurricane?
ALT 2	11. Regardless of location ownership, Can you please provide an island wide site study showing the most preferable and more feasible locations for wind turbines based on wind profiles alone? Can you include locations where there will be little or no impacts to PV installation by private homeowners?
WIL 1 WIL 3	12. Can you please provide details about how Champlin has dealt with endangered and threatened species, Incidental Take Permits and Incidental Take Licenses on its other projects, both in the U.S. and elsewhere? In addition to studying the impacts on endangered avian species, will there be a complete study

WIL 1
WIL 3

on the impacts on other native species like the Frigate bird ('Iwa), Wedge Tailed Shearwater (Ua Kani), Hawaiian Petrel and others? Specifically, how are these studies to be conducted and by who?

ACK

13. The previous developer made certain representations and commitments to the community. One of these was to stop efforts to implement the proposal if the community opposed it. Does Champlin plan on honoring this commitment to the Kahuku community?

DAT 1

14. Champlin's CEO, Mike Cutbirth is the former CEO of the American Wind Energy Association (AWEA) as well as a former ENRON executive. Champlin recently brought in Dr. McCunney, a paid AWEA consultant, to address the community's concerns regarding health impacts imposed on folks living in close proximity to Industrial Wind Turbines (IWT's). McCunney acknowledged that IWT's are indeed an annoyance but in his opinion -do not cause disease. Will this process include entertaining other opposing views such as this comment by Dr. Michael A. Nissenbaum, MD - November 5, 2013 Industrial wind turbines, human variability, and adverse health effects New England College of Occupational and Environmental Medicine - Michael A. Nissenbaum, MD - November 5, 2013. Dr. Michael Nissenbaum, who conducted extensive research into the effects of audible wind turbine noise on sleep disturbance, has written a paper that explains his findings to other medical professionals who are unaware of the issue. The summary of his paper follows:

SUMMARY

In summary, in many IWT projects, the preconstruction sound modeling has underestimated the eventual real world sound levels those turbine projects eventually produce. When coupled with the underappreciated human physiological responses to the type of noise large turbines produce (adverse sleep and mental health effects), this has had real world consequences for those living near them. The relationship of noise to sleep disturbances is established. The biological plausibility of sleep disturbances resulting in ill health is settled science. Chronic noise exposure leads to chronic sleep disturbance in many of those exposed, often resulting in ill health. Observed adverse human effects must trump preconstruction sound modeling; changes in practice must occur when there are errors. It's all about distance when siting decisions are made.

REG 2
REG 3

15. What are the industry recommended optimal distances placed between each turbine? What are the complete scientific and engineering rationale for these recommended distances? Are these distances greater or less than City and County of Honolulu set back distances?

PRO 1
HAS 1

16. There are numerous wind energy facilities in place around the world. The vast majority of health and quality of life complaints come from people who live in close proximity to IWT's - similar to the distances Kahuku community will be from Champlin's turbines. If we are to benefit from wind energy, would it not benefit all to place these machines further away from residential communities? Would greater set back distances mitigate most health or other complaints?

HAS 1

17. If the facility is built and later found to contribute to health issues associated with IWT's, what mitigating plans or response can the community expect? Are Champlin, the State of Hawaii and the private land owner's involved prepared to address preventable impacts? Would it be reasonable for the impacted community to take legal action against any entity involved in this project? Before and after implementation?

PRO 1

18. Champlin has stated that the nearest turbine will be 2100 feet removed from the nearest residence. What is the exact distance from the Elementary and High schools? Community boundary? Also, in examining distances from our community residences, does that include the Patsy and Lee Colburn residence?

NOI 1

19. Will there be audible sounds noticeable from the schools? Community? What will be infra-sound levels be at the schools? Community?

HAS 1

20. Sound engineers have developed devices specifically used to disperse crowds using subsonic sounds similar if not identical to the type of sound generated by wind turbines. This same type of sound is utilized in small home devices intended to drive away pests like rodents, cockroaches and the like. If this type of sound has been developed to cause distress, would it not be safe to conclude that IWT generated infrasound has negative impacts on humans living in close proximity to IWT's?

PRO 3

21. When decommissioning the turbines, have/will funds be/been set aside for this purpose? Will these components be placed in local landfills or taken out of state for disposal or recycling? Will the parcels be 100% fully returned to their previous state? If not, why?

CUL 3

22. Will planning and pre-construction include Ko'olauloa based and approved native Hawaiian cultural consultants? What are Champlin's mitigation plans should culturally significant sites be discovered? Should any dispute arise, will

CUL 3

there be a fair dispute resolution process developed that allows the issue to be fully explored from the Ko'olauloa community's perspective?

ACK

23. If HECO switched to utilizing LNG to generate electricity, would the power generated be more of less per kilowatt hour than wind? Taking wind out of the equation, would the addition of LNG be less or more costly to O'ahu ratepayers?

24. The previous developer of this project, Keith Avery of West Wind Works, made several representations to the Kahuku community. One such promise he made was that all residents within the Kahuku State Agricuture Park would receive free electricity when the project comes on line. This promise was made in the presence of the manager of the Kahuku State Agriculture Park, multiple lessees of the park, and several community members including current representatives of Makani Pono 'o Kahuku. Can HECO and the State Dept. of Agriculture confirm this offer? Another representation Mr. Avery made was that if the community opposed this project, he would cease his attempt to develop the project. Is Champlin willing to honor this? Why?

SOC 1

25. Since West Wind Works has since passed this project on to Champlin, is Champlin required to re-examine and support previous commitments made by WestWind Works? If not, would it be fair to say that the developer is employing less than credible bait and switch tactics?

DAT 1

26. Since West Wind Works did all the preliminary footwork for Champlin, is the previous Environmental Assessment of 2008 (EA 2008) still valid?

DAT 1

27. There have been significant alterations to the project as detailed in the EA 2008. Does this negate or have any effect on the findings of the EA 2008?

SOC 5

28. Many communities across the country are learning that there are impacts to private property values as well as salability of homes in close proximity to wind energy facilities. Some municipalities are requiring wind energy developers to place monies in an escrow fund set up to compensate impacted private property owners. Should the accepting agencies develop a plan to institute this practice that is designed to protect private property owners, will Champlin oppose such efforts?

SOC 3

29. Are there plans to study the impacts this project will have on the collective psyche of the Kahuku community? If not - why not? If yes, who and how will the study be conducted?

Regards,

Makani Pono 'o Kahuku

April 1, 2015 TTCES-4819-OUT-15-029

Marvin Kaleo Manuel
Acting Planning Program Manager
Department of Hawaiian Home Lands
PO Box 1879
Honolulu, HI 96805

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Manuel,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

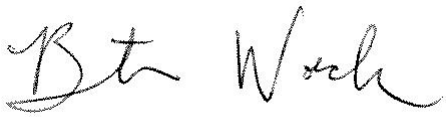
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

DARRELL T. YOUNG
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

January 17, 2014

TETRA TECH, INC.
Attn: Brita Woeck
737 Bishop Street,
Mauka Tower, Suite 2340
Honolulu, Hawaii 96813

Dear Birta Woeck:

Subject: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai'i

ACK

Thank you for the opportunity to review the subject EISPN. The Department of Hawaiian Home Lands has no comment to offer at this time. If you have any questions, please contact our Planning Office at 620-9480.

Aloha,

Marvin Kaleo Manuel,
Acting Planning Program Manager

April 1, 2015 TTCES-4819-OUT-15-030

Kealoha Mercurio
mountaintodaocean@yahoo.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Mercurio,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Protection of Native Hawaiian cultural sites and burial grounds, and preservation of culturally-significant lands.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

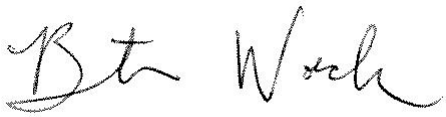
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Julio Mercurio** <mountaintodaocean@yahoo.com>
Date: Thu, Dec 5, 2013 at 7:44 PM
Subject: "Na Pua Makani HCP and DEIS"
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

Aloha,

CUL 1
HAS 1
PRO 1
VIS 1

I am speaking on behalf of all the Kahuku residents that are not aware of this project being put into action. These wind turbines will take away from the beautiful country scenery that we all love and there have also been studies suggesting that there are terrible health problems that are linked to them. These wind turbines are being proposed too close to our schools and community, for us to find out the hard way that those studies were correct. Also, the land that is proposed to be desecrated for the development of these wind turbines have great purpose and significance in the NATIVE HAWAIIAN COMMUNITY in Kahuku. It is not right to have people who are not connected to the ʻāina (land) in this specific ahupuaʻa (land division) to say it is okay to go on with development, because as a Native Hawaiian with a love for this land, IT IS NOT okay to build a wind farm on this land!!!! I humbly ask you to think with your hearts and not with your wallets….

Mahalo
Kealoha Mercurio

April 1, 2015 TTCES-4819-OUT-15-031

Delsa Moe
55-706 E Wahinepee St.
Laie, HI 96762
kekamoe@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Delsa Moe,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your comments; every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- The alternatives analysis should include a reasonable range of alternatives, and should describe how alternatives were developed and also how they were eliminated from further analysis.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

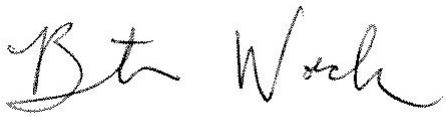
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Delsa Moe** <kekamoe@gmail.com>
Date: Thu, Nov 14, 2013 at 11:26 PM
Subject: Na Pua Makani HCP and DEIS
To: napuamakanihcp@fws.gov

ACK

I am a resident of Laie and I oppose the additional windmills being proposed for the Kahuku area for the following reasons:

PRO 1
ALT 3
VIS 1

1. The proposed location for these windmills is too close to the school and the residential community.
2. We already have enough windmills in our area -- any more would be overkill for this small area.
3. These machines are huge and they overpower the rural beauty of this land. The worst example of this are the ones that appear above pristine Waimea Valley. In an attempt to save the environment by providing alternative energy, these gigantic turbines have ruined the beauty of that unique place because of their location. The current windmills in Kahuku are located away from the residential area and placed in an area not known for it's picturesque views so they are less of an eyesore than the ones being proposed behind the high school.

ALT 1

Please find another location or another source of providing alternative energy.

--
Delsa Moe
55-706 E Wahinepee St
Laie, HI 96762

TETRA TECH

April 1, 2015 TTCES-4819-OUT-15-032

Steve Molmen
Supervising Land Agent, Land Division
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street, Suite 220
Honolulu, HI 96809-0621

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Molmen,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received the written comments you submitted from several DLNR Divisions, including the Land Division – Oahu District, State Parks, Office of Conservation & Coastal Lands, Engineering Division, and Commission on Water Resource Management. Every letter from agencies and the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

The DLNR comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in the DLNR submittals:

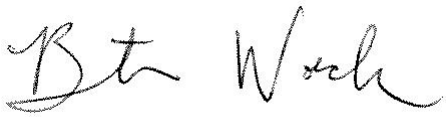
- Would like to see mitigation measures and Best Management Practices related to water resources, including water quality, landscape irrigation, and stormwater management.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the Environmental Impact Statement.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: <Steve.Molmen@hawaii.gov>
Date: Thu, Jan 23, 2014 at 9:21 AM
Subject: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i
To: NaPuaMakanihcp@fws.gov

ACK

Dear Mr. Cutbirth,

Attached, please find our comments on the subject project. No hard copy will be sent.

Best regards,

Steve Molmen, Supervising Land Agent
Land Division
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street, Suite 220
Honolulu, HI 96809-0621
Tel.: (808) 587-0439
Fax: (808) 312-6357
Email: steve.molmen@hawaii.gov

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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 21, 2014

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop St., Suite 2340, Mauka Tower
Honolulu, HI 96813

via email: NaPuaMakanihcp@fws.gov

Dear Mr. Cutbirth,

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i

ACK

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (1) Land Division – Oahu District; (2) Division of State Parks; (3) Office of Conservation & Coastal Lands; (4) Engineering Division; and (5) Commission on Water Resource Management. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 20, 2013

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division
_X_ Div. of Forestry & Wildlife
_X_ Div. of State Parks
_X_ Commission on Water Resource Management
_X_ Office of Conservation & Coastal Lands
_X_ Land Division – Oahu District
_X_ Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i
LOCATION: Kahuku, Hawai`i,
APPLICANT: Champlin Hawaii Wind Holdings, LLC by Tetra Tech, Inc.

ACK

Transmitted for your review and comment on the above-referenced document. If we have not provided you with one of the limited number of CD's, the document can be found here:

1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
2. Login: Username: LD\Visitor Password: 0pa$$word0 (first and last characters are zeros)
3. Click on: Requests for Comments
4. Click on the subject file "Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i" then click on "Files" and "Download a copy".

We would appreciate your comments on this document. Please submit any comments by January 21, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

REG 3

Comments:
Any improvements on the State land requires a disposition from the Board. We have no objections.

(✓) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: T Chee
Print Name: Jimmy Chee
Date: 1/9/2014

cc: Central Files

55957

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
STATE PARKS DIV

'13 DEC 23 A10:59

DEPT OF LAND & NATURAL RESOURCES

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 20, 2013

MEMORANDUM

RECEIVED
LAND DIVISION
2014 JAN -2 PM 2:46
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i
LOCATION: Kahuku, Hawai`i,
APPLICANT: Champlin Hawaii Wind Holdings, LLC by Tetra Tech, Inc.

ACK

Transmitted for your review and comment on the above-referenced document. If we have not provided you with one of the limited number of CD's, the document can be found here:

1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
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3. Click on: Requests for Comments
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We would appreciate your comments on this document. Please submit any comments by January 21, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: [signature]
Print Name: Daniel S. Quinn
Date: 12/30/13

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

2013 DEC 23 A 9:39

OFFICE OF CONSERVATION & COASTAL LANDS

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

Conservation

December 20, 2013

MEMORANDUM

~~TO:~~ FROM

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

2014 JAN -7 AM 9:58

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

RECEIVED LAND DIVISION

TO:
~~FROM:~~ Russell Y. Tsuji, Land Administrator
SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i
LOCATION: Kahuku, Hawai`i,
APPLICANT: Champlin Hawaii Wind Holdings, LLC by Tetra Tech, Inc.

ACK

Transmitted for your review and comment on the above-referenced document. If we have not provided you with one of the limited number of CD's, the document can be found here:

1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
2. Login: Username: LD\Visitor Password: 0pa$$word0 (first and last characters are zeros)
3. Click on: Requests for Comments
4. Click on the subject file "Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i" then click on "Files" and "Download a copy".

We would appreciate your comments on this document. Please submit any comments by January 21, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

Not in Conservation District.

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Signed: [signature]
Print Name: ALEX ROY
Date: 12-31-2013

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 20, 2013

RECEIVED
LAND DIVISION
2014 JAN 15 PM 2:57
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

MEMORANDUM

TO: FR:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

TO:

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i
LOCATION: Kahuku, Hawai`i,
APPLICANT: Champlin Hawaii Wind Holdings, LLC by Tetra Tech, Inc.

Transmitted for your review and comment on the above-referenced document. If we have not provided you with one of the limited number of CD's, the document can be found here:

1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
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We would appreciate your comments on this document. Please submit any comments by January 21, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____
Print Name: Carty S. Chang, Chief Engineer
Date: 1/14/14

cc: Central Files

ACK

REG 3

REG 3

REG 3

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref.: EISPN for Na Pua Makani Wind Farm Project, Kahuku
Oahu.025

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site according to the Flood Insurance Rate Map (FIRM), is located in Zones X (shaded), AEF, AE, and A. The National Flood Insurance Program (NFIP) regulates developments within Zones X (shaded), AEF, AE, and A as indicated in bold letters below.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

(X) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

(X) Mr. Mario Siu Li at (808) 768-8098 or Ms. Ardis Shaw-Kim at (808) 768-8296 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.

( ) Mr. Carolyn Cortez at (808) 270-7813 of the County of Maui, Department of Planning.

( ) Mr. Stanford Iwamoto at (808) 241-4884 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: _____

( ) Other: _____

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 1/14/14

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
KAMANA BEAMER
GARY L. GILL
MILTON D. PAVAO
JONATHAN STARR
TED YAMAMURA

WILLIAM M. TAM
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

January 15, 2014

REF: RFD.3893.3

TO: Russell Tsuji, Administrator
Land Division

FROM: William M. Tam, Deputy Director
Commission on Water Resource Management

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawaii

LOCATION: Kahuku, Hawaii
TMK NO.:

RECEIVED
LAND DIVISION
2014 JAN 22 AM 10: 13
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore, all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://www.hawaii.gov/dlnr/cwrm.

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

MIT 2

☒ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EPA as having high water efficiency can be found at http://www.epa.gov/watersense/.

MIT 2

☒ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

MIT 2

☒ 6. We recommend the use of alternative water sources, wherever practicable.

☐ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/programs/achieving-efficiency/green-business-program

MIT 2

☒ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://landscapehawaii.org/_library/documents/lich_irrigation_conservation_bmps.pdf

REG 3

☒ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

Permits required by CWRM:
Additional information and forms are available at http://hawaii.gov/dlnr/cwrm/info_permits.htm.

REG 3

☒ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 11. A Well Construction Permit(s) is (are) required before any well construction work begins.

☐ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

REG3

☒ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

REG 3

☒ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration(s) can be made to the bed and/or banks of a stream channel.

☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is (are) constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

WAT 1

☒ OTHER:
Projected potable and non-potable water demands and the calculations for these estimates should be disclosed. The proposed source of water supply should be identified.

REG 3

There are 8 existing wells in on TMK 5-6-006:018, 4 of which are used for agriculture. If the Wind Farm requires use from any of these or other well sources in the area then existing ground water use permits will need to be modified or new ground water use permits obtained.

If there are any questions, please contact Roy Hardy at 587-0225.

April 1, 2015 TTCES-4819-OUT-15-033

Joshua Noga
54 130 Imua Place
Hauula, HI 96717
joshua.noga@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Noga,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittals:

- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.

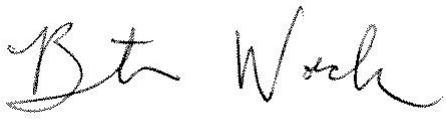
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Joshua Noga** <joshua.noga@gmail.com>
Date: Thu, Dec 5, 2013 at 10:06 AM
Subject: No more windmills
To: napuamakanihcp@fws.gov

Aloha,

PRO 1

My name is Joshua Noga husband/father of two and I live in Hauula my church is St. Roch Parish in Kahuku. I am writing to let you know that I oppose any more windmills in Kahuku especially those so close to our schools. The windmills already present are proof that Ko'olau Loa has already done more than its fair share toward creating alternative clean energy solutions for our state.

HAS 1

Not enough studies and information have been provided to the negative consequences of these windmills so close to schools and children. Noise pollution is also a big concern revealed in youtube testimonials from an island community in Maine who had windmills constructed on their island who regret that they allowed it.

ACK

We need a more balanced discussion regarding this matter mahalo for your kokua.

Joshua Noga
54 130 Imua Place
Hauula, HI 96717

---------- Forwarded message ----------
From: **Joshua Noga** <joshua.noga@gmail.com>
Date: Thu, Dec 5, 2013 at 10:07 AM
Subject: Na Pua Makani No more windmills
To: napuamakanihcp@fws.gov

Aloha,

PRO 1

My name is Joshua Noga husband/father of two and I live in Hauula my church is St. Roch Parish in Kahuku. I am writing to let you know that I oppose any more windmills in Kahuku especially those so close to our schools. The windmills already present are proof that Ko'olau Loa has already done more than its fair share toward creating alternative clean energy solutions for our state.

HAS 1

Not enough studies and information have been provided to the negative consequences of these windmills so close to schools and children. Noise pollution is also a big concern revealed in youtube testimonials from an island community in Maine who had windmills constructed on their island who regret that they allowed it.

ACK

We need a more balanced discussion regarding this matter mahalo for your kokua.

Joshua Noga
54 130 Imua Place
Hauula, HI 96717

TETRA TECH

April 1, 2015 TTCES-4819-OUT-15-034

Aliitasi Ponder
P.O. Box 360
Kahuku, HI 96731
tasiponder1@yahoo.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Aliitasi Ponder,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments and testimony from the public scoping meeting. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittals and verbal testimony:

- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- The alternatives analysis should include a reasonable range of alternatives, and should describe how alternatives were developed and also how they were eliminated from further analysis.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Direct, indirect, and cumulative impacts to public health, visual resources, and socioeconomics for communities nearby.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

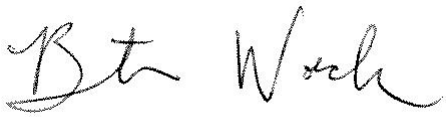
- Direct, indirect, and cumulative impacts to aquatic and terrestrial ecosystems, habitat, native plants, wildlife, bat, and avian species.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- Hazardous wastes, chemicals, and pesticides that will be produced or used by the Project, and how they will be stored, disposed of, and managed.
- The status and value of agricultural lands within the wind farm site.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.
- Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- Concerned about the details of the community benefits package.
- Concern that the Project would lower property values and make it harder for homeowners to sell homes that are in close proximity to the turbines.
- Short- and long-term socioeconomic impacts to the community resulting from the Project.
- Potential impacts to Native plant communities located within the wind farm site, and how any impacts would be mitigated.
- Avian and bat impacts, including potential cumulative impacts resulting from existing and future wind projects should be discussed and analyzed. Comprehensive pre-construction and post-construction mortality monitoring surveys should be conducted.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

From: Tasi P [mailto:tasiponder1@yahoo.com]
Sent: Wednesday, January 22, 2014 5:59 AM
To: NaPuaMakanihcp@fws.gov; contact@champlinwind.com; Woeck, Brita; william.j.aila@hawaii.gov
Subject: Na pua Makani HCP and EIS

,EISPN response questions from Aliitasi Ponder

Att:
Mike Cutbirth, Champlin Hawaii Wind Holdings, LLC
contact@champlinwind.com

William Aila, Department of Land and Natural Resources
william.j.aila@hawaii.gov

Brita Woeck, Tetra Tech, Inc.
Brita.Woeck@tetratech.com

Loyal Mehrhoff or Aaron Nadig, U.S. Fish and Wildlife Service
NaPuaMakanihcp@fws.gov

Re: Na Pua Makani Wind Project (EISPN)

ACK

I, a Kahuku community resident, herein submit scoping questions for the Na Pua Makani Wind Project Environmental Impact Statement Preparation Notice

(Note: Anywhere there is mention of Champlin, Champlin Hawaii Wind or Champlin WInd it is intended that they are all one and the same Champlin Hawaii Wind Holdings, LLC.)

Questions:

PRO 3

1. What is the length/ width/ surface depth of the road going from Kamehameha Hwy to the intended turbine site? What company will be building that private road?

2. What are the building spec requirements for the private road to the turbines iin order for it to handle the special

needs of this project?

PRO 3

3. How much will it cost the developer to build such a road going from Kamehameha Hwy to the turbine site? Will the developer cover all costs of the road leading to the turbines from the main public roadways?

PRO 3

4. In dollar amounts how much of Kamehameha Hwy's maintenance will Champlin Hawaii Wind be required to cover?

PRO 3

5. In other parts of the world where turbines of this size are installed, what is the life of these types of turbines in years? How does weather and temperature affect the longevity of a turbine?

DSC 1

6. How many communities have continued to report positively about the ongoing effects 1, 2 and 3 years after the turbines have been installed?

DSC 1

7. Has Champlin studied the types, basis and quantities of complaints by community members in other communities where turbines have been installed to be sure they don't repeat the same mistakes?

REG 1
ALT 3

8. What adjustments has Champlin made in their development process to lessen complaints in current and future wind developments?

ACK

9. How many complaints from community members have there been reported to city, county, state officials about wind turbines erected in their communities?

10. What is Champlin's track record for addressing and resolving community complaints made to them or to local/city/county/state officials and or organizations? What is Champlin's average time from complaint to resident-satisfactory resolution?

HAS 1

11. What organization will be monitoring the initial and ongoing effects the turbines have on sleep, health, concentration, and property values?Will Kahuku community members receive that report?

PRO 3

12. How do these turbines compare mechanically to those turbines installed and being taken down in Europe, Australia and other parts of the U.S.?

PRO 1

13. Where else in the world have turbines of this size and quantity been installed as close as is being proposed by Champlin in Kahuku to public schools and/or neighborhoods? What is the closest distance to a school where turbines in this size category have ever been installed?

SOC 1

14. Will the developer establish a fund to cover the cost of reviewing and addressing health issues, including loss of work, for community members who live within a mile of these turbines? If so, how much will there be in the fund initially and ongoing? Who at Champlin will be in charge of the fund and how do they propose to educate the Kahuku community on contacting them about resolving these issues?

ACK

15. What is the penalty to Champlin, enforced by our city/county/state organizations that monitor the ill effects of wind turbines on community members, for not resolving these issues in an expedient manner?

ACK

16. What are the specific city/county/state organizations currently established to monitor the complaints and negative impacts on the Kahuku community?

ACK

17. What is the process for community members to submit complaints about these proposed turbines once installed, including noise and impacts to health, sleep, loss of work, and increased stress? Who will fund the effort of reviewing complaints of community members and providing solutions to resolve these issues?

HAS 1
WIL 3

18. Have there been studies conducted on turbine effects on unborn fetuses? On the elderly? On special needs children? On those with ADD/ADHD? On those with mental health issues? On all the various types of animals that currently reside within 2 miles of the proposed turbines?

DAT 1

19. What are the list of all independent organizations that investigate the effects of turbines on public health? Has

DAT 1	Champlin conducted and published their own independent study? What is the size of Champlin's sampling used in their studies?
ACK	20. What are the names of all the Kahuku area organizations who have or will be given funds from the developer? i.e. athletic organizations, booster clubs. What are the names of the individuals and or organizations who are or will be managing those various groups who have or will receive Champlin Hawaii Wind monies/contributions? 21. Has Keith Avery ever worked with or for any member of Champlin Hawaii Wind Holdings, LLC? What is his connection with Champlin Hawaii Wind or any affiliation of Champlin Hawaii Wind?
DAT 1 HAS 1	22. Rather than minimizing, has Champlin Hawaii Wind Holdings, LLC objectively and seriously considered and evaluated the long list of health-impact issues by Dr. Pierpoint who wrote the book called, "Turbine Syndrome?" What are Champlin's results regarding such a comparative study and the methods and list of independent experts used by Champlin to conduct their own studies? What other medical study findings and independent medical experts have Champlin investigated in their health impact studies?
ACK	23. If the effects warned by Dr. Pierpoint and other medical experts do become a reality for Kahuku community members, what funds will be provided by Champlin to cover litigation costs so those costs do not fall on the state, city or county?
DAT 1	24. Has anyone at Champlin Hawaii Wind ever spoken directly with Dr. Pierpoint or others in the medical community with a differing viewpoint, to discuss those contrasting experts' published findings on the negative impacts to human health?
ACK	25. What other locations has Champlin Hawaii WInd installed turbines of this size? What is the largest number of wind turbines of this size that Champlin has installed or for which they have been directly responsible?
ACK	26. What other locations has Champlin Hawaii Wind installed turbines of this size in which there is a basin? What studies has Champlin conducted about the sound effects when turbines are installed within a basin?
ACK	27. On what other island has Champlin ever installed wind turbines of this size category? If so, exactly how tall are they? In what other tropical area has Champlin ever installed wind turbines? What experience has Champlin had with wind turbines installed and running in hurricane zones?
SOC 5	28. What is Champlin's proposal for covering the cost of lowered property values for homes within 2 miles of the proposed wind turbines, and for home owners who are unable to sell their homes at all as a result of the wind turbine industrialization of the Kahuku community?
HAZ 2 LAN 2	29. What is the effect of the installation on surrounding ag lands, including the chemicals used for clearing weeds/grounds and ongoing weed control?
ACK	30. In what other area has Champlin installed industrial size wind turbines where there is a similar complex, integrated, diverse eco system on par with that of Hawaii?
VEG 1	31. What studies has Champlin Hawaii Wind conducted themselves directly on the effects of turbines on plant matter where there is a rich, diverse and large quantity of plant matter before and at regular intervals after installation up to 5 years of large industrial turbines in full on operation?
WIL 1	32. What numbers and types of birds do Champlin estimate will be sacrificed annually if turbines are installed in Kahuku? Who are the bird specialists that Champlin Hawaii WInd currently employs?
HAS 1	33. In their due diligence studies, at what distance from the turbines has Champlin determined that there is a negative effect on human health, including emotional and or physical health?
	34. Dr. McCunney, a paid AWEA medical expert, was presented as an independent expert at a recent Kahuku

REG 1

community meeting. To assure us of his objectivity, he purported to have no connection to Champlin Hawaii WInd or to know Mike Cutbirth in any way, even though Mike was once the CEO of AWEA. Instead of owning up when his association was pointed out, he became outwardly defensive. Earlier in the presentation, when community members asked Dr. McCunney questions based on his being the wind expert, he deferred several of those questions requiring objectivity for Mike to handle at some future time. Also, his presentation inferred that health issues were from those who didn't approve of turbines to begin with. His condescending style of communicating was off-putting. He as the impartial independent expert appeared cautious about anything that might run counter to any position held by Champlin, even going as far as to build up and complement the developer as he went through his presentation. This non-transparent, partial. compromised approach increased community distrust in Champlin Hawaii Wind and Mike Cutbirth. How does Champlin propose they will become more transparent in their communication, and repair public distrust caused by their past methods and styles of communication (starting with their initial representative, Keith Avery) in our community?

ACK

35. In what legal litigations is Champlin currently involved, connected to other wind turbine development projects?

36. At times it has sounded as though Champlin is negating a connection with West Wind Works, the earlier version of the proposed project. If that is so, then shouldn't Champlin conduct their own, and more current, Environmental Assessment? What, if any, connection is there between Champlin and West Wind Works?

HAS 3

37. Based on First Wind's experiences with 3 fires, as a community we have learned that large wind developments require extra resources from our local fire department. What would Champlin be contributing to beef up/cover any extra equipment needed for proposed Champlin's Kahuku wind project's ongoing unique emergency needs?

HAZ 1

38. What is Champlin's emergency response strategy, policy, program and funding availability for dealing with turbines destabilized during a hurricane or as part of any other natural disaster?

ALT 2

39. If the majority of our community doesn't want the turbines as close as is being proposed to our schools and community, will you find another location more suited to these 50 story high machines?

ACK

40. What other turbine projects have you developed where large industrial turbines have been installed in a similar type of soil/rock bed with similar amounts of moisture as we have here in Kahuku?

PRO 3

41. What is the "tipping point" financially and environmentally? In other words, at what height do 50 story high turbines become less stable to where the cost of periodically stabilizing them and correcting environmental harm becomes too high to justify their 20 yr shelf life?

SOC 6

42. Based on your experience in wind development in other communities. how will our home insurance rates be affected by your proposed wind project in Kahuku? If rates increase, to what do you attribute the insurance companies need for the increase and will you cover the increase?

PRO 3

43. Since wind turbine technologies continue to develop and turbines evolve, what is your process and plans for upgrading your system and your process for communicating about those changes with the surrounding community before proceeding with upgrades?

NOI 1

44. Sound reverberates, bouncing off other sound "surfaces;" What are the findings on sound/vibrational effects on humans when surrounded by turbines on 3 sides?

REG 1

45. In blue-collar communities, like Kahuku, where english for many is a 2nd language and rising early/ working long hours means being unable to attend evening meetings, there has been a tendency for speculators to swoop in, identify a few influential key people, "motivate" them to cooperate by offering "extras" if they will sell out their own community and rush along the process, etc. With millions at stake, it is easy for developers and community members "helping" them to disregard the democratic process or to do what it takes to keep a community informed in an open and honest way. What are you doing to keep every member of the Kahuku community updated on your developmental process and best ways to weigh in along that process?

April 1, 2015 TTCES-4819-OUT-15-035

Melissa Primacio
Kahuku Community Association Chair
PO BOX 333
Kahuku HI 967312

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Primacio,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

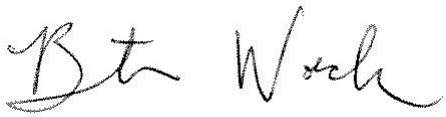
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Melissa Primacio** <melissaprimacio@gmail.com>
Date: Tue, Dec 3, 2013 at 8:58 AM
Subject: wind farm
To: napuamakanihcp@fws.gov

Aloha All,

I would like to clarify an issue on a statement made by KCA in the above email by Kent Fonoimoana.

ACK

Kahuku Community Association (KCA) has taken a position against any additional wind mills in our area, and yet the developer is quietly moving ahead against the wishes of the community.

The developer is in the Environmental Impact Study (EIS) process with Fish and Wildlife.

This statement was not made by KCA. I am the current 2013 KCA President. Please let me share an official statement on our current position.

Kent does not represent KCA, he does not take his elected Board of Director seat until January 2014.

In March 2013 KCA took position to Support (Kent's) Wind Turbine Buffer Zone Resolution with recommendations for ONLY Sub district 01.

KCA has not taken any position on the newly proposed Champlin Wind Project.

Thank you for bringing this matter to my attention. Please feel free to forward this email to those that have received this wrong information.

Mahalo,

Melissa Primacio
Kahuku Community Association Chair
PO BOX 333
Kahuku, HI 96731
808-203-3838

---------- Forwarded message ----------
From: **Melissa Primacio** <melissaprimacio@gmail.com>
Date: Tue, Dec 3, 2013 at 8:56 AM
Subject: Fwd: FW: URGENT! Comments needed to oppose Malaekahana wind farm
To: napuamakanihcp@fws.gov

ACK

On Dec 2, 2013 4:08 PM, "Eric Beaver" <EBeaver@hawaiireserves.com> wrote:

Thanks for clarifying this matter.

From: Steve Hoag
Sent: Monday, December 02, 2013 12:48 PM
To: Jeff Tyau; Eric Beaver
Cc: Jonathan Miller
Subject: FW: URGENT! Comments needed to oppose Malaekahana wind farm

FYI

From: Kent Fonoimoana-TRIsland [mailto:kent@trisland.com]
Sent: Monday, December 02, 2013 12:02 PM
To: Kent Fonoimoana
Subject: URGENT! Comments needed to oppose Malaekahana wind farm

Aloha community member,

YOUR HELP IS URGENTLY NEEDED BEFORE DECEMBER 5th!

A wind farm developer is moving forward with a proposal to erect 15 500' tall towers and turbines at Malaekahana in close proximity to Kahuku schools and the Kahuku community. Should the project move forward, Kahuku's Ko'olau Housing will be surrounded on three sides by industrial sized wind mills.

Independent studies have linked wind turbines to health issues that impact humans if placed in close proximity to residential areas. The proposed wind farm will be 3 times closer to our schools and residences than the existing facility. It will also be upwind - which is significant.

Kahuku Community Association (KCA) has taken a position against any additional wind mills in our area, and yet the developer is quietly moving ahead against the wishes of the community.

The developer is in the Environmental Impact Study (EIS) process with Fish and Wildlife.

PLEASE TAKE THE TIME TO SUBMIT COMMENTS IN OPPOSITION TO:
E-mail: **napuamakanihcp@fws.gov**

Fax: 808-792-9581, Attn: Loyal Mehrhoff
Mail: Loyal Mehrhoff, Field Supervisor,
U.S. Fish and Wildlife Service,
Pacific Islands Fish and Wildlife Office,
300 Ala Moana Boulevard, Room 3-122,
Honolulu, Hawaii 96850
(Include "Na Pua Makani HCP and DEIS" in the subject line of the message, letter or fax)

DEADLINE for submitting comments is December 5th, 2013. Please forward this email to other area residents who are concerned about the proximity issues that will impact school children and residents.

Kent Fonoimoana
#808-294-9991

April 1, 2014 TTCES-4819-OUT-15-036

Suzanne Reed
hawaiianstuntmama@yahoo.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Reed,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

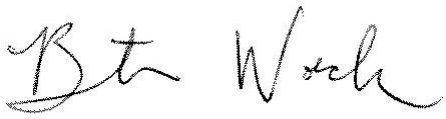
- The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Suzanne Reed** <hawaiianstuntmama@yahoo.com>
Date: Wed, Dec 4, 2013 at 9:48 PM
Subject: Wind turbines- not in our community, please
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

ALT 2
HAS 1
HAS 2
PRO 1

Aloha,
My name is Suzanne Reed and I am against the Wind Project. Safety for the people should be the priority. These turbines are being installed too close to the Kahuku Community. I live in Laie, which is adjacent to Kahuku, and I am concerned for my 14 year old son who attends Kahuku Intermediate. These turbines are not a quiet as the company would like us to believe. This type of project should NOT be placed in an area that has residents and schools. People come first, not money. Yes, Hawaii needs green energy. I agree. Geothermal is great. Solar is great. Wind can work for certain areas- like the open desert or desolate land. What about all the land just mauka of Turtle Bay, next to the other windmills? Or Kaena Point? Why is it RIGHT behind the school?Can you imagine the constant beating of the blades? All day, all night, never ending. I am that worried it will affect the student's concentration and their scores. These students need all the help they can get. They don't need another noise disruption or any aggrevating sounds.

HAS 1

We have relatives who live in Kahuku. Will their sleep patterns be disrupted? Will my nephews sleep well at nightl? Will their parents have enough rest to perform at work? Will the overall lack of sleep exhaust a tired immune system?Causing sickness or over eating in order to stay awake and quite possibly lead to chronic illnesses. This has already occurred in other Wind turbine communities across the United States. People had to either sell or leave their beloved homes to escape the noise. I pray that the needs of the people living under this project will be seriously considered. From the last town meeting, it seemed as though this project will most certainly be moving forward and the turbines erected.

ALT 2
HAS 2
HAZ 1
DAT 1

Another safety concern that I have about this project is the actual blades becoming detached in high winds.Hurricane Iniki had winds exceeding 200mph. A wind project in San Diego had an 11 ton blade fall during 10-15 mile an hour winds. This is not an isolated incident. It has occurred in other locations. I have done my research and concluded that wind power is NOT for this community. Perhaps just a few miles down the road or further back into the mountains. Oh, wait, that will cost the company more money to build those roads. Well....get building ,if you want those turbines installed. Get them away from our ohana and our keiki. www.cbs8.com/.../**blade**-breaks-off-**wind**-**turbine**-at-ocotillo-**wind**-projec...

Sincerely,

Suzanne Reed

April 1, 2015 TTCES-4819-OUT-15-037

Tanoai Reed
samaoanstuntman@yahoo.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Reed,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments and testimony from the public scoping meeting. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal and verbal testimony:

- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- The EIS should address any disproportionate adverse impacts to minority and low-income populations, and should reflect coordination with those affected populations.
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

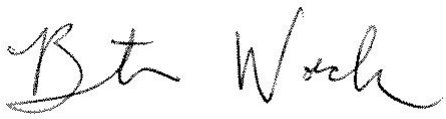
- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The threat of natural disasters, including hurricanes, tsunamis, and earthquakes, and how these events could in turn threaten the health and safety of nearby communities through the collapse of turbine towers or blade throw should be discussed and analyzed.
- How the Project would affect homeowners' ability to install photovoltaic systems.
- How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.
- Concern that the Project would lower property values and make it harder for homeowners to sell homes that are in close proximity to the turbines.
- Short- and long-term socioeconomic impacts to the community resulting from the Project.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Tanoai Reed** <samoanstuntman@yahoo.com>
Date: Wed, Dec 4, 2013 at 9:49 PM
Subject: Kahuku wind turbines.
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

ACK

DAT 1
HAS 1
HAS 3
HAZ 1
SOC 5
WIL 3

VIS 1

HAS 1
HAS 3

Aloha Loyal,

My name is Tanoai Reed and Im a very concerned member of this community. Im against putting these new turbines up for so many different reasons. To start with let me share with you some video of the danger these things can bring to our people and our wildlife. Please take the time to view theses I will refer to them later.

1) The killing of wildlife. http://youtu.be/jwVz5hdAMGU
2) High wind/ Hurricanes. http://youtu.be/-YJuFvjtM0s
3) Electrical failure/ Fires. http://youtu.be/0ovHFTSBQ54
4) Property devaluation. http://youtu.be/_utFV2ukOtU
5) Sound pollution. http://youtu.be/SNxvkrgoPLo
6) Health Hazards. http://youtu.be/lm0Oe8J6qT8
7) *A similar community to Kahuku affected: http://youtu.be/jtGijb_oNeQ
8)** And yet another community tells its story of the wind turbines: http://youtu.be/MO53YqA0D9M
9) Lastly, Look at the pictures I attached. Can you HONESTLY tell me these things are beautiful or enhance our landscape? Our Aina is the most important and precious thing we have.Thats why they don't allow billboards or tall buildings in our community. These RUIN our beautiful scenery and landscape.

.....And the list goes on and on of videos, photos and first hand accounts and testimonies of the negative impacts of these monstrosities being built near communities.

The noise alone is enough to stop these from being built behind our elementary and high school. The students will hear the noise that was recorded in the video 5, ALL DAY LONG. How can they focus and concentrate with that? My son is an 8th

HAS 1
HAS 3

grader at Kahuku and I don't want him to be near these things. Not only because of the noise, but also because of what I've shown you in videos 2 & 3. If these things burst into flames, explode, or even if a hurricane hits, the proposed site right now is so close that it puts peoples lives in danger.

SOC 2

What about the fact that adding these wind turbines will prevent the addition of homeowners own individual solar energy (which will actually help impact our bills as well as conform to the green energy movement).

SOC 4

Each community is only allowed a certain percentage of renewable energy and the turbines (which don't help lower our monthly electric bills) are taking up all of that allowed percentage.Once the maximum wattage has been reached, HECO won't allow anymore alternatives like solar, which they lose money on. I smell something funny there.

SOC 5

As you see in video 4, these things bring down our property value. If there is even a small chance that these things do what you hear about and see in the videos, people won't want to move in....only out! Why should we have to sacrifice equity in our homes because some big multi-million dollar company wants to "drop their load and hit the road" with millions in their pockets off our our land? They might leave a handful of loose change to help buy our "pono", but that won't bring our property values back up.

ACK

As you can see there are MANY documented dangers and reasons why we shouldn't allow these next to our homes and schools. Even if there was only one reason, that should be enough.

The community voices have spoken. The majority are against it!! At the meeting we had, not too many people showed up and not too many spoke up. That doesn't mean the rest want to have these win turbines built. I learned that a lot of people didn't know about the meting or weren't able to make it. If we look at the people who did speak up, ONLY 1 person stood up FOR the wind turbines. There were at least 6 people who spoke up AGAINST them. I'm sure this reflects the communities voice percentage wise, per capita. The few people in our community who are for them have been approached and "bought off" by Champlin wind. If there was no offer of money, I'm sure they wouldn't say they like the presence of them looming over our homes and schools. Big Mainland companies know we are a low income community and that makes us easy prey. Look at what Monsanto has done to our land with the GMO's. Only NOW we are wising up and passing bills to stop them from polluting our soil? Champlain is no different. Both say they want to do good and help the environment, but we all know its about the all mighty $!!! Think about it.....They can't buy off or fool the rich communities. Thats why you don't see their footprint in those areas.

ACK

The homes, schools, families and countryside mountains of Kahuku are so beautiful and safe. PLEASE help us keep it that way.

Mahalo for your time,

-Tanoai Reed

April 1, 2015 TTCES-4819-OUT-15-038

Ben Shafer
52210 Kamehameha HWY
Hauula, HI 96717
bdshafer@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Shafer,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittals:

- The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

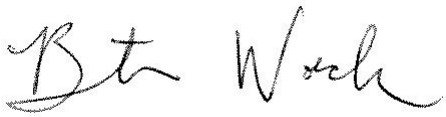
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Aloha from Ben Shafer** <bdshafer@gmail.com>
Date: Tue, Dec 3, 2013 at 4:03 PM
Subject: Na Pua Makani HCP and DEIS
To: napuamakanihcp@fws.gov

Loyal Mehrhoff, Field Supervisor,
U.S. Fish and Wildlife Service,
Pacific Islands Fish and Wildlife Office,
300 Ala Moana Boulevard, Room 3-122,
Honolulu, Hawaii 96850

Benjamin Shafer
52210 Kamehameha Hwy
Hauula, Hawaii 96717
8082223138
bdshafer@gmail.com

December 4, 2013

RE: In full opposition to Windmills in Kahuku, Oahu.

Aloha Loyal
Mehrhoff,

ACK

I and many in our communities of Kaaawa, Kahana, Punalu'u, Hauula, Laie, Kahuku, Sunset and Waimea, the Ko'olauloa District are appalled at your request for windmills anywhere near schools, homes, agricultural area, activity centers in Kahuku or in any communities where these settings exist. Please note that these communities are in strong opposition to this assine plan.
There are too many reasons why this is will not work.

Respectfully submitted,
Ben Shafer

Sent via the Samsung GALAXY S®4, an AT&T 4G LTE smartphone

---------- Forwarded message ----------
From: **Ben Shafer** <bdshafer@gmail.com>
Date: Wed, Dec 4, 2013 at 3:59 PM
Subject: Request an email listing
To: napuamakanihcp@fws.gov

Aloha Loyal,

ACK

I would like to request and email listing of all those who supported and in not of support of the proposed windmills in Kahuku, Oahu as of the end of the deadline for submital of testimony.

Mahalo nui loa for all you do,
Ben Shafer
bdshafer@gmail.com
808.222.3138

VIS 1
REG 2

---------- Forwarded message ----------
From: **Aloha from Ben Shafer** <bdshafer@gmail.com>
Date: Mon, Jan 20, 2014 at 9:03 PM
Subject: No windmills
To: NaPuaMakanihcp@fws.gov
Cc: Kent Fonoimoana <kent@trisland.com>

Aloha,
No windmill should be built closer than three miles from any human or animal contact. All view plains should not obliterated windmills except ocean views.

Mahalo,
Ben Shafer
52210 Kamehameha Hwy
Hauula, Hawaii 96717
8082223138

Sent via the Samsung GALAXY S®4, an AT&T 4G LTE smartphone

April 1, 2015 TTCES-4819-OUT-15-039

Scott Sysum
National Older Worker Career Center, Energy Specialist
U.S. EPA Region IX, Environmental Review Office
75 Hawthorne Street CED-2
San Francisco, CA 94105
sysum.scott@epa.gov

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Sysum,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Air quality impacts (criteria pollutants) and greenhouse gases resulting from construction and operation of the Project, and how impacts will be calculated and mitigated.
- Impacts related to climate change should be identified and analyzed.
- The alternatives analysis should include a reasonable range of alternatives, and should describe how alternatives were developed and also how they were eliminated from further analysis.
- Proper consultation is conducted between the USFWS and Native Hawaiian people and mitigation measures are developed for potential impacts to cultural resources.

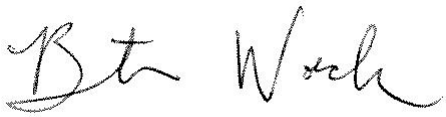
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Direct, indirect, and cumulative impacts to aquatic and terrestrial ecosystems, habitat, native plants, wildlife, bat, and avian species.
- The EIS should utilize a clear methodology for analyzing direct, indirect, and cumulative impacts; proposed mitigation measures should be identified and analyzed; and past, present, and future actions should be analyzed as part of the cumulative impact analysis.
- The EIS should address any disproportionate adverse impacts to minority and low-income populations, and should reflect coordination with those affected populations.
- Hazardous wastes, chemicals, and pesticides that will be produced or used by the Project, and how they will be stored, disposed of, and managed.
- The existing condition of the land and land uses within the wind farm site.
- Would like to see mitigation measures included in the analysis to reduce impacts to biological resources such as ecosystems, habitat, native plants, wildlife, bird and avian species.
- Would like to see mitigation measures and Best Management Practices related to water resources, including water quality, landscape irrigation, and stormwater management.
- Would like to see mitigation measures constructed to use less hazardous materials during construction and operation.
- Suggested a specific mitigation measure for inclusion in the impact analysis in the EIS.
- Noise from the wind turbines associated with construction and operation of the Project impacting sensitive receptors.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.
- Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.
- Would like to see the development of a scientifically-supportable Habitat Conservation Plan (HCP), and a description of how the HCP will be implemented.
- The EIS should include measures to monitor and control invasive plant species and noxious weeds.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the Environmental Impact Statement.
- Critical fish habitat within the wind farm site and potential impacts should be disclosed.
- Direct, indirect, and cumulative impacts to native wildlife species and habitat, as well as mitigation measures, should be identified.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Sysum, Scott** <Sysum.Scott@epa.gov>
Date: Thu, Dec 5, 2013 at 9:02 AM
Subject: Na Pua Makani HCP and DEIS-EPA R9 Scoping Comments
To: "NaPuaMakanihcp@fws.gov" <NaPuaMakanihcp@fws.gov>

ACK

Dear Sir
I have been assigned as the lead reviewer for U.S. EPA Region 9 for the Na Pua Makani Wind HCP Project Notice of Intent to prepare an Environmental Impact Statement. I have attached a pdf file of our comments. The signed letter was mailed today to Dr. Loyal Mehrhoff.

Thank you for providing us the opportunity to review this interesting project. Please feel free to contact us if you have any questions, seek clarifications or if we can help in any other way.

v/r
Scott Sysum

National Older Worker Career Center
Energy Specialist
U.S. EPA Region IX
Environmental Review Office
75 Hawthorne Street CED-2
San Francisco, CA 94105
voice-415-972-3742; fax-415-947-3562
Email: sysum.scott@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

DEC 0 5 2013

- 2013

Loyal Mehrhoff, Field Supervisor
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Subject: Notice of Intent to Prepare a Draft Environmental Impact Statement on a Proposed Incidental Take Permit for the Na Pua Makani Project, Kahuku, Hawai'i

Dear Dr. Mehrhoff:

ACK

The U.S. Environmental Protection Agency has reviewed the Notice of Intent to Prepare a Draft Environmental Impact Statement on a Proposed Incidental Take Permit for the Na Pua Makani Project, Kahuku, Hawai'i. Our comments are provided pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Parts 1500-1508) and our NEPA review authority under Section 309 of the Clean Air Act.

To assist in the scoping process for this project, we have identified several issues for your attention in the preparation of the EIS. We are most concerned about the following issues: impacts to water and air, impacts to biological resources, invasive species management, and habitat protection.

We appreciate the opportunity to review this NOI and are available to discuss our comments. Please send one hard copy of the Draft EIS and one CD ROM copy to this office at the same time it is officially filed with our Washington D.C. Office. If you have any questions, please contact me at (415) 972-3545, or contact Scott Sysum, the lead reviewer for this project. Scott can be reached at (415) 972-3742 or sysum.scott@epa.gov.

Sincerely,

Ann McPherson
Environmental Review Office
Communities and Ecosystems Division

Enclosure: EPA's Detailed Comments

Printed on Recycled Paper

ACK

PRO 4

DSC 3

ALT 3

US EPA DETAILED COMMENTS ON THE NOTICE OF INTENT TO PREPARE A DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED INCIDENTAL TAKE PERMIT FOR THE NA PUA MAKANI PROJECT, KAHUKU, HAWAI'I, DECEMBER 5, 2013

Project Description

The U.S. Fish and Wildlife Service intend to prepare a Draft Environmental Impact Statement for the Habitat Conservation Plan and Incidental Take Permit associated with the construction and operation of the proposed Na Pua Makani Project (Project). Champlin Hawai'i Wind Holdings, LLC (Champlin) has proposed to build a 45-megawatt wind power facility adjacent to the existing Kahuku Wind Farm, near the town of Kahuku, on the north shore of O'ahu, Hawai'i. Champlin intends to seek incidental take coverage for the following five federally-listed threatened and endangered species: Newell's shearwater or 'a'o, Hawaiian coot or 'alae ke'oke'o, Hawaiian moorhen or 'alae 'ula, Hawaiian stilt or ae'o, and the Hawaiian hoary bat or 'ōpe'ape'a. The State-listed endangered Hawaiian short-eared owl or pueo may also be included.

The proposed facility will consist of 14 wind turbine generators, a maintenance building, an electrical substation, overhead and underground electrical collection systems, and access roads. It is anticipated that Champlin will request the ITP coverage for a period of 20 years.

Purpose and Need

The DEIS should include a clear description of the project purpose and need, including why the USFWS and Champlin are undertaking the proposed action and what objectives are intended to be met (40 CFR 1502.13). The purpose and need statement should clearly define the scope of proposed actions that the DEIS will describe and assess for environmental effects, such as issuing the ITP, and the covered activities and conservation measures of the HCP.

> *Recommendations:*
> The purpose and need should be a clear, objective statement of the rationale for the proposed project. Discuss the proposed project in the context of the larger energy market that this project would serve.
>
> The EIS should clarify whether any covered activities and conservation measures will be assessed under separate and future environmental review. If direct and indirect effects of any covered activities and conservation measures are not to be assessed in the EIS, they should be described and included in the cumulative impacts analysis to the extent that they are reasonably foreseeable.

Alternatives Analysis

The environmental document should evaluate a broad mix of possible alternatives. We recommend that a creative and flexible approach be taken in the development of potential alternatives. National Environmental Policy Act requires evaluation of reasonable alternatives, including those that may not be within the jurisdiction of the lead agency (40 CFR Section 1502.14(c)). A robust range of alternatives

ALT 3

will include options for avoiding significant environmental impacts. The DEIS should provide a clear discussion of the reasons for the elimination of alternatives which were not evaluated in detail.

ALT 3
WIL 3

The alternatives analysis should describe the approach used to identify environmentally sensitive areas and the process that was used to designate them in terms of sensitivity (low, medium, and high). The DEIS should indicate what measures will be taken to protect important wildlife habitat areas from potential adverse effects of the proposed alternatives. We encourage habitat conservation alternatives that avoid and protect high-value habitat and create or preserve linkages between habitat areas to better conserve the covered species. The DEIS should consider alternatives that will best benefit the long-term recovery of the covered species, even if immediate environmental effects and mitigation requirements are greater than other alternatives.

DSC 3
REG 4

It is important that the habitat conservation alternatives be based on defensible science. The environmental document should include a full description and evaluation of the scientific foundation and justification for the HCP design. If not already in place, we recommend the USFWS and Champlin consider the use of a scientific advisory committee to help develop a scientifically supportable HCP.

Alternatives should be developed to maximize benefits to the covered species while minimizing negative effects to environmental resources. Based on the information provided in the NOI, the EPA anticipates the potential for impacts to aquatic resources, air quality, the environmental justice community (if present), cultural resources, and other biological resources. The environmental document should describe the potential direct, indirect and cumulative impacts of the alternatives on all environmental resources in the project area.

ALT 3
DSC 3

Recommendations:
The DEIS should describe how each alternative was developed, how it addresses each project objective, and how it will be implemented. We urge consideration of all feasible options, including creative project development and wildlife management tools, habitat restoration, and species conservation measures.

The DEIS should clearly describe the rationale used to determine whether impacts of an alternative are significant or not. Thresholds of significance should be determined by considering the context and intensity of an action and its effects (40 CFR 1508.27).

The DEIS should provide a clear discussion of the reasons for the elimination of alternatives which were not evaluated in detail.

The alternatives analysis should include a discussion of reduced acreage, reduced megawatt and modified footprint alternatives, as well alternative sites and micro-siting of wind turbine generators.

ALT 3

The EPA recommends that the DEIS identify and analyze an environmentally preferred alternative. This alternative should consider options such as downsizing the proposed project within the project area and/or relocating sections/components of the project in other areas to reduce environmental impacts.

LAN 1

The DEIS should describe the current condition of the land selected for the proposed project, discuss whether the land is classified as disturbed, and describe to what extent the land could be used for other purposes into the future.

Mitigation

MIT 1
MIT 2
ENJ 1

The EPA encourages the USFWS and Champlin to develop appropriate mitigation measures for negative effects to other environmental resources that may occur as a result of implementing the HCP covered activities and conservation measures. Resources that may require mitigation could include aquatic resources, air quality, the environmental justice community, cultural resources, and other biological resources.

Aquatic Resources

DSC 2
DSC 3

If the HCP activities that are described in the DEIS have the potential to negatively affect aquatic resources, then potential direct, indirect and cumulative effects should be described. The environmental document should fully disclose potential beneficial and/or adverse direct, indirect and cumulative effects to surface and groundwater quality and quantity, wetlands, and aquatic ecosystems.

REG 3
WAT 1
WIL 2

Recommendations:
At a minimum, the DEIS should include:

a. A discussion of compliance with Clean Water Act Section 404(b)(1) Guidelines (40 CFR 230) if alternatives propose to place fill in water of the U.S (WOUS).
b. A description of any critical fisheries habitat, especially spawning and rearing areas, and other sensitive aquatic sites such as wetlands. Past and potential beneficial uses of these areas, and potential effects from the proposed alternatives should be disclosed.
c. An analysis of potential effects to coastal zones.
d. An analysis of the potential for alternatives to cause adverse effects to water quality and aquatic habitats.

If fill to WOUS is anticipated, the EPA recommends that the USFWS and Champlin include a jurisdictional delineation for all WOUS in accordance with the 1987 *Corps of Engineers Wetlands Delineation Manual*. A jurisdictional delineation will confirm the presence of WOUS in the project area and help determine impact avoidance, or as needed, where state and federal permits would be required for activities that affect WOUS.

REG 3

Construction Stormwater Discharge Permit
The Notice of Intent does not provide the total disturbance area for the project. Given the scope of this project, it is anticipated that the project will disturb more than one acre of soil during the construction phase. Lack of vegetation and periodic disturbance due to maintenance in these areas would potentially increase sedimentation and decrease water quantity.

The Hawai'i Department of Health requires owner/operators to obtain coverage under the either a General Permit for Discharges of Storm Water associated with construction activity or a individual permit if the project will disturb more than one acre of soil. Additionally, a Stormwater Pollution

Prevention Plan, that includes erosion control measures, would need to be generated for the project and implemented on-site.

REG 3

The SWPPP would include the elements described in the Construction General Permit, including a site map(s) showing the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP also would list Best Management Practices, including erosion control BMPs that would be used to protect stormwater runoff, and include a description of required monitoring programs.

Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Guidance from other documents, such as the EPA document entitled "Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites" also could be used in the development of the SWPPP.

REG 3

Recommendation:
The EPA recommends that the applicant determine the need for a National Pollution Discharge Elimination System permit associated with construction activity. If such a permit is required, include a description of the proposed stormwater pollution control and mitigation measures in the DEIS.

Air Quality

AIR 1

The DEIS should provide a detailed discussion of air quality standards, ambient conditions, and potential air quality impacts for the project area and surrounding region. A description of current and proposed activities and their impacts on air quality, including indirect and cumulative impacts to the surrounding region, should be included. The DEIS should provide the estimated air emissions (tons per year) from the proposed project for criteria pollutants, including emissions from all construction, operation, and maintenance activities and vehicle traffic.

REG 3

Federal agencies are required by Clean Air Act Section 176(c) to assure that actions conform to an approved air quality implementation plan. If project emissions would exceed the de minimis thresholds identified at 40 CFR 51.853, the environmental document should include a conformity determination. General Conformity Regulations can be found in 40 CFR Parts 51 and 93 (58 Federal Register, page 63214, November 30, 1993).

AIR 1

Recommendations:
Existing Conditions – The DEIS should provide a detailed discussion of ambient air conditions, National Ambient Air Quality Standards, and criteria pollutant nonattainment areas in the vicinity of the project.

Quantify Emissions – The DEIS should estimate emissions of criteria pollutants from the proposed project and discuss the timeframe for release of these emissions over the lifespan of the project. The DEIS should describe and estimate emissions from potential construction activities, as well as proposed mitigation measures to minimize these emissions.

AIR 1

Specify Emission Sources – The DEIS should specify the emission sources by pollutant from mobile sources, stationary sources, and ground disturbance. This source specific information should be used to identify appropriate mitigation measures and areas in need of the greatest attention.

Greenhouse Gas Emissions – The DEIS should describe the type and annual amount (in tons per year) of greenhouse gas emissions that will result from HCP activities.

Biological Resources

DSC 2
REG 4
MIT 1

The DEIS should clearly describe direct, indirect, and cumulative impacts to wildlife and habitat and measures to avoid, minimize, and mitigate for these impacts. Emphasis should be placed on the protection and recovery of HCP-covered species due to their status or potential status under the Federal Endangered Species Act. Analysis of impacts and mitigation on covered species should include:

- Baseline conditions of habitats and populations of the covered species sufficient enough for estimates of take, and development of adequate avoidance, mitigation and conservation measures that are rationally related to anticipated take.
- A clear description of how avoidance, mitigation and conservation measures will protect and aid in the recovery of the covered species and their habitats in the project area.
- Monitoring, reporting and adaptive management efforts to ensure compliance with the HCP and species and habitat conservation effectiveness.

A comprehensive monitoring program should be designed to evaluate for impacts on bats and avian species. We suggest that the USFWS conduct pre-construction baseline surveys as well as post-construction surveys to determine the extent of mortalities and to determine the effectiveness of mitigation measures. Collision risk depends on a variety of factors related to species, numbers and behavior, weather conditions, topography, and lighting. The DEIS should identify and describe specific turbine types and their operating characteristics and consider turbine design standards that minimize adverse impacts to wildlife, particularly birds and bats. Consideration should be given to reducing perching and nesting opportunities, which may help reduce potential collisions.

REG 3
REG 4

The EPA supports the development of an HCP that is based on the "Five Point Policy" described in the 2000 addendum to the Service's HCP Handbook. We believe the environmental document would benefit from a description of how the HCP is based on guidance from the Five Point Policy in the areas of Biological Goals and Objectives, Monitoring, Adaptive Management, Permit Duration, and Public Participation. As described in the Service's HCP fact sheet, a screening process will be developed for reviewing future activities to determine whether they are covered under the HCP or whether they would require an amendment to the HCP. The environmental document should describe this process and the criteria used to screen future activities.

Recommendations:
Describe how the project will comply with the ESA.

REG 3

Discuss in the DEIS the applicability of the USFWS Land-Based Wind Energy Guidelines to the proposed project. Elaborate on siting, design, and operational modifications that will mitigate impacts.

MIT 1

Discuss design and management measures to minimize adverse impacts to wildlife and native and rare plants.

MIT 5

Consider utilizing unique types of radar technology to monitor for bird and bats.[1]

Consider a tactical shut down option during critical hours of species activity, as appropriate, to minimize adverse impacts on such species.

Consider blade feathering/idling (including on-the-spot and seasonal shutdowns), reducing cut-in speeds, and adjusting turbine speeds during strategic intervals to reduce take and to prevent mortality.

Invasive Species

REG 3

Executive Order 13112, *Invasive Species* (February 3, 1999), mandates that federal agencies take actions to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause. Executive Order 13112 also calls for the restoration of native plants and tree species. If the proposed project will entail new landscaping, the DEIS should describe how the project will meet the requirements of Executive Order 13112.

VEG 2

Recommendation:
The DEIS should include an invasive plant management plan to monitor and control noxious weeds.

Section 106 of the National Historic Preservation Act

REG 3

Section 106 of the National Historic Preservation Act, 16 U.S.C. § 470f, requires federal agencies to take into account the effects of their undertakings on historic properties and provide the Advisory Council on Historic Preservation a reasonable opportunity to comment on those undertakings. The ACHP has issued the regulations implementing Section 106, 36 CFR Part 800, "Protection of Historic Properties." The NHPA requires that, in carrying out the requirements of Section 106, each federal agency must consult with any Native Hawaiian organization that attaches religious and cultural significance to historic properties that may be affected by the agency's undertakings.

CUL 3

Recommendation:
The DEIS should describe the process and outcome of Section 106 consultation between the USFWS and any Native Hawaiian organization that has shown an interest in the covered

[1] For example, see http://www.detect-inc.com/avian.html and http://www.upi.com/Science_News/Resource-Wars/2010/03/18/Radar-reduces-wind-farm-risk-to-birds/UPI-71441268920323/. These resources are provided as examples only and do not constitute endorsement of any particular product by EPA.

activities within the project area, issues that were raised (if any), and how those issues were addressed in the selection of the proposed alternative.

REG 3

Environmental Justice and Impacted Communities

The interagency Memorandum of Understanding on Environmental Justice and Executive Order 12898 (August 4, 2011) and the Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994) directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations, allowing those populations a meaningful opportunity to participate in the decision-making process. Guidance[2] by CEQ clarifies the terms low-income and minority population (which includes American Indians) and describes the factors to consider when evaluating disproportionately high and adverse human health effects.

ENJ 1

Recommendation:
The DEIS should include an evaluation of environmental justice populations within the geographic scope of the projects. If such populations exist, the DEIS should address the potential for disproportionate adverse impacts to minority and low-income populations, and the approaches used to foster public participation by these populations. Assessment of the projects impact on minority and low-income populations should reflect coordination with those affected populations.

Noise Impacts

NOI 1

The DEIS should include an assessment of noise levels from construction, maintenance and operation of the wind turbines. Decibel levels should be evaluated as should the effects of noise levels on a variety of species, as well as effects on sensitive receptors, residences, recreational use and property values.

Visual Impacts

VIS 1

Careful attention should be given to how a wind turbine array is set against the landscape. Steps should be taken to minimize the visual impacts and make the wind turbines less obtrusive.

Hazardous Materials/Hazardous Waste/Solid Waste

MIT 4

The DEIS should address potential direct, indirect and cumulative impacts of hazardous waste from construction and operation. The document should identify projected hazardous waste types and volumes, and expected storage, disposal, and management plans. It should address the applicability of state and federal hazardous waste requirements. Appropriate mitigation should be evaluated, including measures to minimize the generation of hazardous waste (i.e., hazardous waste minimization). Alternate industrial processes using less toxic materials should be evaluated as mitigation. This potentially reduces the volume or toxicity of hazardous materials requiring management and disposal as hazardous waste.

---

[2] Environmental Justice Guidance under the National Environmental Policy Act, Appendix A (Guidance for Federal Agencies on Key Terms in Executive Order 12898), CEQ, December 10, 1997.

PRO 3

Wind Turbine Production and Recycling

Wind turbine production can address the full product life cycle, from raw material sourcing through end of life collection and reuse or recycling. Wind turbine companies can minimize their environmental impacts during raw material extraction and minimize the amount of rare materials used in the product. Collection and recycling can be facilitated through buy-back programs or collection and recycling guarantees. Some companies provide recycling programs that pay all packaging, transportation, and recycling costs.

> *Recommendation:*
> EPA recommends that the proponent strive to address the full product life cycle by sourcing wind turbine components from a company that: 1) minimizes environmental impacts during raw material extraction; 2) manufactures wind turbines in a zero waste facility; and 3) provides future disassembly for material recovery for reuse and recycling.

PRO 3

Project Decommissioning, Site Restoration and Financial Assurance

On the average, a lifespan of a wind farm is 20-30 years. The life of the proposed wind project should be taken into consideration regarding decommissioning and reclamation.

> *Recommendation:*
> The decommissioning and site restoration plan should include the following elements: cost estimates; the project owner to secure a performance bond surety bond, letter of credit, corporate guarantee, or other form of financial assurance adequate to cover the cost of decommissioning/restoration; description of the conditions when decommissioning will commence; description of time allotted to complete the decommissioning; description of the structures, facilities, and foundations to be removed; and restoration of the site by recontouring the surface and revegetation to a condition reasonably similar to the original condition.

DSC 3

Cumulative and Indirect Impacts

The cumulative impacts analysis should identify how resources, ecosystems, and communities in the vicinity of the project have already been affected by past or present activities in the project area. Characterize these resources in terms of their response to change and capacity to withstand stresses. Trends data should be used to establish a baseline for the affected resources, to evaluate the significance of historical degradation, and to predict the environmental effects of the project components.

DSC 3
WIL 1

For the cumulative impacts assessment, we recommend focusing on resources of concern or resources that are "at risk" and/or are significantly impacted by the proposed project, before mitigation. For this project, the USFWS should ensure that a thorough assessment of the cumulative impacts to bird and bat species is included, especially in the context of other wind power developments occurring nearby and on other Hawaiian islands. In general, individual projects may not significantly affect bird or bat populations, but the USFWS should look at cumulative impacts based upon the avian and bat fatalities accumulating under all future wind development scenarios in the state of Hawaii.

DAT 1

The EPA assisted in the preparation of a guidance document for assessing cumulative impacts and we recommend consideration of its use for the DEIS. While this guidance was prepared for transportation projects in California, the principles and the 8-step process outlined therein can be applied to other types of projects and offers a systematic way to analyze cumulative impacts for a project. The guidance is available at: http://www.dot.ca.gov/ser/cumulative_guidance/purpose.htm. In the introduction to the *Cumulative Impacts Section*, identify which resources are analyzed, which ones are not, and why. For each resource analyzed, the DEIS should:

DSC 3

- Identify the current condition of the resource as a measure of past impacts. For example, the percentage of species habitat lost to date.
- Identify the trend in the condition of the resource as a measure of present impacts. For example, the health of the resource is improving, declining, or in stasis.
- Identify all on-going, planned, and reasonably foreseeable projects in the study area that may contribute to cumulative impacts.
- Identify the future condition of the resource based on an analysis of impacts from reasonably foreseeable projects or actions added to existing conditions and current trends.
- Assess the cumulative impacts contribution of the proposed alternatives to the long-term health of the resource, and provide a specific measure for the projected impact from the proposed alternatives.
- When cumulative impacts are identified for a resource, mitigation should be proposed.
- Disclose the parties that would be responsible for avoiding, minimizing, and mitigating those adverse impacts.
- Identify opportunities to avoid and minimize impacts, including working with other entities.

Recommendations:
The DEIS should consider the cumulative impacts associated with multiple large-scale renewable energy projects proposed in the Hawaiian Islands and the potential impacts on various resources including: water supply, covered species, and habitat.

DSC 2

The USFWS and project proponents should consider a regional assessment of resource impacts, including cumulative impacts to avian and bat populations, given the number of wind energy projects either built or planned for the area.

ACK

Climate Change

Scientific evidence supports the concern that continued increases in greenhouse gas emissions resulting from human activities will contribute to climate change. Global warming is caused by emissions of carbon dioxide and other heat-trapping gases. On December 7, 2009, the EPA determined that emissions of GHGs contribute to air pollution that "endangers public health and welfare" within the meaning of the Clean Air Act. Potential impacts from climate change could include the following changes: poor air quality; more severe heat; increased wildfires; shifting vegetation; declining forest productivity; decreased spring snowpack; water shortages; a potential reduction in hydropower; a loss in winter recreation; agricultural damages from heat, pests, pathogens, and weeds; and rising sea levels resulting in shrinking beaches and increased coastal floods.

Recommendations:

AIR 3

The DEIS should consider how climate change could potentially influence the proposed projects, specifically within sensitive areas, and assess how the projected impacts could be exacerbated by climate change.

AIR 1
AIR 3

The DEIS should quantify and disclose the anticipated climate change *benefits* of wind energy. We suggest quantifying greenhouse gas emissions from different types of generating facilities including solar, geothermal, natural gas, coal-burning, and nuclear and compiling and comparing these values.

April 1, 2014 TTCES-4819-OUT-15-040

Theone Taala
theone.taala@byuh.edu

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

DearTheone Taala,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Short- and long-term socioeconomic impacts to the community resulting from the Project.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

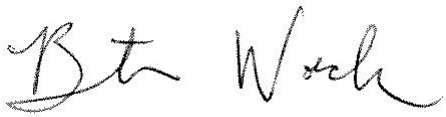
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Theone Taala** <theone.taala@byuh.edu>
Date: Tue, Nov 19, 2013 at 8:17 AM
Subject: Na Pua Makani HCP and DEIS
To: napuamakanihcp@fws.gov

Loyal Mehrhoff,

ACK

I am in total opposition of the addition of 15 500' wind turbines in Kahuku.

HAS 1
PRO 1

These turbines will be in close proximity to Kahuku schools and the Kahuku community. Independent studies have linked wind turbines to health issues that impact humans if placed in close proximity to residential areas. The proposed wind farm will be 3 times closer to our schools and residences than the existing facility. It will also be upwind - which is significant.

VIS 1
SOC 6

I am totally opposed to the wind turbines already existing in Kahuku. They are an eye sore and do not appear to benefit anyone in the islands. They are a total waste of money and time; Hawaii does not need any more wind turbines.

Theone Taala

April 1, 2015 TTCES-4819-OUT-15-041

Chris Takashige
Director, Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, HI 96813

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Takashige,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

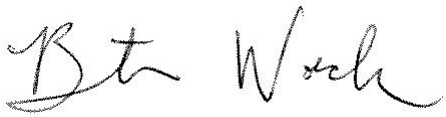
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

KIRK CALDWELL
MAYOR

CHRIS T. TAKASHIGE, P.E., CCM
DIRECTOR

MARK YONAMINE, P.E.
DEPUTY DIRECTOR

January 15, 2014

Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Mauka Tower
Honolulu, Hawaii 96813

Attn: Mike Cutbirth

Dear Mr. Cutbirth:

Subject: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawaii

ACK

The Department of Design and Construction does have any comments to offer on the environmental impact statement preparation notice.

Thank you for the opportunity to review and comment. Should there be any questions, please contact me at 768-8480.

Sincerely,

for M. Yonamine

Chris T. Takashige, P.E., CCM
Director

CTT: cf (542797)

April 1, 2015 TTCES-4819-OUT-15-042

Vasa Taualii
vasa@icloud.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Taualii,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments and testimony from the public scoping meeting. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal and verbal testimony:

- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- Power generation – specifically, what the overall capacity and daily production of the Project will be, transmission line upgrades that might be needed, how much electricity will go into the HECO grid, and how much of that electricity will stay in local communities.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed

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Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.

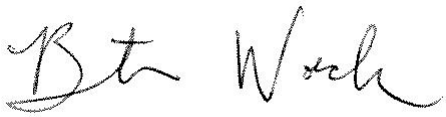
- Clarification on the purpose and need of the Project, including how the Project would fit into the larger energy market that it would serve.
- Concern that the Project would impact the quality of life for nearby communities.
- How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.
- Wind turbines impact the scenic beauty of the wind farm site, and steps should be taken to minimize visual impacts.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **vasa taualii** <vasa@icloud.com>
Date: Wed, Jan 22, 2014 at 5:22 PM
Subject: re: Questions re Makani HCP & EIS wind turbin project in Kahuku by Champlin HI Wind Holdings
To: napuamakanihcp@fws.gov

To Whom It May Concern:

SOC 3
HAS 1
PRO 1

I am a long-standing resident in the Laie/Kahuku area and have serious concerns regarding the wind-turbine project anticipated by Champlin HI Wind Holdings, LLC. If allowed to go through, it will reduce the quality of life for area residents by affecting their health and especially impact the health issues of our children. The placement of the wind turbines in close-proximity to the Kahuku Elementary and High Schools and the homes of the local residents is in total disregard for studies which have already been done and can be verified by the Canadian Physicians website, cases of residents living in the wind-turbine areas who suffer from the negative impact of the noise, flicker and ultra-sound influence. i have the following questions:

SOC 6

1. I understand the millions of dollars to be made by the makers of Wind Turbines, the Developer, the State and private land holders subsidized by our tax dollars, but what are the specific and direct short/long-term benefits to the community as a whole?

PRO 3
PRO 4

2. If the purpose of wind turbines is to reduce fossil fuel usage, what specific studies have been made to indicate the off-setting costs of wind turbine installations. While the wind is "free," the costs of equipment, labor, land and continual maintenance are not.

PRO 2
SOC 4

3. The wind is not always constant and, therefore, there is down-time when the turbines are not turning efficiently,
what studies have been done to factor in this aspect in the cost of electricity, what are the costs for constant maintenance of the wind turbines.

SOC 4

4. If the ultimate aim is to reduce electrical costs to the area, how does taking the wind from this area to generate electricity for the "whole grid" reduce our electrical costs? Will Champlin HI Wind Holdings, LLC., guarantee residents a reduction in their electrical monthly bills and how soon will residents see this difference? How much of a savings will this add to our current electrical bill and when would this take place?

SOC 4

5. If the total costs of the wind turbine project initially raises the costs of our current electrical bills, how much will this increase be? At what point in the project do residents begin to see a "savings and reduction" in their current
electrical bill and for how long into the project?

SOC 4

6. If the project is for only a 20-year period, how soon into the 20-year period do residents wait to: l) See an increase in their electrical bill as a result of the wind turbines and by what percent of increase? 2) How long do residents keep paying for

SOC 4

this increase before they experience the promise of "reduction of electrical bills?"
3) What is the specific time-period? 4) If residents keep paying for this increase, does this mean that not only is the wind turbine project being subsidized by our tax dollars, but residents are also paying for that increase in costs. This would mean as residents, we are paying twice for the cost of electricity: once for the initial costs of the project which increases the cost of our electricity then we are having to keep paying for that increase (the costs will never go down) to maintain this project. So the big question is, how is it that we save on electrical costs from our present costs?

PRO 3

4. Who pays for the costs of maintaining the wind turbines and are these costs passed on to the consumers? Again, as tax payers, we would be paying twice, once for the initial project and then to pay for high costs of maintaining this project which keeps our electrical costs going higher and higher. Is this just?

SOC 4

5. At the end of the 20-year period, will Champlin HI Wind Holdings, LLC make available the data of the real "pay off to the consumers?" Since the prevailing reason given is that the project will reduce the costs of electricity, will there be data available to substantiate this?"

SOC 6

6. Will there also be data that will specify how much fossil-fuel-savings made as the result of the wind-turbine project compared to the total of all costs related to the initial installation, maintenance over the 20-year period? It is important to area residents to know all this information.

PRO 3

7. What will happen after the 20-year period? Who will pay for the dismantling of the wind turbines after this period?

HAS 1

8. What are other studies available by physicians who are treating residents living in approximate wind-turbine areas? Will Champlin HI Wind Holdings, LLC, be responsible for any resulting physical injuries to children and adults as a result of noise, flicker, ultrasound disturbances? Resident physicians know the state of the health of residents before the wind turbines and after the wind turbines. Will Champlin HI Wind Holdings, LLC., sign a statement of responsibility for the after affects of wind turbine impact on their health?

PRO 3

9. Info on the internet states that turbines can sometimes spin at 180 miles an hour, what are the means of measuring the speed of the turbines and also the average daily speed of the turbine? Will the public have access to this information?

SOC 4

10. Will the public have a monthly, quarterly report of how much total electricity generated from these turbines and how this data reduces/increases monthly electrical bills?

VIS 2

I respect the need for reducing fossil fuel usage but can we be assured that we are not replacing fossil fuel for an alternative that brings other equally pressing long-term issues. I love my community and the children and families who reside in this area who are immediately affected. We are also giving up the "beauty of our environment." There is nothing that sticks out like a sore thumb among our beautiful mountains and greenery than wind turbines which reduces the natural beauty for which residents and tourists alike have enjoyed to date. All you have to do is look at the existing wind mills and know immediately how much they reduce Hawaii's ambiance.
I strongly oppose this project for many other reasons the least of which it reduces the spirit of our culture as wind turbines prevents us from enjoying our mountains and surrounding land.

Sincerely,

Vasa Taualii

ACK

5. If the initial costs of the wind-turbine machinery and equipment, the installation and maintenance, land, road costs and other associated costs to build and maintain this project are available, will this data be readily available to area residents since this project is being subsidized by our tax dollars.

TETRA TECH

April 1, 2015 TTCES-4819-OUT-15-043

Herman Tuiolosega
Senior Planner
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, HI 96813

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Tuiolosega,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Direct, indirect, and cumulative impacts to public health, visual resources, and socioeconomics for communities nearby.
- The EIS should utilize a clear methodology for analyzing direct, indirect, and cumulative impacts; proposed mitigation measures should be identified and analyzed; and past, present, and future actions should be analyzed as part of the cumulative impact analysis.
- Noise from the wind turbines associated with construction and operation of the Project impacting sensitive receptors.
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed

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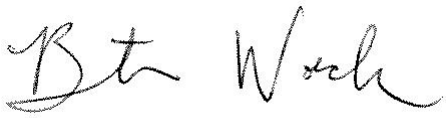
for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.

- Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

NEIL ABERCROMBIE
GOVERNOR

VACANT
DIRECTOR

STATE OF HAWAI'I
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
Department of Health
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813
Telephone (808) 586-4185
Facsimile (808) 586-4186
Email: oeqchawaii@doh.hawaii.gov

January 23, 2013

TO: William J. Aila, Jr., Chairperson
Department of Land and Natural Resources

FROM: Herman Tuiolosega, Senior Planner
Office of Environmental Quality Control

SUBJECT: Na Pua Makani Wind Project, O'ahu Environmental Impact Statement Preparation Notice (EISPN)

The Office of Environmental Quality Control has reviewed the subject EISPN you submitted for publication in the December 23, 2013 issue of The Environmental Notice, and offer these comments:

REG 1

1. The EISPN explains the process well (including associated permits) and provides useful background information. However, as consultation is a very important part of the HEPA process and the direct to EIS option omits one layer of public participation that would otherwise occur through the EA process, it is important for agencies and preparers to undertake comprehensive consultation prior to and during the preparation of the Draft EIS (DEIS).

PRO 3

2. Although the design and development of the Na Pua Makani Wind Project are still in early stages, a sufficient amount of project description detail is necessary to help readers fully understand the proposed action.

   The EISPN identifies that the project consists of the construction of up to 15 turbines. Along with the supporting infrastructure that currently includes met towers, access roads, wind turbine assembly lay down areas, overhead and underground transmission and collector lines, and may also include an on-site substation, and an operations and maintenance building. It is recommended to describe these project components in much more detail to help readers to submit more refined scoping comments in the review of the DEIS. Further background information and project detail may also assist readers in commenting on the particular items you are seeking input on listed on page 3 of the EISPN. It's

important to stress that an EIS should convey information succinctly in easily understandable forms and address the environmental effects.

DSC 3
PRO 3

3. The TMKs are provided on the publication form and the EISPN includes a section that describes the existing conditions of the parcels and a project vicinity map. However, detailed maps that clearly illustrate the size of the parcels, existing agricultural uses, the topography, etc. are not included in the EISPN document. This makes it difficult to get a sense of the receiving environment and the potential impacts of the proposed wind turbines. It is recommended to include detailed maps and accurate visual representations of the wind turbines in the DEIS. Clarification on how the assessment would identify environmentally sensitive areas and how mitigation planning for these potential impacts will also be useful.

REG 3

4. The NA Pua Makani Wind Project EISPN explains the process and the intention to prepare a joint HEPA/NEPA document. It is noted that the Notice of Intent (NOI) was published in the Federal Register on Tuesday, November 5, 2013 and contains similar information that is presented in the EISPN. It's important to remember that NEPA documents do not sufficiently address all issues of concern in Hawaii. In particular cultural impact and environmental justice assessments are areas where content requirements may differ. To assist DLNR in identifying the HEPA EIS content requirements (prescribed in Section 11-200-18, HAR), it is recommended to clearly identify these elements in the document.

NOI 1
DSC 1

5. Also, it may be helpful for you to know that a recent EIS for a wind turbine project on O'ahu raised community concerns, due to a visual impact study that some residents considered a misrepresentation of the now built turbines. The noise impacts were also identified by community members as an area for concern. Therefore, both a robust visual impact assessment and noise analysis are recommended in the DEIS.

ACK

Thank you for the opportunity to comment on the subject document. Feel free to contact Genevieve Hilliard at (808) 586-4185 for any questions.

Copy: Champlin Hawai'i Wind Holdings, LLC

April 1, 2015 TTCES-4819-OUT-15-044

Cindy Tutor
55-488 Iosepa St
Laie, HI 96762
tutorc@hotmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Tutor,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittals:

- Would like to see alternative energy solutions analyzed, including solar, geothermal, personal photovoltaic systems, and geothermal as part of the alternatives analysis.
- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Recommended specific studies and reports to be reviewed for inclusion in the EIS, or made data requests related to specific issues for inclusion in the EIS.
- Recommended visual simulations of the Project be included in the EIS
- The EIS should address any disproportionate adverse impacts to minority and low-income populations, and should reflect coordination with those affected populations.

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Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

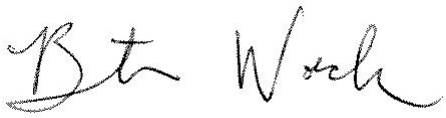
- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- Safety impacts to community members related to wind turbine mechanical issues, such as blade throw or turbine collapse should be discussed and analyzed.
- The existing condition of the land and land uses within the wind farm site.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- The City and County of Honolulu setback distance regarding proximity of wind turbines to residences is insufficient and must be updated to reflect safe distances.
- The construction and operation of the Project must be in compliance with all federal, state, and county regulations, plans, and policies; Champlin must obtain applicable federal, state, and county permits.
- Concerned about the details of the community benefits package.
- How would the Project contribute to a savings on the electrical bills of local residents, and how soon once the Project is operational could residents begin to see any potential savings.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Cindy Tutor** <tutorc@hotmail.com>
Date: Wed, Jan 22, 2014 at 10:04 PM
Subject: Na pua Makani HCP and EIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>, "william.j.aila@hawaii.gov" <william.j.aila@hawaii.gov>, "Brita.Woeck@tetratech.com" <brita.woeck@tetratech.com>

HAS 1

Aloha,
I'm writing in opposition to Na Pua Makani Wind Project by Champlin/West Wind Works, docket #2013-0423 for the following reasons:

Health Impact - loss of sleep, lack of concentration, heart palpitations, lethargy, motion sickness, depression.

DAT 1
HAS 1

Attached are 3 documents

1-Wind Turbine Noise: What Audiologists Should Know
2-Bruce McPherson's Infrasound and Low Frequency Noise Study
These are excellent studies on the effects of Wind Turbines on health which show how detrimental the effects of industrial wind turbines on nearby residents.

The third attachment, WTS (Wind Turbine Syndrome) and Health Effects contains the findings of a panel of doctors including Dr. Robert McCunney hired by AWEA (American Wind and Energy Association). Mike Cutbirth was formerly the director of AWEA and is now the developer for the Na Pua Makani Wind Project. I would be highly suspicious of the motivation behind McCunney and his findings.

REG 2

Setback is not far enough-industry standards recommend it should be a minimum of 5 times the wing span. Choosing to err on the side of caution, I suggest 2 miles which would eliminate almost all possible health impacts.

SOC 1
SOC 4

Community benefits although Kahuku and it's surrounding communities will be the ones who will bear the burden of living with the noise, possible dangers, and unsightliness, they are not given any long term benefits of HECO credits or other compensations. The financial benefits from the former project went to organizations outside of Kahuku. KAHUKU HAS NOT BENEFITTED AT ALL FROM THE FIRST WIND PROJECT. Therefore, there is a ZERO degree of confidence that they will benefit from any future projects.

REG 3

Contradicts the Ko'olauloa SCP Vision "to preserve the region's overall rural character and its
natural, cultural and scenic resources."

ALT 2

Other locations-The Federal Government and DOD owns land further inland that would be more desirable locations for the wind turbines. That seems like a win-win situation. The Federal Govt can benefit from lease revenues as well as HECO payments.

ACK

I beg of you to please consider these and other objections presented by other community members as you contemplate the approval of this project. I am Cindy Fonoimoana Tutor, a resident of Ko'olauloa for 45+ years. I oppose the Na Pua Makani Wind Project.

Mahalo for your Kokua!
Cindy F. Tutor
55-488 Iosepa St.
Laie, HI 96762

From: Cindy Tutor [mailto:tutorc@hotmail.com]
Sent: Thursday, January 23, 2014 12:05 AM
To: napuamakanihcp@fws.gov; william.j.aila@hawaii.gov; Woeck, Brita
Subject: Na pua Makani HCP and EIS

HAS 1

Aloha,
I'm writing in opposition to Na Pua Makani Wind Project by Champlin/West Wind Works, docket #2013-0423 for the following reasons:

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SOC 1
SOC 4

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ACK

I beg of you to please consider these and other objections presented by other community members as you contemplate the approval of this project. I am Cindy Fonoimoana Tutor, a resident of Ko'olauloa for 45+ years. I oppose the Na Pua Makani Wind Project.

Mahalo for your Kokua!
Cindy F. Tutor
55-488 Iosepa St.
Laie, HI 96762

---------- Forwarded message ----------
From: **Cindy Tutor** <tutorc@hotmail.com>
Date: Mon, Dec 2, 2013 at 5:36 PM
Subject: I oppose the proposed wind farm projects in Kahuku
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

ACK

Aloha,
I oppose the new wind farm projects in Kahuku!

The majority of the community is against it as well. Do not believe the Kahuku Community Association President and her grandfather who are railroading these project through without the knowledge or consent of the other officers. Jr. Primacio did not disclose to the association and other officers, information regarding the THIRD proposed project! Something is very wrong here!

ALT 2
SOC 4

The Koolauloa communites should not sacrifice any more land, sleep or scenery for the sake of the rest of the island. There's lots of wind in other areas on the island. The community does NOT receive any benefits from the current wind farm. No one's electric bill has decreased since the First Wind install. Nor do they get any power from the wind mills in the event of a power outage. This is not about "not in my backyard". This is about sharing the costs and benefits.

REG 2
LAN 1

The law regarding the proximity of windmills to residences must be updated. It was originally written when windmills were proportionally smaller. The proposed farms could be installed a mile further inland. It is unwise to restrict the Kahuku Community's growth by more of these Goliath turbines.

ACK

In 1980 the largest wind turbine in the world was installed in Kahuku. It operated for a few years and then died. After which we had to put up with the monstrosity for almost 10 years as it slowly decayed and rusted.

Yes, we need alternative energy and wind may be a viable option. Just not so close to residential areas no matter where on the island they are.

Please DO NOT approve the Kahuku Wind Farm Project.

Mahalo,
Cindy Tutor

---------- Forwarded message ----------
From: **Cindy Tutor** <tutorc@hotmail.com>
Date: Mon, Dec 2, 2013 at 6:22 PM
Subject: Na Pua Makani HCP and DEIS
To: "napuamakanihcp@fws.gov" <napuamakanihcp@fws.gov>

ACK

Aloha,
Please DO NOT approve the Kahuku Wind Farm Project.

PRO 1
REG 2
HAS 2

The law regarding the proximity of windmills to residences must be updated. It was originally written when windmills were proportionally smaller. It is unsafe to install more of these Goliath turbines so close to the community and especially elementary and high school structures. The proposed wind farms will be significantly closer to the community than the current ones. AND the schools will be down hill from them. Should a catastrophic event occur causing the blades to come off, it is reasonable to believe that the children could be in danger.

ALT 1

Yes, we need alternative energy and wind may be a viable option. New technology exists that does not require such a large footprint.

Please DO NOT approve the Kahuku Wind Farm Project.

Mahalo,
Cindy Tutor

April 1, 2015 TTCES-4819-OUT-15-045

Tim Vandeveer
Co-Chair, Defend Oahu Coalition
defendoahucoalition@gmail.com

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Vandeveer,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- Health impacts resulting from noise (infrasound and audible) such as headaches, loss of sleep, and lack of concentration as well as health impacts resulting from shadow flicker that may affect community members who live within close proximity to the Project should be discussed and analyzed.
- The proposed locations for the wind turbines are too close to residences and schools, and potential impacts should be analyzed. The EIS should show distances from the closest turbines to the elementary and high schools, the community boundary, and nearest residences.
- The construction and operation of the Project must be in compliance with all federal, state, and county regulations, plans, and policies; Champlin must obtain applicable federal, state, and county permits.

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1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

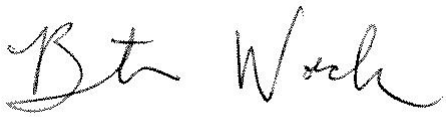
- Concern that the Project would impact the quality of life for nearby communities.
- Short- and long-term socioeconomic impacts to the community resulting from the Project.

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **DOC** <defendoahucoalition@gmail.com>
Date: Wed, Dec 4, 2013 at 9:01 PM
Subject: Na Pua Makani HCP and DEIS
To: napuamakanihcp@fws.gov

To whom it may concern-

ACK

The Defend Oahu Coalition is a diverse group of community residents, environmentalists, activists and religious leaders, all working together toward one immediate goal: protecting communities on Oahu from the dangerous effects of large scale development. As such, Defend Oahu Coalition is opposed to the large scale windmill development currently being proposed in the Na Pua Makani Draft Environmental Impact Statement (DEIS).

SOC 6
REG 3

Our coalition and the vast majority of Hawai'i residents are in strong support of renewable energy development (including solar, wave and wind) in our islands. Regardless of the source however, renewable energy developers must consider impacts that projects would have on residents as well as the sentiment of potential host communities in regard to proposed development. Large scale projects (such as wind farms) must be properly vetted and reviewed before being allowed to move forward. It is crucial that developers address resident concerns regarding size, scale and safety, and build consensus amongst those who would be affected most.

ACK

Our communities are tight-knit, especially in the rural Oahu, and if large scale energy development is perceived as dangerous or forced upon an unwilling public, it threatens the success of all renewable projects because developers are seen as putting profits ahead of people. This is unacceptable. As Dr. Martin Luther King Jr. said "injustice anywhere is a threat to justice everywhere." Defend Oahu Coalition works on land use policy and enforcement so we can realize a future for our island home that is truly sustainable. We recognize the role that renewable energy plays and are committed to ensuring that nothing threatens that future.

HAS 1
PRO 1
SOC 3

The Kahuku Community Association (KCA) has taken a position against any additional wind mills in the area, yet this developer is quietly moving ahead against the wishes of the host community. For this project in particular, residents have serious safety concerns that have not been addressed. Independent studies have linked wind turbines to negative health impacts for humans if placed in close proximity to residential areas. The proposed Na Pua Makani wind farm will be three times closer to schools and residences than the existing wind turbines. Also significant is the way in which the windmills would be situated upwind of many homes. This could also result in substantial negative impacts on the quality of life for many residents.

WIL 3

As the accepting authority, U.S. Fish and Wildlife should also insist that potential impacts on native fauna (i.e. bats or birds from the nearby James Campbell Wildlife Refuge) be rigorously studied and that developers make sure that minimal loss of wildlife occurs before the project is allowed to move forward.

ACK

For these reasons Defend Oahu Coalition opposes the wind farm project currently being proposed in the Na Pua Makani DEIS.

Mahalo for your time.

Tim Vandeveer
Co-Chair, Defend Oahu Coalition
808-388-0660
www.defendoahucoalition.org

April 1, 2015 TTCES-4819-OUT-15-046

Daniel Whitney
Colonel
U.S. Army Installation Management Command, Pacific Region
851 Wright Ave
Wheeler Army Airfield
Schofield Barracks, HI 96857-5000

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Col. Whitney,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- An alternate location for the Project should be analyzed (e.g. moving turbines further inland, different location on Oahu) due to the current Project's close proximity to the community and schools.
- Potential negative impacts to U.S. Army training facilities located adjacent to the wind farm site should be analyzed.
- Compliance with both the NEPA and HEPA processes for public scoping and outreach, that community members and agencies have been adequately consulted during scoping, and will continue to be consulted with during the entire planning process.

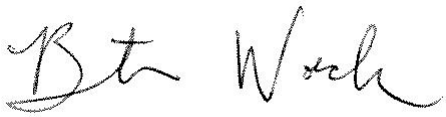
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

As you are aware, we are engaging in ongoing coordination with the Department of Army.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Naki, Brenda A CIV (US)** <brenda.a.naki.civ@mail.mil>
Date: Wed, Jan 22, 2014 at 2:25 PM
Subject: Sent on behalf of COL Daniel Whitney - USAG-HI (UNCLASSIFIED)
To: "NaPuaMakanihcp@fws.gov" <NaPuaMakanihcp@fws.gov>
Cc: "governor.abercrombie@hawaii.gov" <governor.abercrombie@hawaii.gov>, "susan.n.richey@hawaii.gov" <susan.n.richey@hawaii.gov>, "mayor@honolulu.gov" <mayor@honolulu.gov>, "loyal_mehroff@fws.gov" <loyal_mehroff@fws.gov>

Classification: UNCLASSIFIED
Caveats: NONE

Aloha Mr. Cutbirth,

ACK

As requested, please see attached letter sent on behalf of COL Daniel Whitney, Commander, U.S. Army Garrison, Hawaii.

v/r,
Brenda Naki
Office of the Garrison Commander
(808) 656-1153

Classification: UNCLASSIFIED
Caveats: NONE

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND, PACIFIC REGION
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
851 WRIGHT AVENUE, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5000

REPLY TO
ATTENTION OF:

January 21, 2014

Office of the Commander

Mr. Mike Cutbirth
Champlin Hawaii Wind Holdings, LLC
2020 Alameda Padre Serra, Suite 123
Santa Barbara, CA 93103

Dear Mr. Cutbirth:

ACK

LAN 3
ALT 2

REG 1

I am writing to comment on your proposed wind project at Kahuku, Oahu, Hawaii. The land for the Na Pua Makani project borders the United States Army Garrison – Hawaii (USAG-HI) Kahuku Training Area (KTA). The KTA is an active Army training area where helicopter operations and ground maneuver training are performed throughout the year by Army and Marine units. KTA is the site of the recently completed Combined Arms Collective Training Facility (CACTF).

The proposed Na Pua Makani project would have a significant negative impact on U.S. Army training in the KTA and the CACTF. The operation of fifteen 440 ft. wind turbines directly adjacent to this USAG-HI training area will be detrimental to aviation training operations and unmanned aerial vehicle (UAV) use. Ground maneuvers will also be negatively impacted by interference with radio transmissions and GIS transmitters. Therefore, I am requesting that you select an alternative location for your project.

USAG-HI has not been engaged by your community outreach program and the existence of the Kahuku Training Area is not acknowledged in the description of existing conditions for the project. Further communication regarding your project may be forthcoming from the Department of Defense. However, as USAG-HI Garrison Commander, I am transmitting my comment now to meet the deadline of January 22, 2014.

Sincerely,

Daniel W. Whitney
Colonel, U.S. Army
Commanding

CF:
Brita Woeck
Governor Neil Abercrombie
Mayor Kirk Caldwell
Mr. William Aila
Dr. Loyal Mehrhoff

April 1, 2014 TTCES-4819-OUT-15-047

Casey Willis
Infinity Wind Power
3760 State St., Suite 102
Santa Barbara, CA 93105

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Willis,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

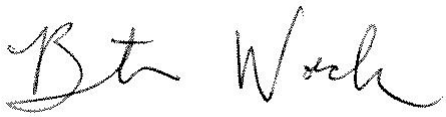
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

---------- Forwarded message ----------
From: **Casey Willis** <cwillis@infinitywind.com>
Date: Sat, Nov 9, 2013 at 12:41 PM
Subject: Na Pua Makani Distribution List
To: "NaPuaMakanihcp@fws.gov" <NaPuaMakanihcp@fws.gov>

To whom it may concern,

ACK

Can you please add my email list to the distribution list for the Na Pua Makani ITP application.

Thanks,

Casey Willis

Infinity Wind Power

3760 State St., Suite 102 | Santa Barbara, CA 93105

O 805.569.6185 | M 805.701.1979 | F 805.569.6190

April 1, 2015 TTCES-4819-OUT-15-048

Alec Wong, PE
Chief
Department of Health, Clean Water Branch
PO Box 3378
Honolulu, HI 96801

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Wong,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

- The construction and operation of the Project must be in compliance with all federal, state, and county regulations, plans, and policies; Champlin must obtain applicable federal, state, and county permits.

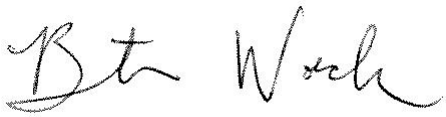
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,

Tetra Tech Inc.



Brita Woeck

Project Manager, Na Pua Makani Wind Project EIS

Cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC

Alicia Oller, Tetra Tech, Inc.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMO/CWB

12076PCTM.13

December 26, 2013

Mr. Mike Cutbirth
Tetra Tech, Inc.
737 Bishop Street, Suite 2340, Mauka Tower
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

SUBJECT: Comments on the Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project Kahuku, Island of Oahu, Hawaii

REG 3

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated December 20, 2013, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/10/CWB_Oct22.pdf

REG 3

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. National Pollutant Discharge Elimination System (NPDES) permit coverage is required for pollutant discharges into State surface waters and for certain situations involving storm water (HAR, Chapter 11-55).

   a. Discharges into Class 2 or Class A State waters can be covered under an NPDES general permit only if all of the NPDES general permit requirements are met. Please see the DOH-CWB website (http://health.hawaii.gov/cwb/) for the NPDES general permits and instructions to request coverage.

REG 3

b. All other discharges into State surface waters and discharges into Class 1 or Class AA State waters require an NPDES individual permit. To request NPDES individual permit coverage, please see the DOH-CWB forms website located at: http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/forms/

c. NPDES permit coverage for storm water associated with construction activities is required if your project will result in the disturbance of one (1) acre or more of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. NPDES permit coverage is required before the start of the construction activities.

   Land disturbance includes, but is not limited to clearing, grading, grubbing, uprooting of vegetation, demolition (even if leaving foundation slab), staging, stockpiling, excavation into pavement areas which go down to the base course, and storage areas (including areas on the roadway to park equipment if these areas are blocked off from public usage, grassed areas, or bare ground).

3. If your project involves work in, over, or under waters of the United States, it is highly recommend that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 438-9258) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

12076PCTM.13

ACK

If you have any questions, please visit our website at: http://health.hawaii.gov/cwb, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Darryl Lum for AW

ALEC WONG, P.E., CHIEF
Clean Water Branch

CTM:rh

April 1, 2015 TTCES-4819-OUT-15-049

Leo R. Asuncion
Acting Director
Office of Planning
State of Hawaii
P.O. Box 2359
Honolulu, HI 96804

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Asuncion,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives. Note that the Draft EIS will include a discussion of the proposed Project's conformance with land use plans and policies.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

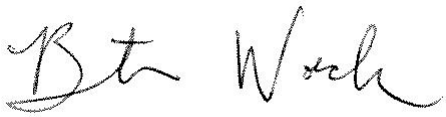
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the Environmental Impact Statement.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

OFFICE OF PLANNING
STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
ACTING DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-14590

December 1, 2014

Mr. Mike Cutbirth
Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Mauka Tower
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

Subject: Environmental Impact Statement Preparation Notice – Na Pua Makani Wind Project, Kahuku Hawaii, TMK: (1) 5-6-008:006 (por); (1) 5-6-006:018, 32, 33, 34, 35, 47, 48, 49, 50, 51, 52, 54, 55, 56 (por); (1) 5-6-074:005:018 (por)

Thank you for the opportunity to provide comments on the Environmental Impact Statement Preparation Notice (EISPN) for the proposed Na Pua Makani Wind Project. It is our understanding that this project proposes to construct a wind farm generating a capacity of approximately 25 megawatts, consisting of 10 wind turbines, an onsite substation, operations and maintenance facilities, an electrical collection system, a 34.5 kilowatt HECO-owned transmission line, and grid construction access route along existing public roadways.

Based on our review of the documents provided to our office, by letter dated November 8, 2014, we have the following comments to offer:

1. The Office of Planning (OP) provides technical assistance to state and county agencies in administering the statewide planning system set forth in Hawaii Revised Statutes (HRS) Chapter 226, the Hawaii State Plan. The Hawaii State Plan provides goals, objectives, priorities, and priority guidelines for growth, development, and the allocation of resources throughout the State. The Hawaii State Plan includes diverse policies and objectives of state interest including but not limited to the economy, agriculture, the visitor industry, federal expenditure, the physical environment, facility systems, socio-cultural advancement, and sustainability.

   The Draft Environmental Impact Statement (Draft EIS) should include an analysis on the Hawaii State Plan, HRS Chapter 226, in a section that addresses the project's conformity or conflict with state and county plans, policies, and controls. The analysis should include a discussion on the project's ability to meet all of the objectives and policies listed in HRS Chapter 226.

REG 3

2. OP is the lead agency for the Hawaii CZM Program. The coastal zone management area is defined as "all lands of the State and the area extending seaward from the shoreline to the

limit of the State's police power and management authority, including the U.S. territorial sea" see HRS § 205A-1 (definition of "coastal zone management area").

REG 3

The Draft EIS shall include a statement in a section that addresses how the project conforms or is in conflict with state and county plans, policies, and controls. The statement should include a discussion of the proposed project's ability to meet all of the objectives and policies set forth in HRS § 205A-2. Where a conflict or inconsistency exists, the statement must describe the extent to which the applicant has reconciled its proposed action with this statute. These objectives and policies include: recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection, and marine resources.

REG 3

3. The national Coastal Zone Management Act requires direct federal activities and development projects to be consistent with approved state coastal programs to the maximum extent practicable. OP is the lead state agency to conduct this evaluation. This project may need to be evaluated on Federal Consistency requirements since the project will require United States Army Corps of Engineers Clean Water Act Section 401, 402, and 404 approval.

WAT 1

4. The information provided to our office does address storm water runoff and drainage. Please consider utilizing OP's *Stormwater Impact Assessment* to identify and evaluate information on hydrology, stressors, sensitivity of aquatic and riparian resources, and management measures to control runoff occurrences. In particular, please examine the section on Low-Impact Development Concepts, which include decentralized micro-scale controls that infiltrate, filter, store, re-use, evaporate, and detain runoff close to its source.

   This guidance document will assist in integrating stormwater impact assessment within your review process. The purpose of this document is to provide guidance on assessing stormwater impacts in the planning phase of project development. The goal is to provide a suggested framework and various tools for integrating stormwater impacts assessment. These concepts are listed on pages 14-16 of the *Stormwater Impact Assessment* guidance. This can be found at http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_stormwater_impact_assessments_guidance.pdf.

If you have any questions regarding this comment letter, please contact Josh Hekekia of our Hawaii CZM Program at 587-2845.

Sincerely,

Leo R. Asuncion
Acting Director

April 1, 2015 TTCES-4819-OUT-15-050

Ford N. Fuchigami
Director of Transportation
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, HI 96813-5097

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments, STP 8.1725

Dear Mr. Fuchigami,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

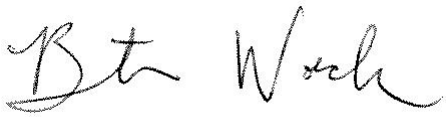
- Would like to see more detail on the Proposed Action and Project components (in text and represented graphically), including: wind turbine components, specifications, and materials needed for construction of turbines; turbine upgrades (if needed); the locations of turbines, collection lines, and point of interconnection; access road construction and maintenance; plans for turbine operations and maintenance; and plans for decommissioning and site restoration.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

DAVID Y. IGE
GOVERNOR

FORD N. FUCHIGAMI
INTERIM DIRECTOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
STP 8.1725

December 10, 2014

Mr. Mike Cutbirth
Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Mauka Tower
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

Subject: Na Pua Makani Wind Project
Environmental Impact Statement Preparation Notice (EISPN)
Kahuku, Oahu
TMK: (1) 5-6-008:006, var.; 5-6-005:018

Our Department of Transportation's (DOT) comments on the subject project are as follows:

Airports Division

PRO 3

1. The developer should provide specific geographic locations for the wind turbines, permanent and temporary met towers, and any temporary construction equipment, such as, but not limited to cranes, so that they may be included in aeronautical charting to ensure aircraft operators are aware of the potential hazard.

REG 3

2. The developer should submit Federal Aviation Administration Advisory (FAA) Form 7460-1 "Notice of Proposed Construction or Alteration," for construction of the proposed horizontal-type wind turbine. Additionally, a copy of the FAA determination should be submitted to the Airports Division.

Highways Division

REG 3

The subject project is not expected to significantly impact the State highway facility. However, the developer and their contractors shall conform to established procedures for movement of large and oversized loads on State highway facilities.

If there are any questions, please contact Mr. Norren Kato of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Sincerely,

FORD N. FUCHIGAMI
Interim Director of Transportation

April 1, 2015 TTCES-4819-OUT-15-051

Louis M. Kealoha
Chief of Police
City and County of Honolulu
801 South Beretania Street
Honolulu, HI 96813

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Kealoha,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

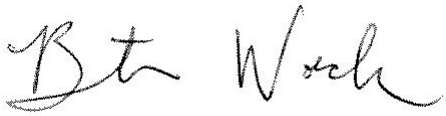
Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE MT-DK

November 18, 2014

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
Mauka Tower
737 Bishop Street, Suite 2340
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

This is in response to a letter (dated November 8, 2014) from Brita Woeck of Tetra Tech, Inc., requesting comments or concerns on an Environmental Impact Statement Preparation Notice for the Na Pua Makani Wind Project in Kahuku.

ACK

This project should have no significant impact on the services or operations of the Honolulu Police Department.

If there are any questions, please call Major Ryan J. Borges of District 4 (Kailua-Kaneohe-Kahuku) at 723-8639.

Thank you for the opportunity to review this project.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By
MARK TSUYEMURA
Management Analyst VI
Office of the Chief

Serving and Protecting With Aloha

April 1, 2015 TTCES-4819-OUT-15-052

Ernest Y. W. Lau, P.E.
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Lau,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in your submittal:

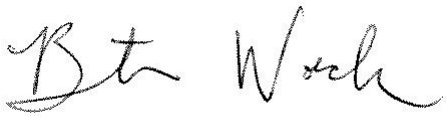
- Fire hazards associated with the Project's construction and operation including facility electrical failure and the identification of appropriate safety measure to address fire preparedness and emergency response.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits. The construction drawings will be submitted to the Board of Water Supply for review.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

November 26, 2014

KIRK CALDWELL, MAYOR

DUANE R. MIYASHIRO, Chair
ADAM C. WONG, Vice Chair
MAHEALANI CYPHER
THERESIA C. McMURDO
DAVID C. HULIHEE

ROSS S. SASAMURA, Ex-Officio
ROSS M. HIGASHI, Ex-Officio

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

Subject: The Letter Dated November 8, 2014 on the Environmental Impact Statement Preparation Notice for the Na Pua Makani Wind Farm Project in Kahuku - Tax Map Key: 5-6-008: 006; 5-6-006: 018, 32, 33, 34, 35, 47, 48, 49, 50, 51, 52, 54, 55, 56, 5-6-005:018

Thank you for the opportunity to comment on the proposed wind farm project.

REG 3

The project is in the vicinity of Board of Water Supply (BWS) Kahuku wells, transmission mains and 228' reservoir. We have future plans to install a second reservoir at the site and will require sufficient setback around the entire facility. The construction drawings should be submitted to BWS for review.

HAS 3

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division, at 748-5443.

Very truly yours,

for ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

April 1, 2015 TTCES-4819-OUT-15-053

Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, HI 96801-3378

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments, EPO 14-242

Dear Ms. McIntyre,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issue was raised in your submittal:

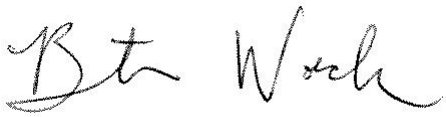
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. This topic will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:
EPO 14-242

November 10, 2014

Mr. Mike Cutbirth
C/O Tetra Tech, Inc.
737 Bishop St., Suite 2340
Mauka Tower
Honolulu, Hawaii 96813
Via email to: brita.woeck@tetratech.com

Dear Mr. Cutbirth:

SUBJECT: Na Pua Makani Wind Project, Koolauloa

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your correspondence, dated November 8, 2014 to the Department's Director's office. Thank you for allowing us to review and comment on the proposed project available for public review on the OEQC website at: http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Oahu/2010s/2014-11-08-OA-5E-Na-Pua-Makani-Wind-Project.pdf

REG 3

The document will be routed electronically to the relevant Environmental Health divisions, branches, and offices. They will provide specific comments to you if necessary. EPO recommends that you review the standard comments at: http://health.hawaii.gov/epo/home/landuse-planning-review-program/. You are required to adhere to all applicable standard comments.

REG 3

We encourage you to examine and utilize the Hawaii Environmental Health Portal. The portal provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings. The Portal is continually updated. Please visit it regularly at: https://eha-cloud.doh.hawaii.gov

REG 3

The EPO agrees with your Table 2 on page eight that this project may require permit/approval from the State of Hawaii Department of Health in regards to:

- Clean Water Act Compliance (Sections 401/ 402 / 404)
- Noise
- Air Quality

We are pleased that this project would encourage the use of sustainable energy and the reduction of fossil fuels.

Mahalo nui loa,

Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

c: CWB, IRHB, & CAB

April 1, 2015 TTCES-4819-OUT-15-054

Steve Molmen
Supervising Land Agent
Land Division
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street, Suite 220
Honolulu, HI 96809-0621

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Molmen,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received the written comments you submitted from several DLNR divisions, including on December 4, 2014 from the Land Division – Oahu District, Office of Conservation & Coastal Lands, and Engineering Division, and on December 18, 2014 from the Commission on Water Resource Management. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

The DLNR comment submissions are attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issues were raised in the DLNR submittal:

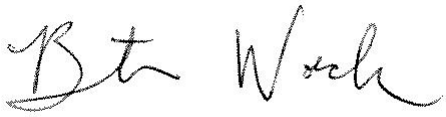
- Would like to see mitigation measures and Best Management Practices related to water resources, including water quality, landscape irrigation, and stormwater management.
- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.
- Water resources impacts including water sources for the Project, sediment run-off, and potential effects to coastal zones should all be analyzed in the Environmental Impact Statement.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. These topics will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

From: Steve.Molmen@hawaii.gov [mailto:Steve.Molmen@hawaii.gov]
Sent: Thursday, December 18, 2014 4:19 PM
To: Woeck, Brita
Cc: William.Tam@hawaii.gov; Roy.Hardy@hawaii.gov
Subject: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i - additional comments

Dear Mr. Cutbirth,

Attached, please find additional comments on the subject project. Again, no hard copy will be sent.

Best regards,

Steve Molmen, Supervising Land Agent
Land Division
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street, Suite 220
Honolulu, HI 96809-0621
Tel.: (808) 587-0439
Fax: (808) 312-6357
Email: steve.molmen@hawaii.gov

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From: Steve Molmen/DLNR/StateHiUS
To: brita.woeck@tetratech.com
Date: 12/04/2014 03:54 PM
Subject: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i

---

Dear Mr. Cutbirth,

Attached, please find our comments on the subject project. No hard copy will be sent.

[attachment "DOC314.pdf" deleted by Steve Molmen/DLNR/StateHiUS]

Best regards,

Steve Molmen, Supervising Land Agent
Land Division
Department of Land and Natural Resources
State of Hawaii

1151 Punchbowl Street, Suite 220
Honolulu, HI 96809-0621
Tel.: (808) 587-0439
Fax: (808) 312-6357
Email: steve.molmen@hawaii.gov

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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 4, 2014

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop St., Suite 2340, Mauka Tower
Honolulu, HI 96813

via email: brita.woeck@tetratech.com

Dear Mr. Cutbirth,

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (1) Land Division – Oahu District; (2) Office of Conservation & Coastal Lands; and (3) Engineering Division. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 13, 2014

MEMORANDUM

TO:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i

LOCATION: Kahuku, Koolauloa District, Oahu, Hawaii; Tax Map Keys: (1) 5-6-008:006 (portion); (1) 5-6-006: 018, 32, 33, 34, 35, 47, 48, 49, 50, 51, 52, 54, 55, 56 (portions); (1) 5-6-005:018 (portion)

APPLICANT: Na Pua Makani Power Partners, LLC, a wholly owned subsidiary of Champlin Hawaii Wind Holdings, LLC, by consultant Tetra Tech Inc.

Transmitted for your review and comment on the above-referenced document. If we have not provided you with one of the limited number bound documents, the document can be found here:

1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
2. Login: Username: LD\Visitor Password: 0pa$$word0 (first and last characters are zeros)
3. Click on: Requests for Comments
4. Click on the subject file "Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i" then click on "Files" and "Download a copy". ". (Any issues accessing the document should be directed to Jonathan Real, Applications/Systems Analyst at 587-0427 or Jonathan.C.Real@hawaii.gov)

We would appreciate your comments on this document. Please submit any comments by December 4, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed: _____
Print Name: _____
Date: _____

REG 3

Comments:

At its meeting on August 8, 2008, under agenda item D-10, the Board approved in principle, the issuance of a direct lease to the applicant over TMK (1) 5-6-008:006. The proposed project now includes the addition of new TMK parcels for access purposes. Portions of TMK (1) 5-6-006 and (1) 5-6-005:018 have now been added into the proposed project.

Upon the finalization of the parcel/acreage/access roads, the applicant is required to provide a map and legal description of the State lands affected, as a part of the disposition process. The requested material is relevant to the final approval for the issuance of a direct lease, if appropriate, before the Land Board.

1A-15-80

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
OFFICE OF CONSERVATION
AND COASTAL LANDS
2014 NOV 14 P 3:13

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

November 13, 2014

MEMORANDUM

RECEIVED
LAND DIVISION
2014 NOV 17 AM 10:51
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i
LOCATION: Kahuku, Koolauloa District, Oahu, Hawaii; Tax Map Keys: (1) 5-6-008:006 (portion); (1) 5-6-006: 018, 32, 33, 34, 35, 47, 48, 49, 50, 51, 52, 54, 55, 56 (portions); (1) 5-6-005:018 (portion)
APPLICANT: Na Pua Makani Power Partners, LLC, a wholly owned subsidiary of Champlin Hawaii Wind Holdings, LLC, by consultant Tetra Tech Inc.

Transmitted for your review and comment on the above-referenced document. If we have not provided you with one of the limited number bound documents, the document can be found here:

1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
2. Login: Username: LD\Visitor Password: 0pa$$word0 (first and last characters are zeros)
3. Click on: Requests for Comments
4. Click on the subject file "Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i" then click on "Files" and "Download a copy". ". (Any issues accessing the document should be directed to Jonathan Real, Applications/Systems Analyst at 587-0427 or Jonathan.C.Real@hawaii.gov)

We would appreciate your comments on this document. Please submit any comments by December 4, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments. * Not in Conservation
( ) Comments are attached.

Signed: A. Yasaka
Print Name: Lauren Yasaka
Date: 11/17/14

ACK

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

'14 NOV 14 PM 2:33 ENGINEERING

November 13, 2014

MEMORANDUM

RECEIVED LAND DIVISION 2014 NOV 26 PM 2:51 DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

TO: PR.

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i
LOCATION: Kahuku, Koolauloa District, Oahu, Hawaii; Tax Map Keys: (1) 5-6-008:006 (portion); (1) 5-6-006: 018, 32, 33, 34, 35, 47, 48, 49, 50, 51, 52, 54, 55, 56 (portions); (1) 5-6-005:018 (portion)
APPLICANT: Na Pua Makani Power Partners, LLC, a wholly owned subsidiary of Champlin Hawaii Wind Holdings, LLC, by consultant Tetra Tech Inc.

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1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
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We would appreciate your comments on this document. Please submit any comments by December 4, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(✓) We have no additional comments.
( ) Comments are attached.

Signed: _____
Print Name: Carty S. Chang, Chief Engineer
Date: 11/20/14

ACK

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JESSE K. SOUKI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

December 17, 2014

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop St., Suite 2340, Mauka Tower
Honolulu, HI 96813

via email: brita.woeck@tetratech.com

Dear Mr. Cutbirth,

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i

Thank you for the opportunity to review and comment on the subject matter. In addition to the comments sent to you dated December 4, 2014, enclosed are additional comments from the Commission on Water Resource Management on the subject matter. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 13, 2014

MEMORANDUM

2014 DEC 17 PM 1:37
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

RECEIVED
LAND DIVISION

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawai`i

LOCATION: Kahuku, Koolauloa District, Oahu, Hawaii; Tax Map Keys: (1) 5-6-008:006 (portion); (1) 5-6-006: 018, 32, 33, 34, 35, 47, 48, 49, 50, 51, 52, 54, 55, 56 (portions); (1) 5-6-005:018 (portion)

APPLICANT: Na Pua Makani Power Partners, LLC, a wholly owned subsidiary of Champlin Hawaii Wind Holdings, LLC, by consultant Tetra Tech Inc.

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We would appreciate your comments on this document. Please submit any comments by December 4, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached. (Please see January 15, 2014 comments attached).

Signed:
Print Name: WILLIAM M. TAM, Deputy Director
Date: December 17, 2014

FILE ID: RFD.3893.3
DOC ID: 11885

COPY

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
KAMANA BEAMER
GARY L. GILL
MILTON D. PAVAO
JONATHAN STARR
TED YAMAMURA

WILLIAM M. TAM
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

January 15, 2014

REF: RFD.3893.3

TO: Russell Tsuji, Administrator
Land Division

FROM: William M. Tam, Deputy Director
Commission on Water Resource Management

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Farm Project, Kahuku, Hawaii

LOCATION: Kahuku, Hawaii
TMK NO.:

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore, all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://www.hawaii.gov/dlnr/cwrm.

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☒ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EPA as having high water efficiency can be found at http://www.epa.gov/watersense/.

☒ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

☒ 6. We recommend the use of alternative water sources, wherever practicable.

☐ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/programs/achieving-efficiency/green-business-program

MIT 2

MIT 2

MIT 2

FILE ID: RFD.3893.3
DOC ID: 11416

DRF-IA 03/20/2013

MIT 2

☒ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://landscapehawaii.org/_library/documents/lich_irrigation_conservation_bmps.pdf

REG 3

☒ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

Permits required by CWRM:
Additional information and forms are available at http://hawaii.gov/dlnr/cwrm/info_permits.htm.

REG 3

☒ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 11. A Well Construction Permit(s) is (are) required before any well construction work begins.

☐ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

REG 3

☒ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

REG 3

☒ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration(s) can be made to the bed and/or banks of a stream channel.

☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is (are) constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

WAT 1

☒ OTHER:
Projected potable and non-potable water demands and the calculations for these estimates should be disclosed. The proposed source of water supply should be identified.

REG 3

There are 8 existing wells in on TMK 5-6-006:018, 4 of which are used for agriculture. If the Wind Farm requires use from any of these or other well sources in the area then existing ground water use permits will need to be modified or new ground water use permits obtained.

If there are any questions, please contact Roy Hardy at 587-0225.

April 1, 2015 TTCES-4819-OUT-15-055

Michele K. Nekota
Director
Department of Parks & Recreation
City and County of Honolulu
1000 Uluohia Street, Suite 309
Kapolei, HI 96707

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Ms. Nekota,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

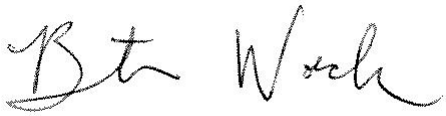
Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

December 17, 2014

Mr. Mike Cutbirth
C/O Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Mauka Tower
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Project, Kahuku, Hawaii

Thank you for the opportunity to review and comment on the EISPN for the subject project.

ACK

The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the department, you may remove us a consulted party to the balance of the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner at 768-3017.

Sincerely,

Michele K. Nekota
Director

MKN:jr
(587378)

April 1, 2015 TTCES-4819-OUT-15-056

Roger Pukahi
Colonel
Hawaii Army National Guard
55-101 Naupaka St
Laie, Hawaii 96762

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Col. Pukahi,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issue was raised in your submittal:

- Potential negative impacts to U.S. Army training facilities located adjacent to the wind farm site should be analyzed.

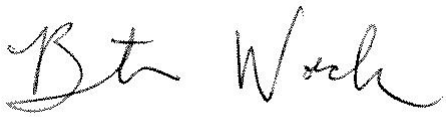
Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project. This topic will be considered and addressed in the Draft EIS as applicable in the appropriate resource sections.

As you are aware, we are engaging in ongoing coordination with the Department of Army.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

Woeck, Brita

From: Pukahi, Roger T COL USARMY NG HIARNG (US) <roger.t.pukahi.mil@mail.mil>
Sent: Wednesday, January 07, 2015 4:00 PM
To: Woeck, Brita
Subject: FW: SAAO: Kahuku Training Area Windfarm Mitigation Response Team (UNCLASSIFIED)
Attachments: SAAO: Kahuku Training Area Windfarm Mitigation Response Team (UNCLASSIFIED); Na Pua_Republished EISPN 10-24-14.pdf; Tetra Tech Letter 11-08-14.pdf

Importance: High

Aloha Brita,

I left a phone message regarding comments to the Wind Farm Projects.

I am COL Roger Pukahi, I am the State Army Aviation Officer for the Hawaii Army National Guard. The National Guard currently operates numerous helicopters from Wheeler AAF. Although our missions are similar to the 25th Combat Aviation Brigade, we have a unique responsibility to the citizens of Hawaii and as you know we provide numerous support by way of aviation to all Island's in the State.

LAN 3

The Hawaii Army National Guard (HIARNG) aviation program reaches back to the 1960's and have developed into the most modern National Guard aviation unit in the nation. Throughout all these years we have operated and trained in the Tactical Flight Training Area (TFTA) and Kahuku Training Area. We are aware of the current improvements in technology toward sustainability and applaud these efforts. However, the impact of building windmills along the ridgeline fronting the town of Kahuku (Project #1-5) directly impacts the TFTA and limits the amount of training area available to our aircrews. The TFTA provides HIARNG with the ability to conduct training in a controlled environment that mirrors wartime situations. It also provides us the opportunity to develop aircrews through a series of individual and collective tasks that support aircrew and unit readiness. Our ability to be ready, affords us the ability to respond to natural disaster, State emergencies and wartime response. It is important that we retain the ability to train in the areas with minimal impact from surrounding areas. This is the only designated aviation training area on the island of Oahu.

LAN 3

I ask that you consider the impacts to the Hawaii Army National Guard and provide a means to support our efforts to the State of Hawaii.

Please let me know if you have any questions or would like to discuss it further.

Thank you.

COL Roger Pukahi
(808) 230-5498

-----Original Message-----
From: Lloyd Maki [mailto:lmaki@dod.hawaii.gov]
Sent: Thursday, December 18, 2014 3:00 PM
To: Pukahi, Roger T COL USARMY NG HIARNG (US)
Cc: Neal Mitsuyoshi
Subject: FW: SAAO: Kahuku Training Area Windfarm Mitigation Response Team (UNCLASSIFIED)
Importance: High

April 1, 2015 TTCES-4819-OUT-15-057

Ross S. Sasamura, P.E.
Director and Chief Engineer
Department of Facility Maintenance
City and County of Honolulu
1000 Uluohia Street, Suite 215
Kapolei, HI 96707

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments, DRM 14-1013

Dear Mr. Sasamura,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

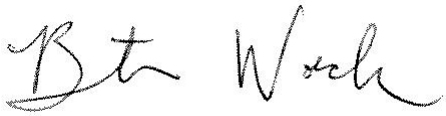
Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu'ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 14-1013

November 20, 2014

Mr. Mike Cutbirth
c/o Tetra Tech, Inc.
737 Bishop Street, Suite 2340, Mauka Tower
Honolulu, Hawaii 96813

Dear Mr. Cutbirth:

SUBJECT: Public Release of Environmental Impact Statement Preparation Notice (EISPN) for the Na Pua Makani Wind Project, Kahuku, Hawaii

ACK

Thank you for the opportunity to review and comment on the subject project. We have no comments. The City does not have any facilities or easements on the subject property.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

Ross S. Sasamura, P.E.
Director and Chief Engineer

April 1, 2015 TTCES-4819-OUT-15-058

Dean H. Seki
Comptroller
Department of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, HI 96810-0119

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Seki,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

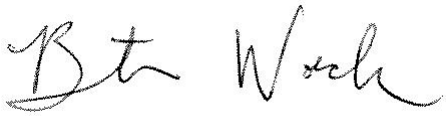
Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. As there were no issues raised in your submittal that fall within the scope of the EIS analysis, your letter has been coded as "Comment Acknowledged."

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

NEIL ABERCROMBIE
GOVERNOR

Dean H. Seki
Comptroller

Maria E. Zielinski
Deputy Comptroller

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)1353.4

NOV 18 2014

Ms. Brita Woeck
Tetra Tech, Inc.
737 Bishop Street, Suite 2340
Mauka Tower
Honolulu, Hawaii 96813

Dear Ms. Woeck:

Subject: Draft Environmental Impact Statement Preparation Notice
Na Pua Makani Wind Project, Kahuku, Hawaii

ACK

Thank you for the opportunity to provide comments for the subject project. This project does not impact any of the Department of Accounting and General Services' projects or existing facilities in this area, and we have no comments to offer at this time.

If you have any questions, please call me at 586-0400, or your staff may call Mr. Alva Nakamura of the Public Works Division at 586-0488.

Sincerely,

DEAN H. SEKI
Comptroller

c: Mr. Mike Cutbirth, Champlin Hawaii Wind Holdings, LLC
Mr. Russell Tsuji, DLNR Land Div

April 1, 2015 TTCES-4819-OUT-15-059

Gordon Wong
Honolulu Airports District Office
Federal Aviation Administration
P.O. Box 50244
Honolulu, HI 96850-0001

RE: Na Pua Makani Wind Project Environmental Impact Statement Scoping Comments

Dear Mr. Wong,

Thank you for providing comments on the Na Pua Makani Wind Project (Project) during the public scoping period. We received your written comments. Every letter from the public was read thoroughly, and substantive comments were grouped into general issue categories. In response to the comments made in each letter, summary statements were then created to identify the overarching issues that were raised during the scoping period from all commenters. Your comments have been coded to correspond to an issue category and a summary statement. These overarching issues identified during the scoping period helped identify a reasonable range of alternatives that met the purpose and need of the Project and considered a full spectrum of positions expressed by participants in the scoping process. The issue categories identified during scoping will be evaluated in the analysis of potential effects of the Proposed Action and alternatives.

Your comment submission is attached to this letter, along with the issue categories and summary statements so that you can view the complete list of issues that were raised. The following issue was raised in your submittal:

- The Project must be in compliance with all federal, state, and county regulations, plans, and policies, including obtaining applicable federal, state, and county permits.

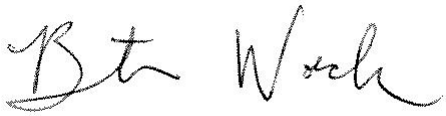
Information related to the proposed Project's FAA determination will be corrected and updated in the Draft EIS.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8636 Fax 503.227.1287 www.tetratech.com

We appreciate you taking the time during the public scoping period to provide feedback about the Project.

If you have any questions, please do not hesitate to contact me at 425.482.7645 or Brita.Woeck@tetratech.com.

Sincerely,
Tetra Tech Inc.



Brita Woeck
Project Manager, Na Pua Makani Wind Project EIS

cc: Mike Cutbirth, Na Pua Makani Power Partners, LLC
Alicia Oller, Tetra Tech, Inc.

Woeck, Brita

From: Gordon.Wong@faa.gov
Sent: Monday, November 10, 2014 4:41 PM
To: Woeck, Brita
Cc: kimberly.k.evans@hawaii.gov; lynn.becones@hawaii.gov; Lynette.Kawaoka@hawaii.gov
Subject: EIS - Na Pua Makani Wind Project (FAA COMMENT)

We have reviewed the EIS Preparation Notice dated November 2014 for the Na Pua Makani Wind Project and offer the following comment:

REG 3

1. Page 8, Table 2, states FAA "Determination of No Hazard issued 03/04/2014 and 10/17/2014." To clarify, the FAA has not issued a no hazard determination on the subject airspace cases yet. Those dates (03/04/2014 and 10/17/2014) are merely the dates the information/data was provided to the FAA. A determination on the cases has not been issued yet.

Gordon Wong
FAA Honolulu Airports District Office
Tel: 808-541-3565
Fax: 808-541-3566

APPENDIX B
TRAFFIC ASSESSMENT REPORT

TRAFFIC ASSESSMENT REPORT
NĀ PUA MAKANI WIND FARM

Kahuku, O‘ahu, Hawai‘i
Tax Map Keys: 5-6-006:018, 047, 051, 055, 5-6-005:018, and 5-6-008:006

January 2015

Prepared for:
Champlin Hawai‘i Wind Holdings LLC
2020 Alameda Padre Serra, Suite 123
Santa Barbara, CA 93102

Prepared by:
BELT COLLINS HAWAII LLC
2153 North King Street, Suite 200
Honolulu, Hawai‘i 96819

2014-33-1000

1 INTRODUCTION

This report summarizes the analysis and findings of a traffic assessment for the Nā Pua Makani Wind Farm. This traffic assessment describes the potential traffic impacts during construction and when the project is completed under six different scenarios, which are based upon the type and quantity of wind turbine generators (WTG) that could be installed.

2 PROJECT DESCRIPTION

The Nā Pua Makani Wind Farm project (Project) is located at the northeast coast of Oʻahu, in Kahuku Town, Tax Map Key (TMK) 5-6-006:018, 047, 051, 055, 5-6-005:018, and 5-6-008:006. See Figure 1 – Location Map. The 707 acre project area is approximately 9,000 feet inland from the coast on a steep sloping ridge with elevations ranging from 13- to 400-feet above mean sea level. There are two proposed access points to the project site off the mauka side of Kamehameha Highway; one will be off an existing paved road owned by the State of Hawaiʻi, Department of Agriculture, just south of Kiʻi Stream Bridge (Proposed Access 1) and the other off a private dirt road between Enos Road and the Mālaekahana Stream Bridge (Proposed Access 2).

Three alternatives evaluated in the Project EIS: Alternative 1 – No Action, Alternative 2 – Proposed Action Wind Project of up to 10 turbines (up to approximately 25 megawatts (MW)), and Alternative 3 – Larger Generation Wind Project of up to 12 turbines (up to 42-MW). Under Alternative 1, there will be no new construction of wind turbines, meteorological towers, supporting structures, and access roadways. Thus, the main focus of this report will only discuss Alternative 2 and 3.

Alternative 2 entails the construction and operation of an approximately 25 MW wind generation facility, consisting of 8 to 10 wind turbines, meteorological tower, operations and maintenance facility, electrical collections system, transmission line, and 16 foot-wide internal access roads. This alternative evaluates construction traffic impacts for three different scenarios, each of which use a specific WTG. Construction would begin in the second or third quarter of 2015 and would be in full operation by the end of 2016. The following lists the quantity and models to be evaluated.

Scenario	WTG Manufacturer	Model	Quantity
1	General Electric (GE)	GE 2.85-103	10
2	Siemens	3.0-108	10
3	Vestas	V110 V117	3 5

Alternative 3 entails the construction and operation of an approximately 42 MW wind generation facility, consisting of up to 12 wind turbines, meteorological tower, operations and maintenance facility, electrical collections system, transmission line, and 16-foot-wide access roads using compacted gravel. It evaluates the impacts for a phased build out plan, whereby phase 1 would begin construction on one of the scenarios by 2016 similar to Alternative 2; then phase 2 would construct additional WTG's of the same manufacturer. Construction of the second phase would start at the beginning of 2019 with operation of those WTGs starting towards the end of 2019. The

following lists the number and model of each WTG constructed in each phase for the three scenarios.

Scenario	WTG Manufacturer	Model	Phase 1 Quantity	Phase 2 Quantity	TOTAL
1	General Electric (GE)	GE 2.85-103	10	2	12
2	Siemens	3.0-108	10	2	12
3	Vestas	V110 V117	3 5	0 4	12

3 EXISTING TRAFFIC CONDITIONS

Kamehameha Highway (Highway 83) is a two-lane undivided State highway that provides the only access around the north side of Oʻahu from Haleʻiwa to Kahaluʻu. The lanes on this highway are 12' wide and have mostly grassed shoulders with some paved shoulders. Posted speed limits along the roadway vary between 25 and 45 miles per hour (mph) and generally have lower speed limits near towns and schools. The posted speed limit at the entrance to the project site is 35 mph.

Existing traffic volume data was retrieved from the State of Hawaiʻi Department of Transportation (HDOT), which collects 24-hour traffic count volumes at various locations throughout the island. The nearest HDOT count station to the project site is along Kamehameha Highway at the Mālaekahana Stream bridge and was conducted in 2013. The following table provides the morning and afternoon peak hour volumes as well as the 24 hour volumes at this station. The morning peak hour was between 7:00 to 8:00 a.m. and the afternoon peak was between 3:45 and 4:45 p.m.

Existing 2013 Traffic Counts

Time	Total Traffic Volume (Both Directions)
AM Peak Hour (7:00 – 8:00 a.m.)	1,095
PM Peak Hour (3:45 – 4:45 p.m.)	1,012
24 hour	12,187

Source: State of Hawaiʻi, Department of Transportation, Highways Division.

Traffic volumes taken by HDOT on previous years are also included in Appendix A and shows that the 2013 data is in line with previous years. The morning peak has also been consistent, while the afternoon peak is trending later. The 24 hour volumes are also showing the modest increase in traffic over the 12 years of available data.

4 FUTURE BASELINE TRAFFIC CONDITIONS

Future baseline conditions have been established for the year 2016 and 2019, when full operations of the project alternatives are expected. Based on the Oʻahu Regional Transportation Plan, other Traffic Impact Reports obtained from projects in the area, and the historical HDOT traffic data the average regional traffic for Kahuku is expected to increase 1.23% annually. Therefore, the future

baseline traffic volumes, which are also considered Alternative 1, at the Mālaekahana Bridge are anticipated to be the following:

Future Baseline Traffic

Time	2016 Total Traffic Volume (Both Directions)	2019 Total Traffic Volume (Both Directions)
AM Peak Hour (7:00 – 8:00 a.m.)	1,136	1,178
PM Peak Hour (3:45 – 4:45 p.m.)	1,050	1,089
24 Hour	12,642	13,114

5 PROJECT TRAFFIC

The proposed project would generate vehicle traffic on roadways in the vicinity throughout the estimated 6 to 12 month construction period as well as once the WTGs are in full operation. Access to the project site is from the mauka side of Kamehameha Highway just south of Kiʻi Stream Bridge (Proposed Access 1) as well as just north of the Mālaekahana Stream Bridge (Proposed Access 2). The first 5 WTG's would likely use the access just south of Kiʻi Stream Bridge, while the rest of the WTG's would utilize the access north of Mālaekahana Stream Bridge.

5.1 CONSTRUCTION RELATED TRAFFIC

Construction related traffic to build the proposed project would include the transporting of the major components to build the WTGs from Kalaeloa Harbor, hauling in cement and aggregate for the foundations, other miscellaneous deliveries, and employee related traffic.

The major components to build the WTGs include the blade, tower, nacelles, and electrical transformer. These will be transported by sea and offloaded at Kalaeloa Harbor, which is a heavy lift berthing facility located on the Western Coast of Oʻahu. Due to the size and weight of these components permits to transport these oversized and/or overweight loads would need to be obtained from both HDOT and the City and County of Honolulu. The following are anticipated requirements of the permit:

- The roundtrips must be performed Monday through Saturday between the hours of 9:00 p.m. and 5:00 a.m. with all equipment off the roadways between the hours of 5:00 a.m. and 9:00 p.m.
- No oversized loads are allowed to be transported on Sundays or holidays.
- A minimum of 4 police escorts per load are required to help the oversized load navigate turns.
- Police escorts and/or flagmen must provide traffic direction at the entrance to the wind farm site during construction.

The following is a table noting the number of nighttime roundtrips and how many days it would take in order to get all the equipment to the project site.

Anticipated Nighttime Roundtrip Oversized Truck Trips

Alternative	Construction Related Oversized Truck Trips between 9 p.m. to 5 a.m.	Total Days
Alternative 1 – No Action	0	0
Alternative 2 – 10 GE WTGs	100	20
Alternative 2 – 10 Siemens WTGs	90	18
Alternative 2 – 8 Vestas WTGs	77	16
Alternative 3 – 12 GE WTGs	Phase 1 – 100 Phase 2 – 20	Phase 1 – 20 Phase 2 – 4
Alternative 3 – 12 Siemens WTGs	Phase 1 – 90 Phase 2 – 20	Phase 1 – 18 Phase 2 – 4
Alternative 3 – 12 Vestas WTGs	Phase 1 – 77 Phase 2 – 40	Phase 1 – 16 Phase 2 – 8

Note: Assume an average of 5 truck trips could be made each day.

Three proposed routes from Kalaeloa Harbor to the project site were identified by ATS International in transporting the WTG's oversized nacelle component, the tower section or nacelle components, and the blade components (see Figure 2 – Proposed Truck Routes).

The following directions for route 1 would be used to transport the oversized nacelle components, which would be transported using a 19-axel trailer.

1. Continue straight out of the Grace Pacific gate onto Hanua Street
2. Turn left on Kauhi Street toward Kalaeloa Boulevard
3. Turn left on Kalaeloa Boulevard
4. Merge onto H-1 East
5. Take Exit 5 to Kunia Waipahu/'Ewa
6. Turn left onto Kunia Road
7. Continue on Kunia Road to Wilikina Drive
8. Turn left on Wilikina Drive
9. Turn right on Kamananui Road
10. Continue north on Kamehameha Highway
11. Continue on Kamehameha Highway to Joseph P. Leong Highway (Highway 99)
12. Continue on Highway 99 to Kamehameha Highway East (Highway 83)
13. Continue on Highway 83 to proposed entrance to the wind farm

The following direction for route 2 would be used to transport the taller tower section and nacelle components.

1. Continue straight out of the Grace Pacific gate onto Hanua Street
2. Turn left on Kauhi Street toward Kalaeloa Boulevard
3. Turn left on Kalaeloa Boulevard
4. Merge onto H-1 East
5. Continue on H-1 East and stay in the right lane

6. Take Exit 8C for Kamehameha Highway North
7. Turn right on Ka Uka Boulevard
8. Turn left onto H-2 North
9. Continue on H-2 North to Wilikina Drive
10. Continue on Wilikina Drive to Kamananui Road
11. Turn right on Kamananui Road
12. Continue north on Kamehameha Highway
13. Continue on Kamehameha Highway to Joseph P. Leong Highway (Highway 99)
14. Continue on Highway 99 to Kamehameha Highway East (Highway 83)
15. Continue on Highway 83 to proposed entrance to the wind farm.

And finally, the following directions for route 3 would be used to transport the wind turbine blade components.

1. Continue straight out of the Grace Pacific gate onto Hanua Street
2. Turn left on Kauhi Street toward Kalaeloa Boulevard
3. Turn left on Kalaeloa Boulevard
4. Merge onto H-1 East
5. Continue on H-1 East and stay in the left lane to merge onto the H-2 North
6. Take Exit 8B for H-2 North to Mililani and Wahiawā
7. Continue on H-2 North to Wilikina Drive
8. Continue on Wilikina Drive to Kamananui Road
9. Turn right on Kamananui Road
10. Continue north on Kamehameha Highway
11. Continue on Kamehameha Highway to Joseph P. Leong Highway (Highway 99)
12. Continue on Highway 99 to Kamehameha Highway East (Highway 83)
13. Continue on Highway 83 to the proposed entrance to the wind farm.

Transport of the oversized components would require tree trimming, sign relocation, and overhead utility lines adjustments in order to provide a clear route. ATS has identified Kalaeloa Boulevard, Kunia Road, Ka Uka Boulevard, and Kamehameha Highway as having trees that may need trimming to a clearance height minimum of 16 feet and 6 inches prior to transport of the equipment. The left turn onto Kamehameha Highway at Kamananui Road, the left turn onto Wilikina Drive, and the right turn at Ka Uka Boulevard would require police escorts to block traffic in order for the truck to make the turns. Additionally, based upon the type of WTG chosen, some temporary roadway improvements like asphalt curb removal, guardrail relocation, or relocation of a traffic signal may be required since transport dimensions of each part vary by manufacturer and model. After all deliveries are made all temporary improvements shall be restored to previous existing conditions.

Traffic estimates that include passenger vehicles, such as those due to construction workers arriving or departing the work site, as well as cement or aggregate deliveries, and building component or substation deliveries were developed based upon estimated quantities for materials. Cement and aggregate deliveries would come from Hālawa, while other deliveries are also expected to originate from Honolulu. Construction workers are also expected to work between the hours of

7:00 a.m. and 3:30 p.m. with approximately 90% arriving to the site before the morning peak hour and the remaining 10% during the peak. It was also assumed that approximately 90% of the construction trips would occur just before the pm peak hour at 3:30 p.m. when they would be leaving work and 10% during the peak. During daylight hours the following average and maximum daytime round trips are anticipated during construction for all scenarios of Alternatives 2 and 3.

Anticipated Average Daytime Trips

Construction Trips	Average Number of Round Trips Per Day	AM Peak Hour Trips (7-8am)	PM Peak Hour Trips (3:45-4:45pm)
Cement	50	5	5
Aggregate	50	5	5
Substation	1	0	0
Building Components	2	1	0
Miscellaneous Deliveries	1	0	0
Construction Workers	40	4	4
TOTAL TIRPS	**144**	**15**	**14**

Note: Assumed 10% of the daytime truck trips would occur during the peak hours.

Anticipated Maximum Daytime Trips

Construction Trips	Average Number of Round Trips Per Day	AM Peak Hour Trips (7-8am)	PM Peak Hour Trips (3:45-4:45pm)
Cement	50	5	5
Aggregate	50	5	5
Substation	1	0	0
Building Components	2	1	0
Miscellaneous Deliveries	1	0	0
Construction Workers	100	10	10
TOTAL TIRPS	**154**	**21**	**20**

Note: Assumed 10% of the daytime truck trips would occur during the peak hours.

Assuming the rate at which the WTGs are constructed is the same for 2016 and 2019, all scenarios in both alternatives would have similar anticipated average and maximum daytime construction trips. The following table provides a comparison of the anticipated volumes to the baseline traffic volumes in the morning and afternoon peak hours and for a 24 hour period for construction in 2016 and 2019.

Percentage of Peak Project Construction Trips to Baseline Traffic

Time	2016	2019
AM Peak Hour (7:00 – 8:00 a.m.)	1.8%	1.8%
PM Peak Hour (3:15 – 4:15 p.m.)	1.9%	1.8%
24 Hour	2.4%	2.3%

Based upon the HDOT's Best Practices for Traffic Impact Reports (TIR), a typical trigger for preparing a TIR is 100 or more new peak hour trips or 500 daily trips. Based upon the trip numbers calculated and the percentage of the total traffic along Kamehameha Highway, the project will not meet this trigger and is therefore not expected to cause a significant impact.

5.2 PROJECT TRAFFIC

When the WTGs are in full operation there will be approximately three to six full time operations and maintenance employees on the site. Their typical work hours would be between 7:00a.m. and 5:00 p.m. and at the most would result in 6 round trips per day. These employees were estimated to be sufficient manpower to handle daily maintenance for up to 13 WTGs on the site. Their total daily trips would account for less than 0.6% of the future 2016 and 2019 traffic loads on Kamehameha Highway for all alternatives.

Percentage of Project Trips to Baseline Traffic

Time	2016	2019
AM Peak Hour (7:00 – 8:00 a.m.)	0.53%	0.51%
PM Peak Hour (3:45 – 4:45 p.m.)	0.57%	0.55%
24 Hour	0.09%	0.09%

6 CONCLUSION

The proposed project will result in minor construction related impacts due to the transportation of large equipment and materials. The net effects of these impacts were found to be minimal because the oversized WTG components would be delivered at night. A less than 3% increase in traffic on Kamehameha Highway due to construction during the morning and afternoon peaks would not result in a significant increase and would be temporary. Project related traffic once the WTGs are in full operation is also not expected to have any significant impacts to Kamehameha Highway due to the low volume of employees that would access the site. The following table summarizes the traffic impacts showing the percentage of project trips to the estimated base year traffic volumes.

Summary of Impacts – Percentage of Project Trips to Baseline Traffic

		Alternative 1 No Action	Alternative 2 (All 3 scenarios)	Alternative 3 (All 3 scenarios)
Construction Impacts	AM Peak	0	1.8%	Phase 1 – 1.8% Phase 2 – 1.8%
	PM Peak	0	1.9%	Phase 1 – 1.9% Phase 2 – 1.8%
	24 Hour	0	2.4%	Phase 1 – 2.4% Phase 2 – 2.3%
Project Impacts	AM Peak	0	0.53%	Phase 1 – 0.53% Phase 2 – 0.51%
	PM Peak	0	0.57%	Phase 1 – 0.57% Phase 2 – 0.55%
	24 Hour	0	0.09%	Phase 1 – 0.09% Phase 2 – 0.09%

7 REFERENCES

Anderson Trucking Services, Inc*, Nā Pua Makani Transport Route Review*, June 6, 2014.

Hawai'i Department of Transportation, *Hawaii Department of Transportation Best Practices for Traffic Impact Reports,* May 2011.

O'ahu Metropolitan Planning Organization, *Oahu Regional Transportation Plan 2035,* April 2011.

The Traffic Management Consultant, *Revised Traffic Impact Analysis Report for the Proposed Turtle Bay Resort Master Plan,* November 2012, amended May 2013.

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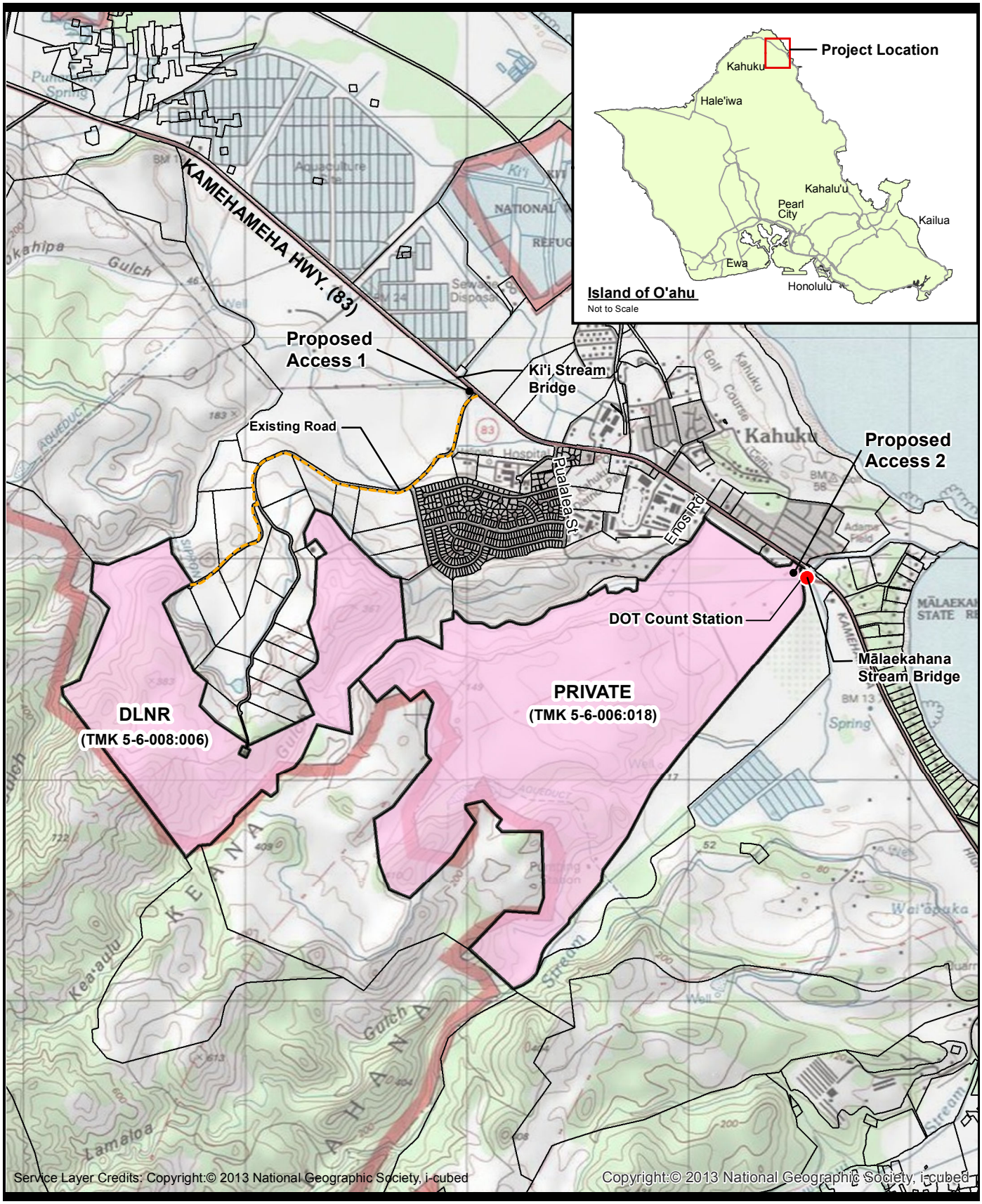


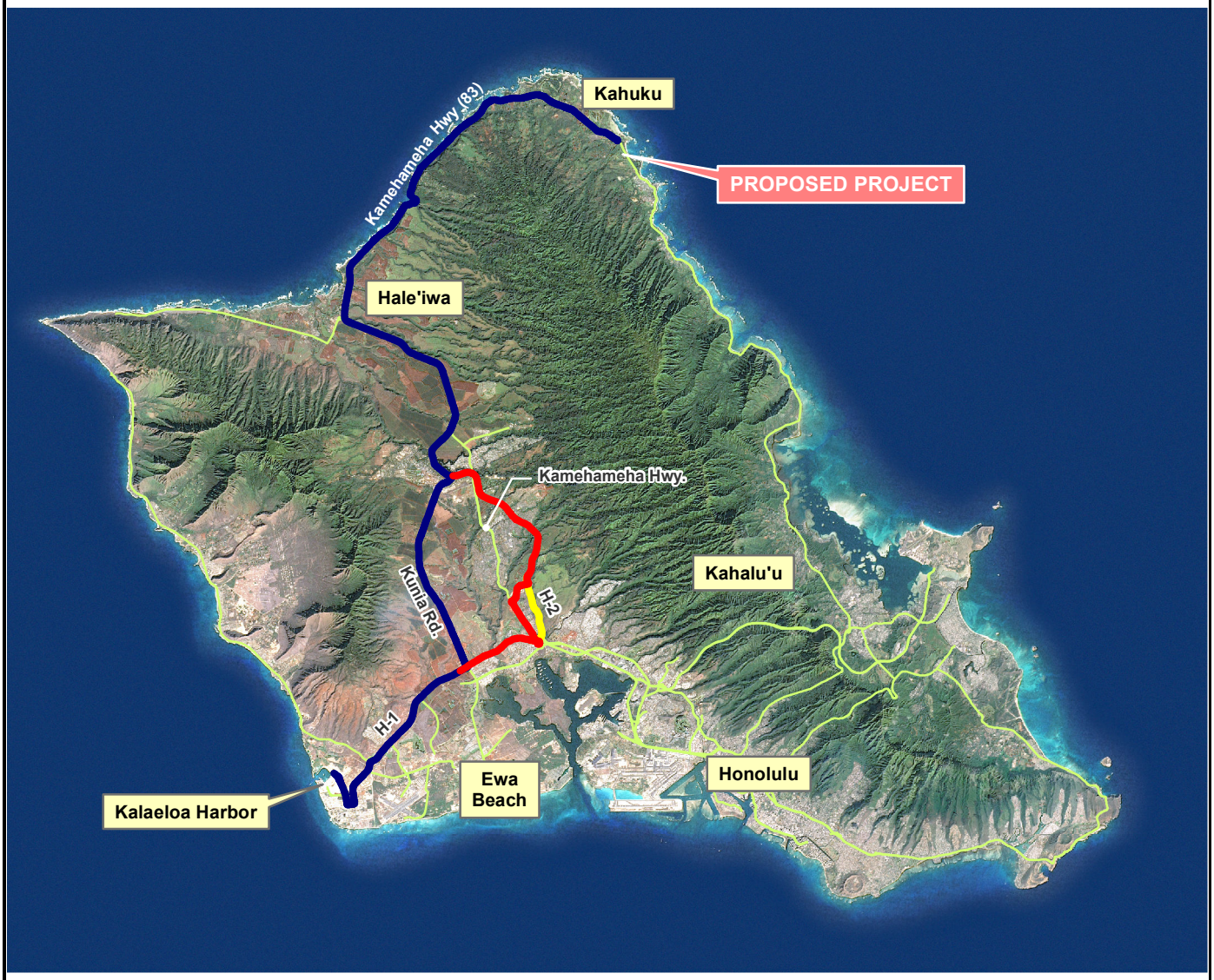
NORTH

0 500 1,000 2,000
SCALE IN FEET

Figure 1

LOCATION MAP

Nā Pua Makani Wind Farm
Champlin Hawaii Wind Holdings LLC
January 2015



LEGEND

- Route 1
- Route 2
- Route 3

BELT COLLINS

NORTH

0 7,500 15,000 30,000

SCALE IN FEET

Figure 2

PROPOSED TRUCK ROUTES

Nā Pua Makani Wind Farm
Champlin Hawaii Wind Holdings LLC
January 2015

APPENDIX A – DOT TRAFFIC COUNT DATA

	PROJECT:	Nā Pua Makani Wind Farm		JOB NO:	2014-33-1000	
	CLIENT:	Champlin Hawaii Wind Holdings LLC		DATE:	7-May-14	
	SUBJECT:	DOT Count Data		BY:	LN	
	FILE:	M:\Na Pua Makani Wind Farm\2014331000 Traffic Study\05 Basis of Design\Reference Docs\DOT Traffic Count Stations\[DOT Count Data.xlsx]Malaekahana Bridge				
Site ID:	B72008301618, 26-E					
Location:	Kamehameha Highway at Malaekahana Bridge					
	AM Peak		PM Peak		24 Hour	
YEAR	Volume	Peak Hour	Volume	Peak Hour	Volume	Rate/year
2001	617	n/a	764	n/a	9,240	
2004	685	n/a	1,018	n/a	11,340	7.6%
2005	845	n/a	1,070	n/a	12,112	6.8%
2006	654	n/a	934	n/a	10,867	-10.3%
2007	689	7:00am	865	3:00pm	10,640	-2.1%
2009	875	7:15am	944	3:15pm	10,943	1.4%
2011					12,200	5.7%
2012	1,055	7:00am	1,014	3:30pm	12,335	1.1%
2013	1,095	7:15am	1,012	3:45pm	12,187	-1.2%
				Average growth per year=		1.1%

APPENDIX C
FIRE MANAGEMENT PLAN

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Date of Draft: 3-18-14

Na Pua Makani Fire Management Sections

Goals and Objectives

The goal of the fire measures outlined below is to mitigate the fire risk posed by construction and operation of the Na pua Makani Wind Farm. To achieve this goal, the following objectives have been defined:

1. Use engineering and maintenance of the wind farm infrastructure to limit fire ignitions from the wind farm infrastructure to an average of less than one per decade.
2. Use industry accepted best management practices to minimize the probability of ignitions during construction.

Background

The Na Pua Makani Wind Farm will introduce additional machinery, electrical infrastructure, and human activity to the project area. Parts of the project area have historically been exposed to very little human presence and this additional activity will potentially slightly increase the fire risk. The following sections are intended to mitigate the additional fire threat posed by construction and operation of the wind farm. Fire mitigation may occur via education; mechanical, chemical, or biological manipulation of the vegetation (hereafter 'fuels'); or construction of barriers to fire such as firebreaks. Fire mitigation should always be commensurate with the threat posed by the activity in question and the values at risk.

Fire Weather Analysis

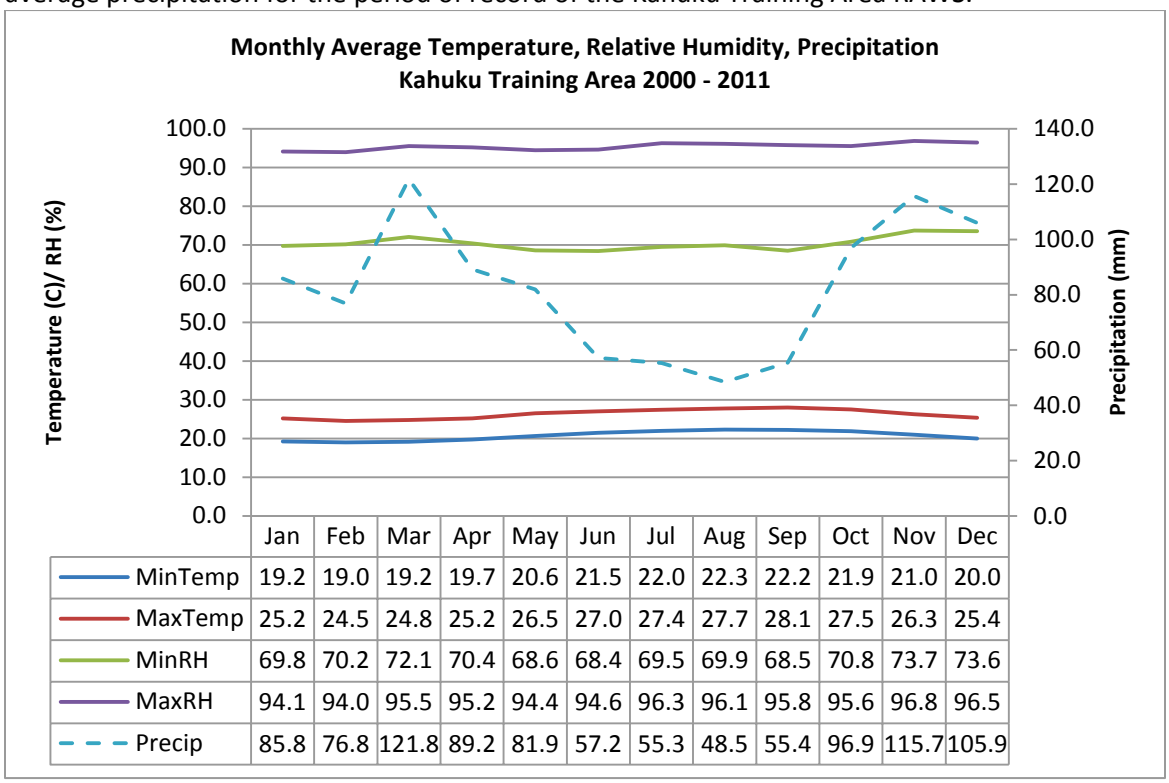
Period of record weather data was collected from the meteorological towers installed for the wind farm project as well as from the Kahuku Training Area Remote Automated Weather Station (RAWS). Wind analyses were run with data from the meteorological towers. These towers do not provide a full suite of weather data, so all other analyses were run using data from the Kahuku Training Area RAWS. Wind monitoring heights at the wind farm towers are higher (10 m) than typically used for fire weather analyses (6.09 m), so a power law correction factor was used to adjust wind speeds for the drag factors associated with interaction with surface features (Masters 2013).

Maximum and minimum temperature and maximum and minimum relative humidity are nearly constant throughout the year (Figure 1). Average nighttime humidity recovery is very good, as demonstrated by maximum relative humidity levels in excess of 90%. This indicates that most fires will either go out or become inactive at night. Average minimum relative humidity is very high as well, with monthly average minimum relative humidity never dropping below 65%. This usually translates into dead fuel moisture that remains quite high the majority of the time, minimizing the potential for fire spread. However, in this case high wind speeds increase the drying effect of the air and therefore decrease fine fuel moisture measurements. Wind speeds are very high throughout the year and wind

direction is overwhelmingly dominated by the easterly trade winds (Figure 2). It is the effect of these high winds that results in lower than expected 1 hour fuel moisture measurements (Table 1).

Precipitation is concentrated in the winter months with a drier, though still quite moist, period from June through September. Even during this period, average rains are > 4 cm per month. Live herbaceous moisture is high (> 120%) virtually without exception (Table 1) indicating that fire behavior will generally be dampened by the presence of live fuels.

Figure 1. Monthly average minimum and maximum temperature and relative humidity and monthly average precipitation for the period of record of the Kahuku Training Area RAWS.

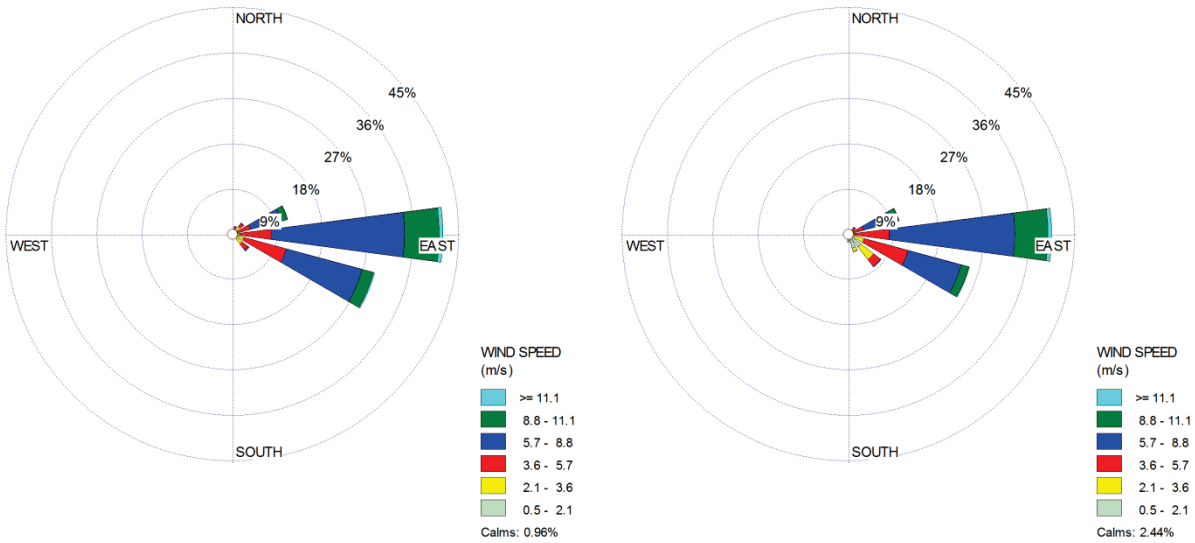


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MinTemp	19.2	19.0	19.2	19.7	20.6	21.5	22.0	22.3	22.2	21.9	21.0	20.0
MaxTemp	25.2	24.5	24.8	25.2	26.5	27.0	27.4	27.7	28.1	27.5	26.3	25.4
MinRH	69.8	70.2	72.1	70.4	68.6	68.4	69.5	69.9	68.5	70.8	73.7	73.6
MaxRH	94.1	94.0	95.5	95.2	94.4	94.6	96.3	96.1	95.8	95.6	96.8	96.5
Precip	85.8	76.8	121.8	89.2	81.9	57.2	55.3	48.5	55.4	96.9	115.7	105.9

Table 1. Percentile weather data for the period of record of the Kahuku Training Area RAWS.

Percentile	Temperature (°C)	RH (%)	Windspeed (m/s)	1 hr. Moist. (%)	Live Herb. Moist. (%)
97	28	56	10.3	7	131
90	28	61	8.9	8	162
80	27	65	8.0	9	180
50	26	74	6.3	10	231

Figure 2. Daytime (0700 – 1800, left) and nighttime (1800 – 0700, right) wind roses for the period of record of the Na Pua Makani Wind Farm meteorological towers. Wind speeds have been adjusted for surface drag from 10 m to 6.09 m.



Fuels

Fuels within the project area include a variety of grass, grass/shrub, and shrub fuel matrices as well as small patches of timber. The substation, construction staging area, operations and maintenance building and storage yard, and two of the nine Phase I wind turbines are located in the midst of existing agricultural fields, which are generally unburnable as currently utilized. The remaining seven turbines are located within grass, grass/shrub, and timber fuels. All of the wind farm infrastructure will be on concrete or gravel pads.

Even in the timber and shrub fuels, grasses comprise a substantial portion of the surface fuels which tend to be primarily responsible for the forward spread of a fire. The grasses are mostly guinea grass (*Megathyrsus maximus*) and California grass (*Urochloa mutica*). These grasses can be highly flammable when cured. There are some pockets of ironwood (*Casuarina equisetifolia*) and eucalyptus (*Eucalyptus spp.*) which both are capable of contributing to fire control problems under dry conditions. However, the climatic conditions necessary to produce problematic fire behavior in these vegetation types are rare on this part of Oahu due to the previously noted substantial precipitation and high relative humidity throughout the year.

Fire History

The Kahuku Training Area abuts the proposed project area to the west and covers 3,680 ha. Military training there has resulted in a total of 10 wildfire ignitions since 2000. The largest of these fires grew to 1.4 ha and the average fire size was 0.46 ha. However, military training is far more ignition-prone than wind turbine construction or operation and access in Kahuku Training Area for firefighters is far more difficult than it will be within the proposed project area. As a result, fires at Kahuku Training area have additional time to grow prior to any suppression action relative to what is predicted for the project area.

Outside of Kahuku Training Area, but within five kilometers of the project area on the east side of the Koolau Mountains ridgeline, there have been a total of 104 recorded fires since 2001. These have averaged 0.42 ha in size. The largest three fires were 10.1, 4, and 3.2 ha.

Values at Risk

There is a community of homes to the north of the project area, due north of the proposed substation. The closest homes are 450 m away from the nearest possible ignition source.

A United States Fish and Wildlife Service data layer depicting federally listed species density indicates that approximately half of the proposed project area lies in the 'little or no' federally listed species zone. The other half lies in the 'low concentration' of federally listed species zone. The shortest distance between a possible ignition source within the project area and the 'medium concentration' of federally listed species zone is 1.5 km. The shortest distance between a possible ignition source within the project area and the 'high concentration' of federally listed species zone is 2.6 km.

Fire Risk Analysis

Fire behavior within the project area is mitigated by the moist conditions. Using weather data from the Kahuku RAWS, an analysis of potential fire behavior under 50th, 80th, and 97th percentile weather conditions found minimal fire activity (Table 2). Even under 97th percentile conditions, probability of ignition is extremely low at 43%; weather at this extreme normally produces ignition probabilities in excess of 90%. These conclusions are corroborated in the fire history by the relatively few fires in the area (on average 10 per year in an area of roughly 50 km^2) and their small size (<1 ha on average).

Table 2. Fire behavior outputs from BehavePlus (Andrews and Chase 1989) under 50th, 80th, and 97th percentile weather conditions for fuels found within the project area. Fuel model identifiers (in parentheses) are per Scott and Burgan 2005.

Fuels		Fire Behavior (Rate of Spread (km/hr))/Flame Length (m)/Probability of Ignition (%))		
Fuel Model	Vegetation Represented	50th Percentile Weather	80th Percentile Weather	97th Percentile Weather
High load, coarse humid climate grass (GR8)	Heavy grass fuels	0.024/0.24/31	0.036/0.30/36	0.048/0.34/43
Moderate load, humid climate timber-shrub (TU2)	Christmas Berry shrublands and broadleaf forest	0.150/0.82/31	0.217/0.98/36	0.314/1.19/43
Long-needle litter (TL8)	Ironwood forest	0.066/0.73/31	0.087/0.82/36	0.115/0.94/43

The likelihood of a wildfire ignition during construction or operation of the project is very low. Sparks from welding and other construction activities are the most likely source. Once operating, all electrical lines will be below ground making an ignition from transmission lines impossible. There are very rare instances in which a wind turbine may catch fire, but these cases are exceptional, in part because there is a very large financial incentive for the operator to avoid this scenario.

Should a fire start, even under 97th percentile conditions it is exceedingly unlikely that it would harm any resources at risk. Despite their relative proximity, homes in the area are at very little risk due to the

highly consistent wind direction which would blow any fire westward, away from the homes to the north (see Figure 2). Rates of spread on the flanks of the fire would be a fraction of those enumerated in Table 2, which lists the rate of spread at the head of the fire (the fastest spreading portion of the fire). The 'medium density' federally listed species zone that lies downwind from the project area is 1.5 km away from the closest proposed turbine pad. Under 97th percentile conditions, it would take over 4.5 hours for a fire to reach the edge of this zone. However, 97th percentile conditions rarely persist for more than two or three hours resulting in even longer travel times to these sensitive resources. Based on an assumption of an elliptical fire shape with a length 4 times the width (very likely a substantial over-estimation of the distance traveled), the largest fire recorded fire in the Kahuku area would have traveled 717 meters indicating that the resources in the area are at little to no risk.

Considering the low probability of an ignition source from construction or operation activities, the low probability of ignition should a firebrand (spark, cigarette, etc.) come into contact with the fuels (Table 2), the low probability of conditions conducive to rapid fire spread (Table 2), and the lack of persistence of such weather conditions over a period of more than a few hours, the overall likelihood of a fire impacting any resource in the area is very small. Probabilities such as these are multiplicative, such that small probabilities compound one another and in a situation such as this, the overall probability becomes very small.

Fire Prevention Requirements

Because the probability of wildfire is so low, no measures beyond normal construction best management practices are required to mitigate the threat. The below measures are specific to fire and shall be practiced throughout the life of the project.

- All heavy equipment and construction vehicles will carry a fire extinguisher as part of their standard equipment. These will allow employees to combat vehicle fires and prevent spread to vegetative fuels.
- Gas powered (non-diesel) vehicles will not be parked in vegetation greater than 10 cm (4 inches) in height. This will prevent catalytic converters from contacting vegetation and igniting a wildfire.
- Smoking will be prohibited on the work site except unvegetated areas and no less than 5 m (~16 ft) from the nearest vegetation or inside a vehicle. Cigarettes smoked in vehicles will be disposed of within the vehicle.
- All internal combustion engines will utilize spark arrestors.
- All welding, grinding, and other spark producing activities will occur no less than 5 m (~16 ft) from the nearest vegetation.
- Exposed aerial welding (e.g. not inside the tower or the nacelle) at more than 15 m (~50 ft) above the ground will be restricted to times when sustained winds are less than 11 m/s (~25 mph) OR when relative humidity is greater than 80%.
- Maintenance of mechanical and electrical systems within the turbine and nacelle will occur regularly, as recommended by the manufacturer, to limit mechanical failures that can result in equipment fires which could then spread to nearby vegetation.

Fuels Management Requirements

Due to the very low probability of ignition and the minimal fire behavior expected should an ignition occur, no special fuels management is justified. Fuels management around the turbine towers and other infrastructure will be carried out per operations procedures identified elsewhere in this EIS. These measures will benefit fire risk mitigation goals by eliminating or reducing vegetation near wind farm infrastructure.

Description of Fire Fighting Resource Availability

The project area falls within the response area of Station 13 of the City and County of Honolulu Fire Department (HFD), Kahuku Fire Department. The department maintains a 24 hour response capability and is staffed and equipped in accordance with HFD protocols. Assuming a rate of travel of 24 kmh (15 mph), response time to the project boundary is estimated to be less than 3 minutes, to the substation less than 5 minutes, and to the furthest turbine location less than 12 minutes.

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Masters, G.M. 2013. Renewable and Efficient Electric Power Systems 2nd edition. Wiley. ISBN: 9 78-1-118-14062-8.

Scott, J. H. and R. E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. General Technical Report RMRS-GTR-153, United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

APPENDIX D
NOISE IMPACT ASSESSMENT

Na Pua Makani Wind Farm

Honolulu County, Hawaii

Prepared for

Champlin

CHAMPLIN/GEI WIND HOLDINGS, LLC

Champlin / GEI Wind Holdings, LLC
2020 Alameda Padre Serra, Ste. 123
Santa Barbara, CA 93103

November 2014

TETRA TECH

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Appendix A – Field Equipment Calibration Sheets

1.0 INTRODUCTION

Champlin/GEI Wind Holdings, LLC (Champlin) is proposing to construct and operate the Na Pua Makani Wind Energy Project (the "Project") in Honolulu County, Hawaii. The proposed Project would implement one of two wind turbine generator (WTG) models, quantity, mega-watt (MW), hub-height and rotor diameter as shown in Table 1:

Table 1. Project WTGs under Consideration

Model	Quantity Alternative 2	Quantity Alternative 3	MW Output per WTG	Hub-height (m)	Rotor Diameter (m)
Vestas V110-2.0	2	2	2.0	80	110
Siemens SWT 3.0-113	8	10	3.0	92.5	113
Vestas 2013, Siemens 2013					

The Project design configurations under consideration translate to a potential power output of approximately 25 to 42 MW, depending on WTG type and quantity. This noise impact assessment provides a description of the existing acoustic environment, noise impact criteria, acoustic analysis methodology, construction and operational noise levels, and conclusions and mitigation recommendations.

1.1 ENVIRONMENTAL NOISE DESCRIPTORS

Sound levels are presented on a logarithmic scale to account for the large range of acoustic pressures that the human ear is exposed to and is expressed in units of decibels (dB). A decibel is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (μPa). Broadband sound includes sound energy summed across the entire audible frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum can be completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), and the limit of human hearing is from 20 Hz to 20,000 Hz. WTGs generally produce mechanical sound at a frequency of 20-30 Hz and a "whooshing" aerodynamic sound in the range of 200-1000 Hz (National Health and Medical Research Council 2013). Typically the frequency analysis for an industrial noise source, such as WTGs, examines 11 octave (or 33 1/3-octave) bands ranging from 16 Hz (low) to 16,000 Hz (high). One third (1/3) octave bands take these octave bands and split them into three, providing a higher resolution and a more detailed description of the frequency content of the sound. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system. Existing sound exposure in the Na Pua Makani Wind Farm acoustic analysis area are reported in A-weighted decibels (dBA).

An inherent property of the logarithmic decibel scale is that the sound pressure levels of two separate sources are not directly additive. For example, if a sound of 50 dBA is added to another sound of 50 dBA, the result is a 3-decibel increase (or 53 dBA), not an arithmetic doubling of 100 dBA. The human ear does not perceive changes in the sound pressure level as equal changes in loudness. Scientific research demonstrates that the following general relationships hold between sound level and human perception for two sound levels with the same or very similar frequency characteristics:

- 1 dBA is the practically achievable limit of the accuracy of sound measurement systems and corresponds to an approximate 10 percent variation in sound pressure. A 1 dBA increase or decrease is a non-perceptible change in sound.
- 3 dBA increase or decrease is a doubling (or halving) of acoustic energy and it corresponds to the threshold of perceptibility of change in a laboratory environment. In practice, the average person is not able to distinguish a 3 dBA difference in environmental sound outdoors.
- 5 dBA increase or decrease is described as a perceptible change in sound level and is a discernable change in an outdoor environment.
- 10 dBA increase or decrease is a tenfold increase or decrease in acoustic energy but is perceived as a doubling or halving in sound (i.e., the average person will judge a 10 dBA change in sound level to be twice or half as loud).

To account for the time-varying nature of environmental noise, a single descriptor known as the equivalent sound level (L_{eq}) is often used. The L_{eq} value is the sound energy average over the complete measurement period. It is defined as the steady, continuous sound level over a specified time that has the same acoustic energy as the actual varying sound levels over the same time. The metrics commonly used for environmental sound studies, including the L_{eq}, are reported as dBA (A-weighted decibels) which is a frequency weighting curve that reflects the response of the human ear to sound frequencies across the entire audible frequency range. The equivalent sound level has been shown to provide both an effective and uniform method for describing time-varying sound levels and is widely used in acoustic assessments of wind energy facilities.

Several other statistical descriptors can also be assessed to provide additional understanding of the existing soundscapes. The statistical sound levels (L_n) provide the sound level exceeded for that percentage of time over the given measurement period. An L_{10} level is often referred to as the intrusive noise level and is the A weighted sound level that is exceeded for 10 percent of the time during a specified measurement period. Perhaps more useful is the L_{90} level, which is the A-weighted sound level that is exceeded for 90 percent of the time during the measurement time period. The L_{90} can be thought of as the quietest 10 percent of any time period and is often referred to as the residual sound level and can be an indicator of the potential of audibility for a new sound source. The L_{max} is the maximum sound level during the measurement period and the L_{min} is the minimum sound levels during the measurement period. Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 2. Table 3 provides additional reference information on acoustic terminology.

Table 2. Sound Pressure Levels (L_P) and Relative Loudness of Typical Noise Sources and Soundscapes

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (perception of different sound levels)
Jet aircraft takeoff from carrier (50 ft)	140	Threshold of pain	64 times as loud
50-hp siren (100 ft)	130		32 times as loud
Loud rock concert near stage or Jet takeoff (200 ft)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 ft)	110		8 times as loud
Jet takeoff (2,000 ft)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 ft)	90		2 times as loud
Garbage disposal, food blender (2 ft), or Pneumatic drill (50 ft)	80	Loud	Reference loudness
Vacuum cleaner (10 ft)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 ft)	65		
Large store air-conditioning unit (20 ft)	60		1/4 as loud
Light auto traffic (100 ft)	50	Quiet	1/8 as loud
Quiet rural residential area with no activity	45		
Bedroom or quiet living room or Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, soft whisper (15 ft)	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	

Adapted from: Beranek (1988) and USEPA (1971a)

Table 3. Acoustic Terms and Definitions

Term	Definition
Noise	Unwanted sound dependent on level, character, frequency or pitch, time of day, and sensitivity and perception of the listener. This word adds the subjective response of humans to the physical phenomenon of sound. It is commonly used when negative effects on people are known to occur.
Sound Pressure Level (L_P)	Pressure fluctuations in a medium. Sound pressure is measured in decibels referenced to 20 micropascals, the approximate threshold of human perception to sound at 1000 Hz.
Sound Power Level (L_W)	The total acoustic power of a noise source measured in decibels referenced to picowatts (one trillionth of a watt). Equipment specifications are provided by equipment manufacturers as sound power as it is independent of the environment in which it is located. A sound level meter does not directly measure sound power.
Frequency (Hz)	The rate of oscillation of a sound, measured in units of Hertz (Hz) or kilohertz (kHz). One hundred Hz is a rate of one hundred times (or cycles) per second. The frequency of a sound is the property perceived as pitch. For comparative purposes, the lowest note on a full range piano is approximately 32 Hz and middle C is 261 Hz.

Table 3. Acoustic Terms and Definitions

Term	Definition
A-Weighted Decibel (dBA)	Environmental sound is typically composed of acoustic energy across all frequencies (Hz). To compensate for the auditory frequency response of the human ear, an A-weighting filter is commonly used for describing environmental sound levels. Sound levels that are A-weighted are presented as dBA in this report.
Propagation and Attenuation	Propagation is the decrease in amplitude of an acoustic signal due to geometric spreading losses with increased distance from the source. Additional sound attenuation factors include air absorption, terrain effects, sound interaction with the ground, diffraction of sound around objects and topographical features, foliage, and meteorological conditions including wind velocity, temperature, humidity and atmospheric conditions.
Octave Bands	The audible range of humans spans from 20 to 20,000 Hertz and is typically divided into octave band center frequencies (Hz) ranging from 31 to 8,000 Hz.
Broadband Sound	The audible range of humans spans from 20 to 20,000 Hz and is typically divided into center frequencies ranging from 31 to 8,000 Hz.
Masking	Interference in the perception of one sound by the presence of another sound. At elevated wind speeds, leaf rustle and noise made by the wind itself can mask wind turbine sound levels, which remain relatively constant.
Low Frequency Noise (LFN)	The frequency range of 20 to 200 Hz is typically defined as low frequency noise. Studies have shown that low frequency sound from modern wind turbines is generally below the threshold of human perception at standard setback distances.
Infrasound (IS)	The frequency range of infrasound is normally defined as below 20 Hz. Infrasound from wind turbines are significantly below recognized thresholds for both human perceptibility and standardized health.

Note: Compiled by Tetra Tech from multiple technical and engineering resources.

1.2 LOW FREQUENCY NOISE AND INFRASOUND

Low frequency noise (LFN) and infrasound (IS) are defined by the frequency ranges they represent. LFN comprises noise in the audible human frequency ranges from 20 Hz to 200 Hz. IS represents the frequencies below 20 Hz that while typically inaudible to humans, if the amplitude of IS is very high, for example at least 80 or above for frequencies under 20 Hz and 103 dB or above for 5 Hz, it may be detectible to humans (Massachusetts Department of Public Health or MDPH 2012). Studies have shown that pain from infrasound can result when sound levels are 165 dB or above at 2 Hz and 145 dB or above at 20 Hz (MDPH 2012).

Existing non-WTG related LFN and IS are apparent in most, if not all, environmental settings. The magnitude of these existing background LFN/IS varies, but can be of sufficient strength in to mask much, or all of the LFN and IS from WTGs. Common background natural sound sources of LFN and IS include wind interacting with vegetation in the surrounding environment and ocean waves hitting shores. Additionally, a common anthropogenic sound source with LFN and IS components is roadway noise.

Outside of sleep disturbance from audible noise from WTGs, health effects have not been scientifically demonstrated as a result of low frequency noise from WTGs (MDPH 2012). Additionally, available evidence demonstrates there are no health effects from WTGs infrasound (NHMRC 2013).

2.0 PROJECT NOISE CRITERIA AND GUIDELINES

A review of noise regulations and guideline criteria applicable to the Project was completed at the federal, state, and county level. The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978 [42 USC 4901-4918]), delegates the authority to regulate environmental noise to each state. No county regulations were found but federal EPA guidelines and the State of Hawaii provide noise thresholds and guidelines applicable to the Project. Additionally, there are no federal, state, or local regulations or guidelines for LFN and IS; however, to provide a framework for assessing potential impacts from operational LFN and IS American National Standards Institute (ANSI) have been identified. Additionally, the United Kingdom (UK) Department of Environment, Food, and Rural Affairs (DEFRA) has proposed LFN 1/3-octave band criteria guidelines which are included in this report to provide another set of guidelines for which to compare against.

2.1 U.S. ENVIRONMENTAL PROTECTION AGENCY

In 1974, the U.S. Environmental Protection Agency (EPA) published Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA 1974). This report represents the only published study that includes a large database of community reaction to noise to which a proposed project can be readily compared. The EPA has developed widely accepted recommendations for long term exposure to environmental noise with the goal of protecting public health and safety. The publication evaluates the effects of environmental noise with respect to health and safety, and provides information for state and local governments to use in developing their own ambient noise standards. For outdoor residential areas and other locations in which quiet is a basis for use, the recommended EPA guideline is a day-night sound level (L_{dn}) of 55 dBA. The EPA also suggests an $L_{eq}(24)$ of 70 dBA (24-hour) limit to avoid adverse effects on public health and safety at publicly accessible property lines or extents of work areas where extended periods of public exposure are possible. The EPA cause-and-effect criteria limits are summarized in Table 4.

Table 4. Summary of EPA Cause and Effect Noise Levels

Location	Level	Effect
All public accessible areas with prolonged exposure	70 dBA $L_{eq(24)}$	Safety
Outdoor at residential structure and other noise sensitive receptors where a large amount of time is spent	55 dBA L_{dn}	Protection against annoyance and activity interference
Outdoor areas where limited amounts of time are spent, e.g., park areas, school yards, golf courses, etc.	55 dBA $L_{eq(24)}$	
Indoor residential	45 dBA L_{dn}	
Indoor non-residential	55 dBA $L_{eq(24)}$	

Source: EPA 1974.

2.2 STATE OF HAWAII COMMUNITY NOISE REGULATIONS

The state of Hawaii regulates noise through the Hawaii Administrative Rule (HAR), Title 11, Chapter 46, and "Community Noise Control", promulgated on September 11, 1996 and limits sound generated by new or expanded developments. The Hawaii Community Noise Regulations (HAR 11-46) provide for the prevention, control, and abatement of noise pollution in the State. The 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 operation are subject to the sound level limits. However, the Community Noise Control Regulation is not applicable to most moving sources, i.e. transportation and vehicular movements. Sound from Project construction and the occasional, major equipment overhauls is regulated as construction activity.

The Hawaii noise limits due to stationary sources are provided 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 the purposes of identifying impact conditions, Class A use on Class C Land has been defined at the residential structure, i.e. agricultural portions of the surrounding properties were considered Class C receivers and the residences considered Class A receivers. This is considered a conservative regulatory assessment approach.

As wind energy generation projects may operate at any time 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 provided in dBA according to zoning districts in Table 5. The Hawaii 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 5. Hawaii Maximum Permissible Sound Levels by Zoning District

	Maximum Permissible Sound Level	
Receiving Zoning Class District	**Daytime (7:00am – 10:00pm)**	**Nighttime (10:00pm – 7:00am)**
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

Source: Hawaii Administrative Rules §11-46, "Community Noise Control"

The maximum permissible sound levels are assessed and at any point at or beyond 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 HAR 11-48-8 a permit may be obtained for operation of an excessive noise source beyond the maximum permissible sound levels. Factors that are considered in granting of such permits include whether the activity is in the public interest and whether the best available noise control technology is being employed. The standard provides further exemptions to these limits and further guidance on application, compliance procedures and penalties. The State Department of Health (SDOH) is responsible for the implementation, administration, and enforcement of the statutes.

2.3 LOW FREQUENCY NOISE AND INFRASOUND GUIDELINES

In the absence of LFN and IS noise regulations or guidelines some wind turbine acoustic studies have referenced a variety of guidelines and other country's regulations to assess the potential for impacts (O'Neal 2011). ANSI provides guidelines for outdoor LFN and IS levels via ANSI S12.9 Parts 4 and 5. Additionally, DEFRA provides guidelines for LFN that are used in the UK.

2.3.1 ANSI S12.9 Part 4

The ANSI S12.9 Part 4 (ANSI 2005) provides guidelines for determining annoyance from sound propagating outdoors. Annex D of ANSI S12.9 Part 4 includes methods for assessing environmental sounds with strong low-frequency content. Annoyance is found to be minimal when sound levels in the low frequency midband frequencies of 16 – 63 Hz are less than 65 dB, which corresponds to the threshold for the onset of impacts in these lower frequencies. Part 4 also states that LFN passes through structures with relative ease and is nearly equal to outdoor predicted sound levels. For the Project an indication of annoyance would be used as an indication of a LFN impact.

2.3.2 UK Department of Environment, Food, and Rural Affairs (DEFRA)

In February 2005 DEFRA published their *"Procedure for the assessment of low frequency noise disturbance"* which provides indoor LFN thresholds for disturbance. The DEFRA guidelines are based off of existing low frequency noise criteria from several countries (e.g., Sweden, Denmark, Netherlands, Germany, and Poland) and off of complaints of disturbance from LFN. DEFRA provides thresholds for 1/3-octave bands from 10 to 160 Hz for both non-steady and steady outdoor received sound levels in using the L_{eq} metric. The thresholds are generally 5 dB lower than the threshold of hearing to avoid disturbance. Recent studies have used these guidelines to establish outdoor equivalent sound levels for use in impact assessments (O'Neal 2011). Table 6 provides the outdoor non-stead and steady 1/3-octave LFN thresholds in dB L_{eq}. As indicated, there are no laws or regulations pertaining to LFN and IS from wind energy projects; however, the DEFRA guidelines provide thresholds from which an assessment of potential impact can be made.

Table 6. DEFRA Equivalent Outdoor dB L_{eq} 1/3-Octave Band Sound Pressure Thresholds

	1/3-Octave Band Center Frequency (Hz)												
Location	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
Non-Steady Outdoor	94	89	86	78	68.5	61	56	51	51	49	47	45	43
Steady Outdoor	99	94	91	83	73.5	66	61	56	56	54	52	50	48

Source: DEFRA 2005, O'Neal 2011

3.0 EXISTING CONDITIONS

The acoustic analysis area for the Project includes Tax Map Keys (TMKs), or commonly referred to as parcels, located within 2 kilometers (km) or 1.2 miles of the Project. The mitigation areas for the Project are habitat areas for wildlife that may be affected from the Project. Because no operational or construction noise would result in these areas they are not included in the noise analysis area. Project components, such as WTGs and the substation, would be located on agriculturally zoned TMKs or HAR 11-46 Class C districts. The remaining TMKs

within the noise analysis area are mostly agriculturally zoned; however, north and west of Project there are Class A (mostly residential) and Class B (mostly commercial) TMKs. Table 2 provides descriptions for each of the HAR 11-46 zoning Class Districts. The most restrictive land use from a noise compliance perspective with HAR 11-46 are the Class A TMKs located approximately 480 meters (1,575 feet) from the nearest Project WTG.

3.1 BASELINE SOUND SURVEY

A long term and short term baseline sound survey was completed in support of Project permitting, which provided a statistically relevant data set, covering the full range of wind speeds and future operational scenarios. Tetra Tech's extensive experience on wind energy projects sited in the U.S. indicates that this data set can typically be obtained over a 2-week monitoring period for long-term monitoring. The objective of the baseline sound survey is to establish the existing ambient sound environment of the Project Area. To fulfill this objective Tetra Tech completed the following steps:

1. A measurement program was developed and reviewed by Champlin including instrument selection and setup;
2. Measurement positions (MPs) for the sound survey were pre-selected to give a representative evaluation of baseline sound conditions over the entire Project Area. Landowner permissions were secured prior to the survey and locations were screened on the day of deployment to determine final measure positions;
3. Execution of baseline sound survey, which consisted of a two week monitoring period from April 22, 2014 to May 7, 2014 with data logging for the entire period at three long-term locations;
4. Long term 2-week measurements were supplemented by in-situ short-term (30-minute) measurements;
5. Analysis of baseline data, correlation with the Project's meteorological station representative of wind speed data at hub height of WTGs and presentation of typical values; and
6. Evaluation of masking of wind turbine noise by wind-induced background noise.

3.1.1 Instrumentation

Measurements were completed with either a Larson Davis 831 real-time sound level analyzer equipped with a PCB model 377B02 ½-inch precision condenser microphone or a Norsonic Model Nor140 precision sound analyzer with a Norsonic 1225 ½-inch precision condenser microphone. The Larson Davis 831 instrument has an operating range of 5 dB to 140 dB, and an overall frequency range of 8 to 20,000 Hz and the Norsonic Nor140 has the same operating range but also extends monitoring to lower frequencies with an overall frequency range of 1 to 20,000 Hz. Both devices meet or exceed all requirements set forth in the American National Standards Institute (ANSI) standards for Type 1 sound level meters for quality and accuracy (precision). All real-time sound level analyzers and instrumentation were calibrated per ANSI specifications to ensure the highest data accuracy possible. Laboratory calibrations occurred within the previous 12 month period with calibration documentation provided in Appendix A.

The sound level meters utilized are designed for service as a long-term environmental sound level data logger measuring the A-weighted sound level. Each unattended and weatherproof sound level monitoring position included a sound analyzer enclosed in a weatherproof case and equipped with a self-contained microphone tripod. The microphone and windscreen were tripod-mounted at an approximate height of 1.5 to 1.7 meters (4.9 to 5.6 feet) above grade away from effects of ground level rustling vegetation and fallen leaves. When sound measurements are attempted in the presence of elevated wind speeds, extraneous noise can be self-generated across the microphone. Air blowing over a microphone diaphragm creates a pressure differential and turbulence. All sound level analyzer microphones were protected from wind-induced extraneous noise effects by a 7 inch (180 millimeter) diameter foam windscreen made of specially prepared open-pored polyurethane. By using this microphone protection, the pressure gradient and turbulence is effectively moved further away from the microphone to ensure accurate collection of baseline data.

In addition, weather data were collected at or near the MPs using Vaisala portable weather transmitters, which operated over the full measurement period. Additional information on the Vaisala units is provided in Section 3.1.3.

3.1.2 Measurement Methodology

The baseline sound survey was conducted during a time of year where human activity is neither more nor less intensive than other times of year. Additionally, sounds produced by leaf and crop rustle as well as insect noise can elevate background sound levels and make correlation of background sound levels to wind speed difficult. Because there is little variation seasonally in vegetative cover, agricultural operations, and insect or other wildlife activity, baseline sound monitoring in the noise analysis area is considered to be typical of any time during the year. The lowest background sound levels typically occur on windless nights when the Project would not be operating. Thus, it is important that baseline sound level monitoring document the existing sound levels, day and night, for wind speeds in the range between WTG cut-in and the maximum rated power.

Using mapping and aerial photography of the Project Area, Tetra Tech selected three long term MP locations along the Project's site limit to be representative of noise sensitive receptors (NSRs) nearest to the Project. Tetra Tech attempted to locate monitoring equipment at the structures of the nearest NSR; however, when Champlin requested access from property owners or leases for deployment of monitoring equipment none were agreeable. As a result, Tetra Tech was restricted to placing long-term monitoring equipment at the Project site limit where Champlin had already obtained landowner permission and which was accessible to Tetra Tech. To supplement the long-term data collection short-term measurements were made from public rights-of-way, such as sidewalks, that did not require landowner access permission.

For each long-term measurement, a sound level meter was set up, calibrated, and run continuously in 1-hour and 10-minute intervals during daytime (7:00 am to 10:00 pm) and nighttime (10:00 p.m. to 7:00 a.m.) periods for the two week survey. The maximum observed calibration drift ranged from -0.1 dB to +0.1 dB, which is well within acceptable tolerances for long term baseline sound measurements. Each sound analyzer was programmed to measure and log broadband A-weighted sound pressure levels including a number of statistical parameters such as the average equivalent (L_{eq}), intrusive (L_{10}), median (L_{50}), and residual (L_{90}) sound levels. These data were logged for the duration of the baseline monitoring period to fully characterize the ambient acoustic environment of the Project Area. In addition, full (1/1) and

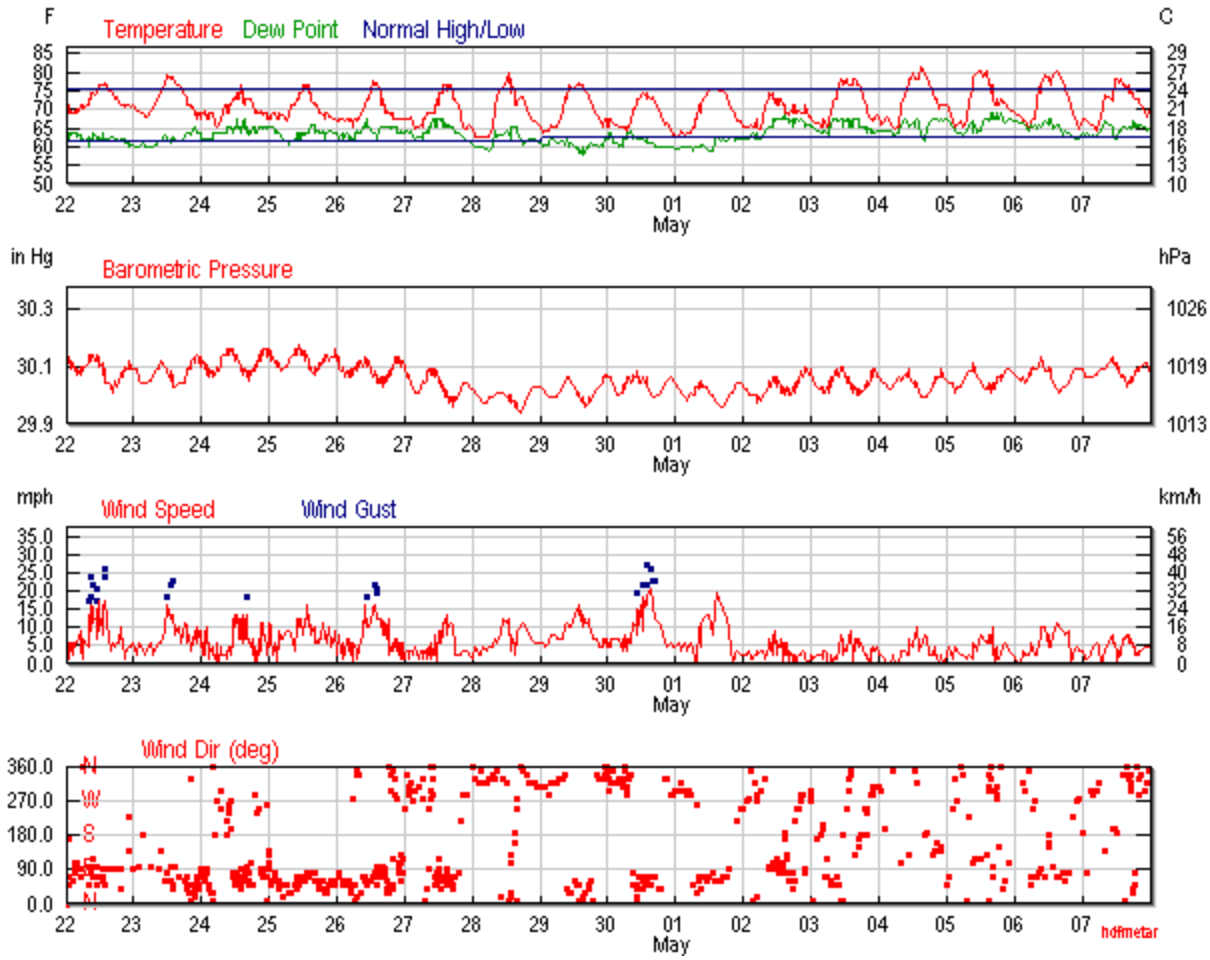
third (1/3) octave band data were collected. All long-term monitoring stations were anchored in a manner that avoided interference from any large vertical reflective surfaces.

Short-term measurements were conducted with the Nor140 sound level meter at selected locations to provide additional information about the acoustical environment. The Nor140 is capable of monitoring to a lower frequency range (e.g., down to 1 Hz) which is useful for describing the LFN and IS content of the existing acoustic environment. Each short-term measurement was conducted for 30-minutes collected in 1-minute intervals, at least once during midday (10:00 a.m. to 3:00 p.m.) to avoid peak hours of traffic noise on area roadways and/or during nighttime hours (12:00 a.m. to 4:00 a.m.), depending on access and safety. The same metrics and octave band data were collected during the short-term measurements as that for the long-term measurements.

Following the completion of the measurement period, all measured data were downloaded and analyzed. Long-term monitoring data were correlated with hub height (approximately 80 meters) wind speed data using a standardized statistical regression analysis methodology. In addition, daytime and nighttime observations were documented during equipment deployment, retrieval, and short-term measurements to identify sound sources with the nighttime period of particular interest as this is a time period of heightened sensitivity to noise (i.e., sleep interruption).

3.1.3 Meteorological Conditions

Champlin provided Tetra Tech wind speed and direction data from their on-site meteorological (MET) towers for the period of the baseline sound survey, given in 10-minute increments. In addition weather data were collected at the long-term MPs using the Vaisala units. The Vaisala unit monitors wind speed and direction via its ultrasonic anemometer, and also measures barometric pressure, temperature and humidity, total rainfall, intensity, and duration of rainfall. The Vaisala unit is also able to distinguish between precipitation type such as rain, hail, and snow. When required, data gaps from the Champlin's MET data were supplemented with the data from the Vaisala units. Figure 1 shows general weather conditions during the baseline sound survey in the vicinity of the Project Area.



Source: Weather Underground, 2014

Figure 1. Baseline Sound Survey Weather Conditions

3.1.4 Sound Survey Results

The three long-term sound monitoring stations were deployed at the Project site limit at locations closest to the nearest NSRs. Table 7 summarizes the UTM coordinates, distance to the nearest proposed WTG, and sound level meter's serial number (S/N) used to collect data for each long-term MP. Figure 2 provides a map of the MPs and acoustic analysis area HAR 11-46 zoning classes.

Table 7. Long-Term Monitoring Position Location Summary

Monitoring Position	UTM Coordinates (NAD83 UTM Zone 14 N)		Distance to Nearest Project WTG (m)	Distance to Nearest Existing Kahuku WTG (m)	SLM Serial Number
	Easting (m)	Northing (m)			
LT-1	606,540.04	2,396,927.75	68.1	326.7	1350 & 14027964
LT-2	607,962.82	2,396,713.27	495.8	1,674.2	3140
LT-3	608,537.47	2,396,811.61	220.6	2,197.0	1403045

Table 8 provides the summary of short-term monitoring locations conducted from public rights-of-way near selected NSRs in the acoustic analysis area.

Table 8. Short-Term Monitoring Position Location Summary

Monitoring Position	UTM Coordinates (NAD83 UTM Zone 14 N)		Distance to the Nearest WTG (m)	Distance to Nearest Existing Kahuku WTG (m)	Serial Number
	Easting (m)	Northing (m)			
ST-1	607,030.73	2,397,241.57	640.6	670.6	1403045
ST-2	607,875.34	2,396,999.59	783.1	1,517.3	1403045
ST-3	608,444.81	2,397,077.41	496.2	2,017.1	1403045
ST-4	609,940.67	2,395,748.07	1,270.4	3,863.1	1403045
ST-5	606,075.81	2,399,058.66	2,235.9	474.6	14027964 & 1403045
ST-6	606,962.96	2,396,334.02	349.2	1,055.4	14027964

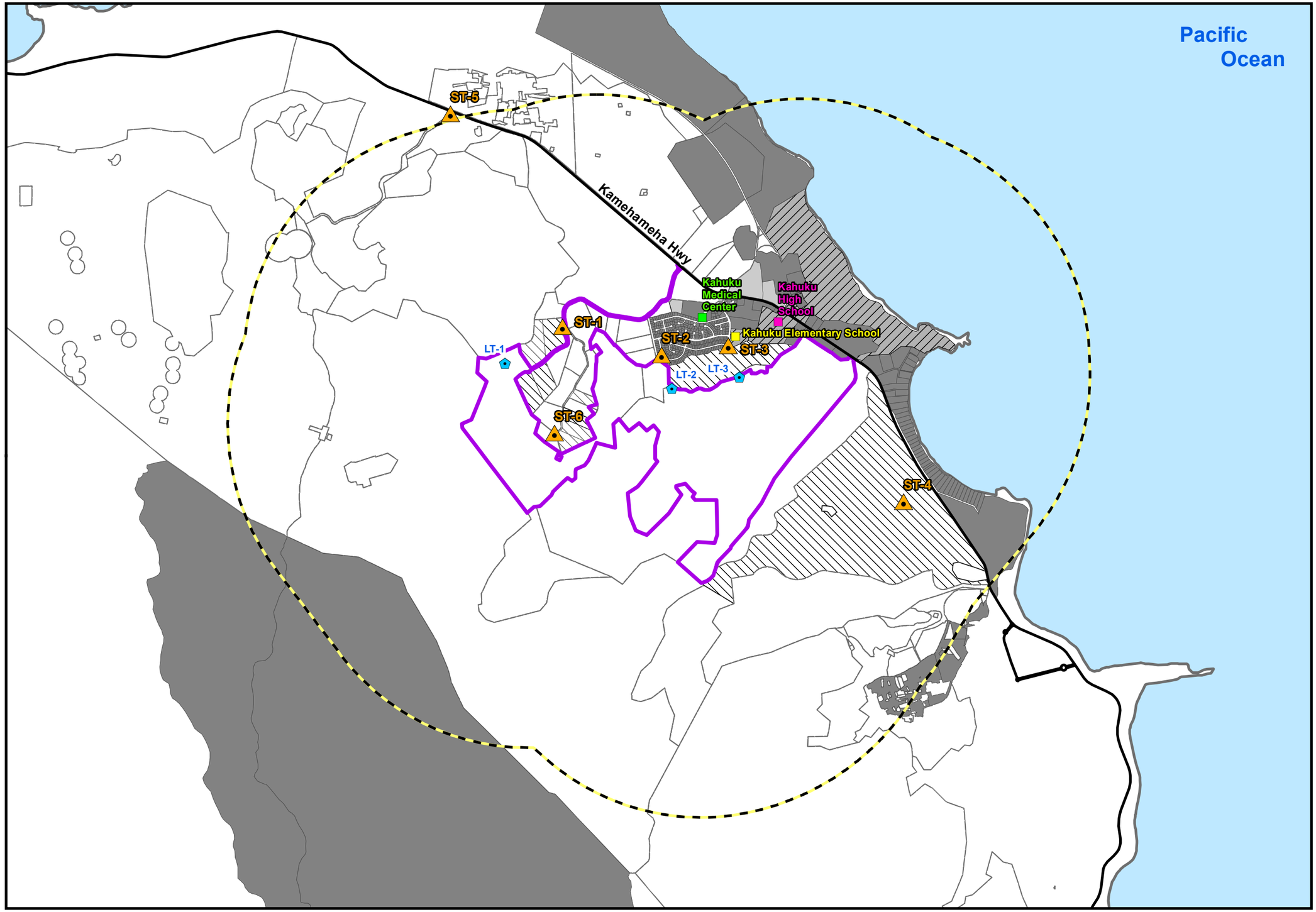


Figure 2

Na Pua Makani Wind Project

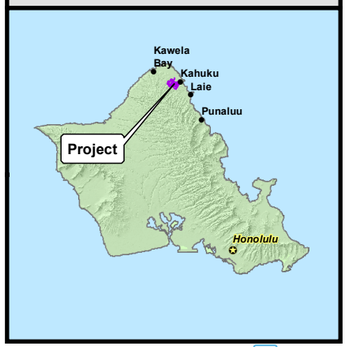
Acoustic Monitoring Positions and HAR 11-46 Zoning Classes

Oahu, HI
Mach 2015

- Wind Farm Site Boundary
- Acoustic Study Area
- Local Road
- Short Term Monitoring Positions
- Sound Monitoring Position
- Kahuku Elementary School
- Kahuku High School
- Kahuku Medical Center

HAR Zone

- Class A (45 dBA Limit)
- Class A (55 dBA Limit) - Day Use Only
- Class B (50 dBA Limit)
- Class C (70 dBA Limit) - Has Residence
- Class C (70 dBA Limit) - No Residence or Project TMK



N 1:32,000 WGS84 UTM 4

0 0.5 1 2 3 4 5 Miles

Data Sources Champlin: project facilities / ESRI: roads / Hawaii Statewide GIS Program: zoning classification

TETRA TECH

P:\GIS_PROJECTS\Champlin_Wind\Na_Pua_Makani\MXDs\EIS\DEIS\Report_Figures\NoiseImpactAssessment\Champlin_NaPuaMakani_DEIS_Sound_Fig2_AffEnvr_11i17i_20150325.mxd - Last Saved 3/25/2015

The baseline sound survey measurement data incorporate all sounds at the MP including contributions from road traffic, sounds of nature, existing industrial facilities, and other human related activities. Long-term monitoring data points below the cut-in wind speed of three meters per second (m/s) for the proposed WTGs and any adversely affected data (external extraneous noise sources) were excluded from the analysis. The refined dataset was evaluated using a regression analysis for each MP as well as all MPs cumulatively grouped for the entire Project Area. Short-term measurements were all conducted during wind speed conditions where the Project would be in operation according to the Project's MET tower with wind speeds ranging from 6 m/s to 11 m/s.

The acoustic monitoring data collected at each MP were matched to Champlin's MET station which monitors wind speeds at 50 meters and that Champlin scaled up to 80 meters, roughly the hub height of the WTGs under consideration. Additionally, each MP's respective Vaisala unit was also matched to the acoustic monitoring data. These two wind speed datasets accurately characterize wind speed conditions at each MP. The 10-minute L_{eq} sound levels were correlated to wind speed (m/s) at an 80 meter (262 feet) hub height with a regression analysis and the best fit correlation coefficient using a second order polynomial equation. The 10-minute L_{eq} sound levels were divided into daytime (7:00 am to 10:00 pm) and nighttime (10:00 pm to 7:00 am) periods to show diurnal variation at each MP. The following subsections present results by MP. Table 9 provides the broadband dBA L_{eq} tabular results of the baseline monitoring survey at integer wind speeds, which is consistent with the limits prescribed in HAR 11-46, which are also given in dBA L_{eq}. The subsections that follow provide 1/3-octave band data results in dB L_{eq} for use with the LFN DEFRA limits.

Table 9. Baseline Monitoring Results at Integer Wind Speeds

Monitoring Position*	Time of Day	dBA L_{eq} by Wind Speed (m/s)								
		Calm	3	4	5	6	7	8	9	10+
LT-1	7AM-10PM	40	45	47	50	50	49	51	52	55
	10PM-7AM	N/A***	43	43	44	47	48	49	50	52
LT-2	7AM-10PM	46	41	45	50	47	46	47	46	48
	10PM-7AM	47	51	42	46	48	46	44	47	45
LT-3	7AM-10PM	42	45	45	44	46	45	45	45	49
	10PM-7AM	44	44	43	40	42	43	43	45	45

Note: *short-term measurements were conducted for 30-minute periods which do not include all operational wind speed conditions. **Vehicle pass-by events removed. ***No "calm" time periods during monitoring.

Monitoring Position: LT-1

LT-1 was located within the Project site along the northwest Project site limits 68m from the Project's proposed WTG #1 and 327m from the nearest existing Kahuku Wind Farm WTG. Deployment occurred on April 23, 2012 at approximately 10:00 AM during sunny and warm (77°F) weather conditions. The elevation at LT-1 is approximately 20 m above sea level (ASL). Noise sources observed during deployment included the existing Kahuku Wind Farm, wind interacting with vegetation, helicopter and fixed-wing aircraft flyovers, and nearby agricultural

activities involving small combustion engine equipment. LT-1 included the two sound level meters, one LD831 and one Norsonic 140 for redundancy. Redundancy was desirable at this location because Tetra Tech wanted to collect sound data generated from the existing Kahuku Wind Farm. During the course of the survey the Norsonic 140 experienced technical issues; however, these issues did not prevent collection of a statistically significant dataset that is appropriate for establishing baseline conditions. Figure 3 presents a photograph of the two sound level meters deployed relative to the existing Kahuku Wind Farm from the viewpoint of the Project's site limit. Figure 4 provides the time history and Figure 5 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods. Figure 6 provides the 1/3-octave band spectral data at cut-in (3 m/s) and maximum rotational (8 m/s) wind speeds relative to the threshold of human hearing. None of the infrasound levels monitored were above the threshold of human hearing. Table 10 provides the 1/3-octave band monitoring results spanning the frequencies from 4Hz to 5000 Hz.

Figure 3. Photo of LT-1

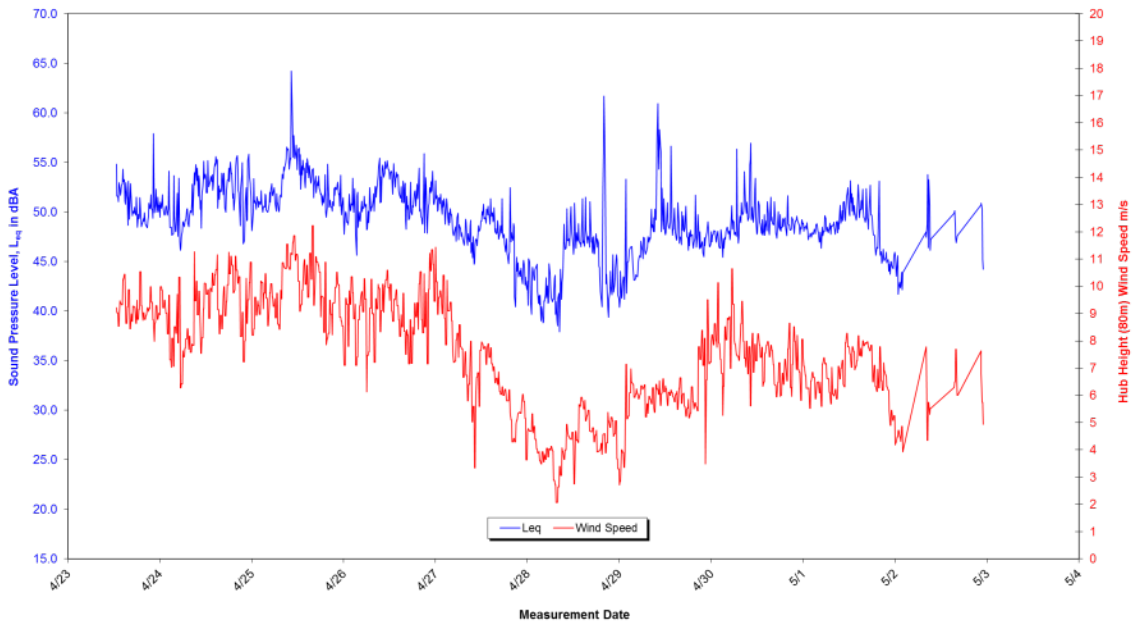


Figure 4. LT-1 Time History Plot

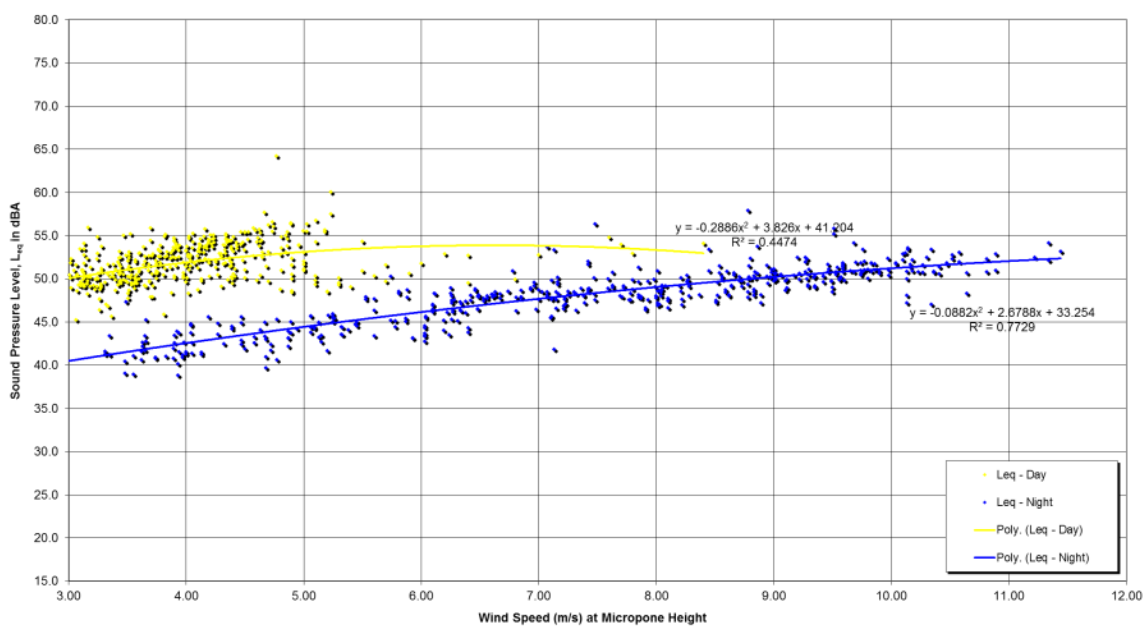


Figure 5. LT-1 Regression Analysis

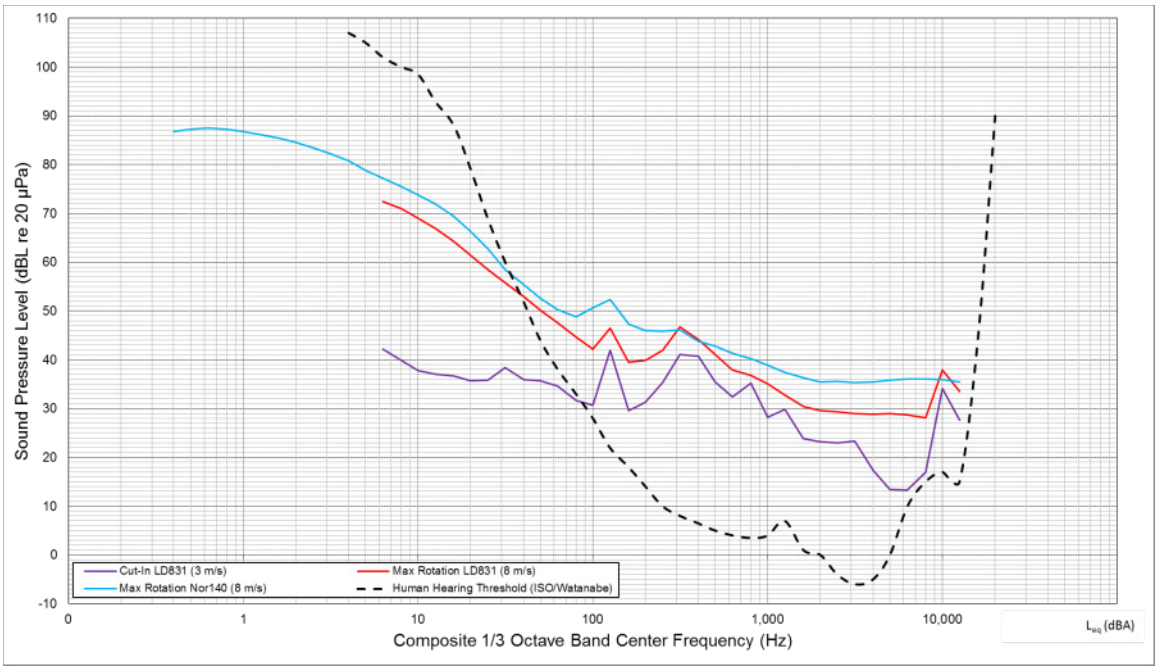


Figure 6. LT-1 1/3-Octave Band Spectral Plot

Table 10. LT-1 1/3-Octave Band Baseline Monitoring Results at Integer Wind Speeds

Frequency Range	1/3-Octave Band (Hz)	dBA L_{eq} by Wind Speed (m/s)							
		3	4	5	6	7	8	9	10
Infrasound	4.0*	-	-	-	74	77	81	82	85
	5.0*	-	-	-	72	75	79	80	83
	6.3	60	60	64	69	71	73	74	75
	8.0	58	58	62	67	70	72	73	74
	10.0	55	56	59	65	68	70	71	72
	12.5	52	53	56	62	66	68	69	71
	16.0	49	50	53	59	63	65	67	69
Low Frequencies	20.0	50	51	52	57	60	63	65	66
	25.0	49	47	48	53	57	60	62	64
	31.5	44	45	48	51	54	57	59	61
	40.0	43	43	45	49	51	54	57	59
	50.0	44	45	45	47	49	52	54	56
	63.0	42	41	42	45	46	49	51	53
	80.0	43	40	40	44	44	47	48	50
	100	41	39	39	43	42	44	46	48
	125	44	45	46	47	47	48	48	48
	160	39	39	38	43	40	42	43	44
	200	37	38	37	43	40	42	42	42
Selected Mid Frequencies	250	38	40	41	42	42	43	44	44
	315	41	43	45	47	47	46	47	47
	400	41	42	43	45	45	44	44	44
	500	38	39	40	42	42	42	41	41
	630	34	35	37	40	38	39	39	39
	800	36	37	37	40	38	38	38	38
	1000	31	32	33	37	36	36	37	37
	1250	30	31	32	35	34	35	35	35
	1600	26	28	29	33	32	32	33	34
	2000	27	28	28	32	31	32	32	33
	2500	28	28	27	31	31	32	32	34

Table 10. LT-1 1/3-Octave Band Baseline Monitoring Results at Integer Wind Speeds

Frequency Range	1/3-Octave Band (Hz)	dBA L_{eq} by Wind Speed (m/s)							
		3	4	5	6	7	8	9	10
	3150	28	27	26	30	31	32	32	34
	4000	22	24	23	29	30	32	33	34
	5000	20	23	23	29	30	32	33	35

Note: *Data monitored using Norsonic 140. All other data monitored with Larson Davis 831

Monitoring Position: LT-2

LT-2 was located within the Project site along the north central Project site limits 496m from the Project's proposed WTG #6 and 1,674m from the nearest existing Kahuku Wind Farm WTG. The location of LT-2 was chosen to represent a cluster of single-family housing 204m north. Deployment occurred on April 23, 2012 at approximately 11:10 AM during sunny and warm (80°F) weather conditions. The elevation at LT-2 is approximately 5m ASL. Sound sources observed during deployment included the light wind interacting with vegetation, distant agricultural equipment, helicopter and fixed-wing aircraft flyovers, and periodic wildlife including insects and stray dogs. The area is relatively sheltered from wind being surrounded by a tree line separating it from other agricultural lands to the south and the residential area to the north. The location is also slightly lower in elevation than the houses in the nearby development which are 34m ASL. Monitoring at LT-2 was accomplished using a LD831 which operated for the entire two week monitoring period providing a statistically significant dataset appropriate for establishing baseline conditions. Figure 7 presents a photograph of the two sound level meters deployed taken in the direction of the residential development. Figure 8 provides the time history and Figure 9 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods. As the time history and regression analysis shows there is little variation in sound level when hub height wind speeds are elevated which confirms that the area is relatively sheltered from the wind. Short-term monitoring in the neighborhood was necessary to ascertain wind effects at the slightly higher elevation which was accomplished via ST-2. Figure 10 provides the 1/3-octave band spectral data at cut-in (3 m/s) and maximum rotational (8 m/s) wind speeds relative to the threshold of human hearing. None of the infrasound levels monitored were above the threshold of human hearing. Table 11 provides the 1/3-octave band monitoring results spanning the frequencies from 6.3Hz to 5000 Hz.

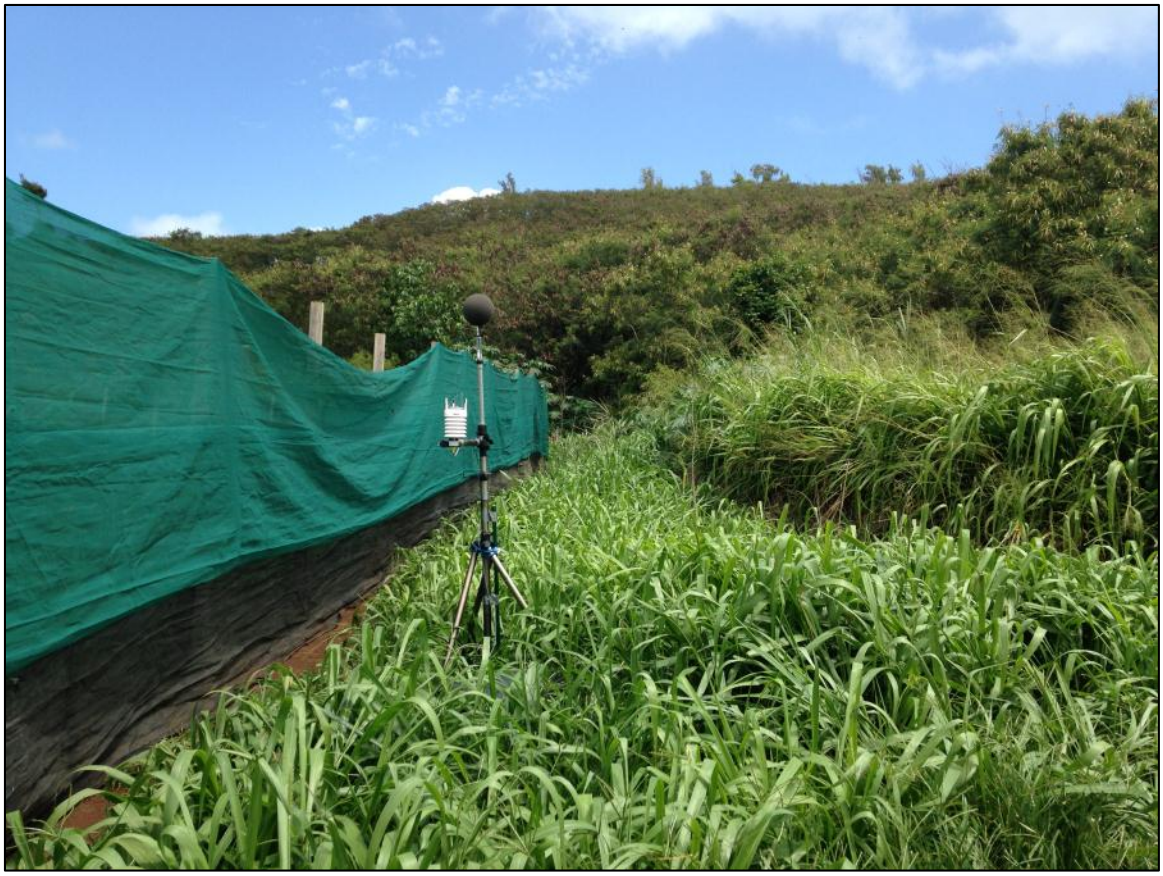


Figure 7. Photo of LT-2

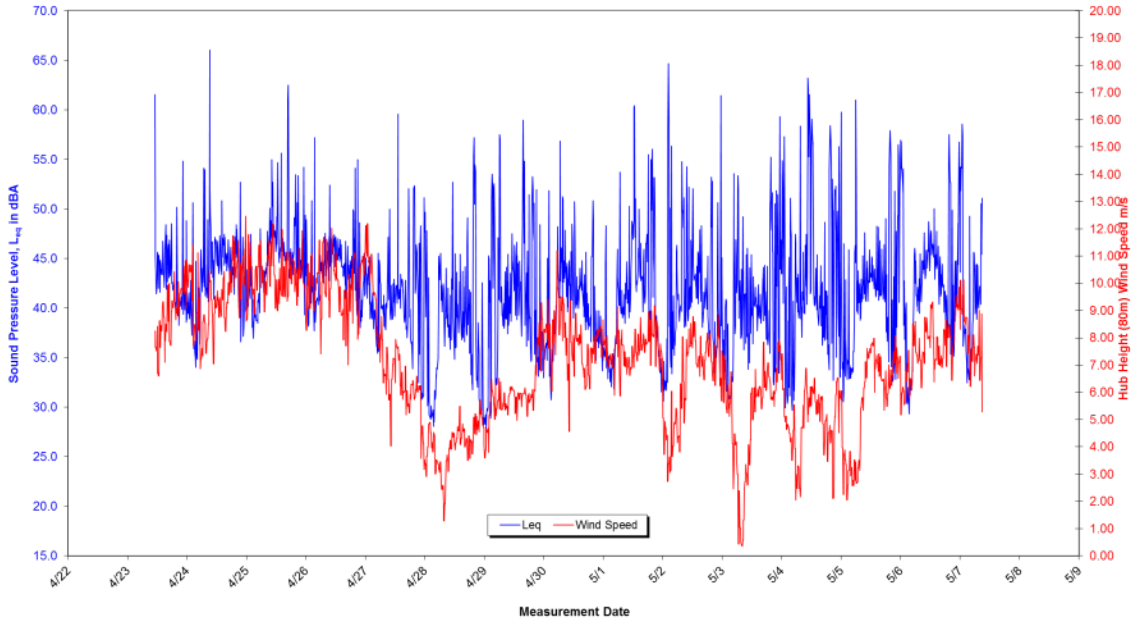


Figure 8. LT-2 Time History Plot

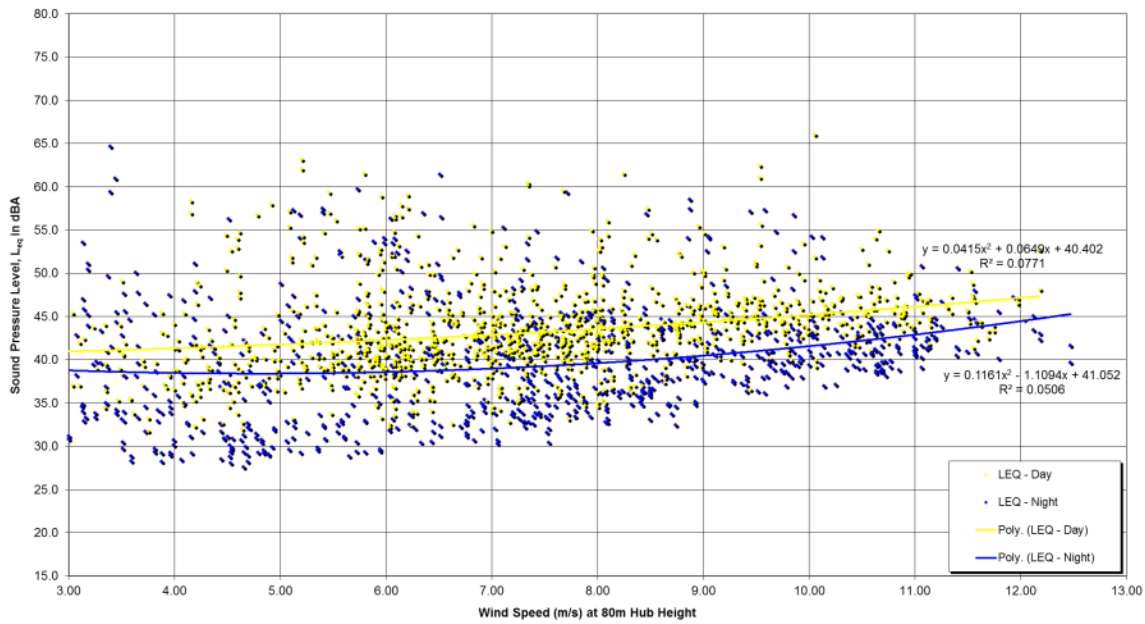


Figure 9. LT-2 Regression Analysis

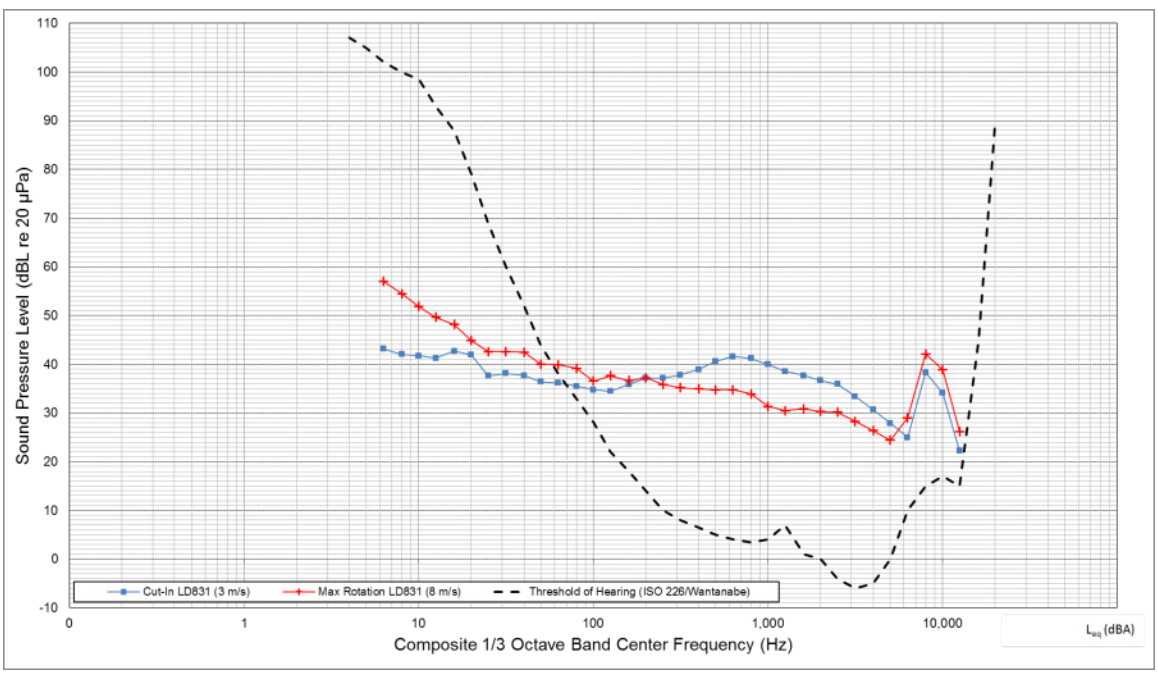


Figure 10. LT-2 1/3-Octave Band Spectral Plot

Table 11. LT-2 1/3-Octave Band Baseline Monitoring Results at Integer Wind Speeds

Frequency Range	1/3-Octave Band (Hz)	dBA L_{eq} by Wind Speed (m/s)							
		3	4	5	6	7	8	9	10
Infrasound	4.0*	-	-	-	-	-	-	-	-
	5.0*	-	-	-	-	-	-	-	-
	6.3	43	47	50	54	56	57	59	60
	8.0	42	45	48	51	54	54	57	58
	10.0	42	43	46	49	51	52	54	55
	12.5	41	43	44	47	49	50	52	52
	16.0	43	46	45	47	48	48	50	51
Low Frequencies	20.0	42	39	40	43	44	45	46	48
	25.0	38	37	39	42	43	43	44	45
	31.5	38	40	41	44	44	43	44	45
	40.0	38	36	39	44	46	42	45	45
	50.0	36	36	39	43	43	40	41	43
	63.0	36	35	41	44	43	40	40	46
	80.0	36	32	43	44	42	39	41	47
	100	35	31	39	41	40	37	38	42
	125	34	32	35	43	42	38	38	40
	160	36	32	36	37	36	37	38	39
	200	37	32	37	37	37	37	38	40
Selected Mid Frequencies	250	37	32	38	37	36	36	37	38
	315	38	31	37	35	35	35	36	37
	400	39	29	37	36	35	35	35	37
	500	41	30	37	36	36	35	36	36
	630	42	30	37	36	35	35	36	36
	800	41	29	37	36	34	34	34	35
	1000	40	27	35	34	32	31	32	36
	1250	39	27	33	32	30	30	31	33
	1600	38	30	34	31	30	31	32	37
	2000	37	29	34	32	30	30	33	35
	2500	36	29	37	33	30	30	34	37
	3150	33	24	34	31	28	28	30	35
	4000	31	22	31	28	26	26	28	32
	5000	28	19	29	26	24	24	28	27

Note: *The LD831 has a functional monitoring limit of 6.3Hz lower frequencies were not monitored at LT-2.

Monitoring Position: LT-3

LT-3 was located within the Project site along the northeastern Project site limits 221m from the Project's proposed WTG #10 and 2,197m from the nearest existing Kahuku Wind Farm WTG. The location of LT-3 was chosen to represent the Kahuku Elementary and High Schools as well as residential areas adjacent to them which are approximately 230m north. Deployment occurred on April 23, 2012 at approximately 11:40 AM during sunny and warm (80°F) weather conditions. The elevation at LT-3 is approximately two meters ASL. Sound sources observed during deployment included the light wind interacting with vegetation, distant agricultural equipment, helicopter and fixed-wing aircraft flyovers, and periodic wildlife including insects. Like LT-2 the area is relatively sheltered from wind being surrounded by a tree line separating it from other agricultural lands to the south and the schools/residential area to the north. The location is also slightly lower in elevation than the schools/residential area which are five meters ASL. Monitoring at LT-3 was accomplished using a Norsonic 140 which operated for the entire two week monitoring period providing a statistically significant dataset appropriate for

establishing baseline conditions. Figure 11 presents a photograph of the two sound level meters deployed taken in the direction of the residential development. Figure 12 provides the time history and Figure 13 provides the regression analyses of ambient sound levels during daytime and nighttime monitoring periods. As the time history and regression analysis shows there is little variation in sound level when hub height wind speeds are elevated which confirms that the area is relatively sheltered from the wind. Short-term monitoring in the neighborhood was necessary to ascertain wind effects at the slightly higher elevation which was accomplished via ST-3. Figure 14 provides the 1/3-octave band spectral data at cut-in (3 m/s) and maximum rotational (8 m/s) wind speeds relative to the threshold of human hearing. None of the infrasound levels monitored were above the threshold of human hearing. Table 12 provides the 1/3-octave band monitoring results spanning the frequencies from 6.3Hz to 5000 Hz.

Figure 11. Photo of LT-3

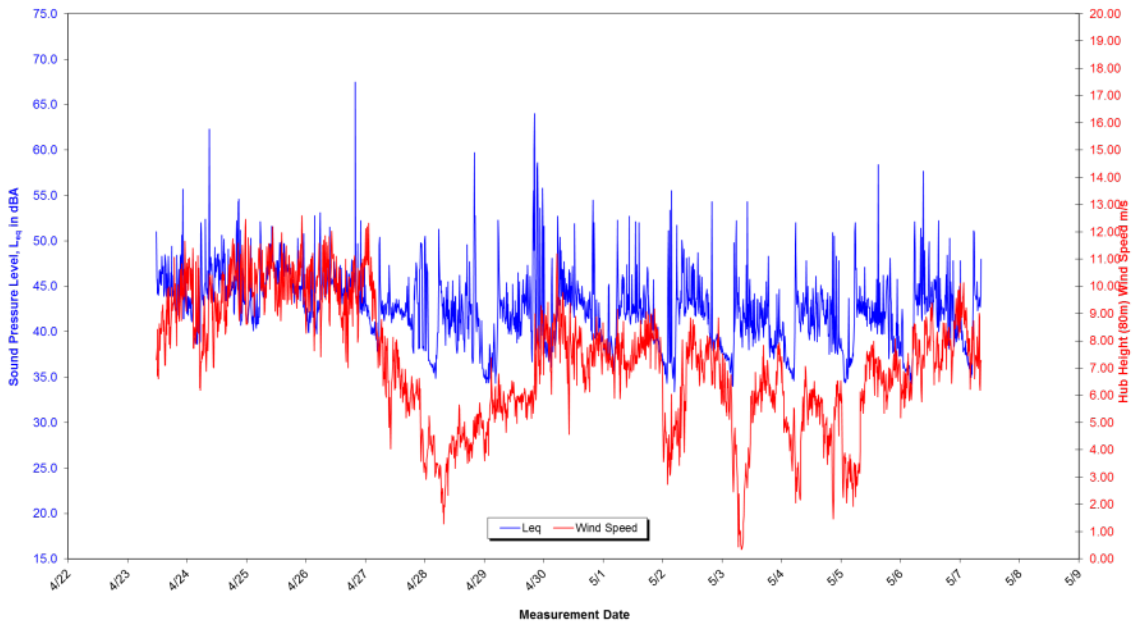


Figure 12. LT-3 Time History Plot

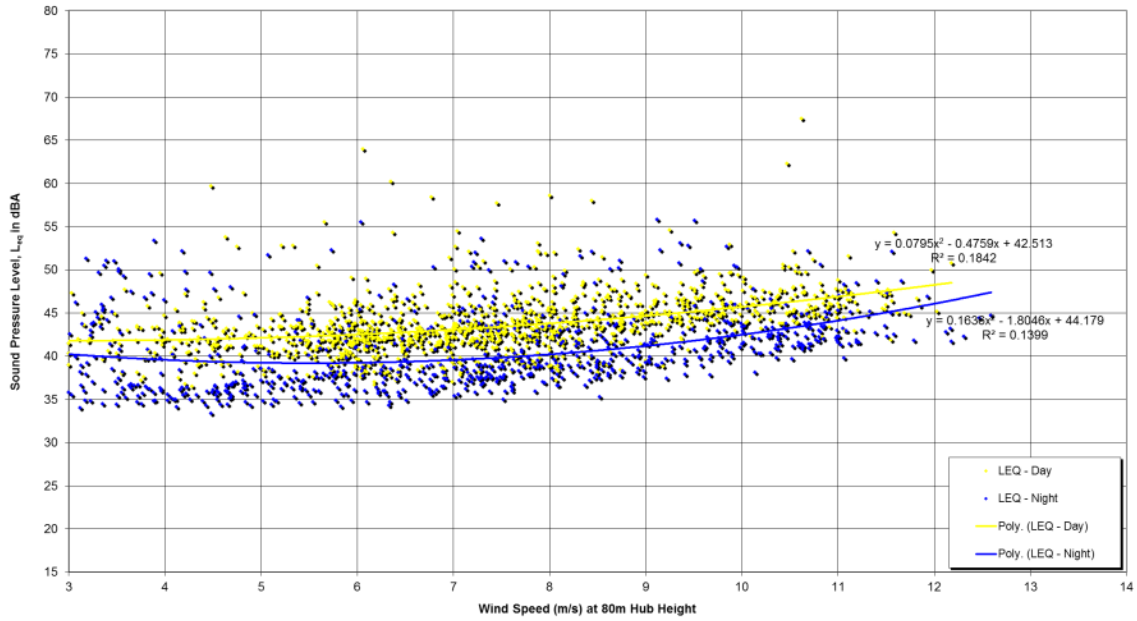


Figure 13. LT-3 Regression Analysis

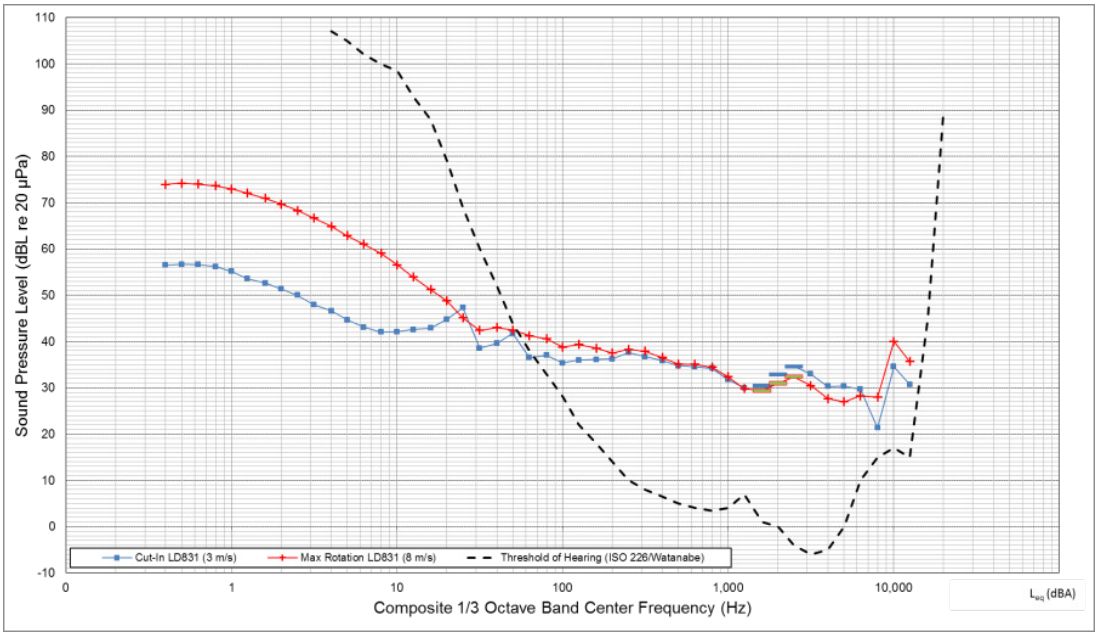


Figure 14. LT-3 1/3-Octave Band Spectral Plot

Table 12. LT-3 1/3-Octave Band Baseline Monitoring Results at Integer Wind Speeds

Frequency Range	1/3-Octave Band (Hz)	dBA L_{eq} by Wind Speed (m/s)							
		3	4	5	6	7	8	9	10
Infrasound	4.0	47	53	56	60	62	65	69	71
	5.0	45	51	54	58	60	63	67	69
	6.3	43	49	52	56	58	61	65	67
	8.0	42	47	50	54	56	59	64	66
	10.0	42	45	47	51	53	57	61	64
	12.5	43	43	45	48	51	54	59	61
	16.0	43	43	44	47	48	51	56	58
Low Frequencies	20.0	45	43	43	46	47	49	53	55
	25.0	47	39	39	41	46	45	49	52
	31.5	39	38	39	40	42	42	46	48
	40.0	40	39	39	41	42	43	45	46
	50.0	42	38	36	39	42	42	44	44
	63.0	37	37	38	37	44	41	43	44
	80.0	37	35	37	38	43	41	42	42
	100	35	34	35	35	41	39	40	41
	125	36	33	33	35	40	39	40	41
	160	36	34	34	36	38	39	40	41
	200	36	33	33	35	38	38	39	41
Selected Mid Frequencies	250	38	34	34	36	38	38	40	42
	315	37	34	34	36	38	38	39	40
	400	36	33	33	35	37	37	37	39
	500	35	32	32	33	36	35	36	38
	630	35	32	31	33	36	35	36	37
	800	34	32	30	32	35	34	35	37
	1000	32	30	28	30	32	32	34	36
	1250	30	28	26	28	30	30	32	34
	1600	30	28	27	28	29	29	31	32
	2000	33	31	29	30	31	31	32	32
	2500	35	33	31	32	32	32	33	35
	3150	33	31	29	31	31	30	31	33
	4000	30	28	25	26	28	28	29	33
	5000	30	28	25	24	27	27	29	30

Monitoring Position: ST-1

The ST-1 measurement was conducted on April 23, 2014 from 5:00PM to 5:30PM along public ROW near leased Hawaii Department of Agriculture (DOA) parcels that have single-family residences. The measurement was conducted to capture monitoring data at these residences where long-term equipment deployment was not allowed. Data collected at ST-1 are meant to provide additional information to characterize the DOA parcels that are located closest to the existing Kahuku Wind Farm. A daytime measurement was conducted at ST-1 with observed sound sources including the existing WTGs at the Kahuku Wind Farm, wind interacting with vegetation, periodic aircraft flyovers, and periodic small combustion engine agricultural equipment. Traffic noise along the Kamehameha Highway was not audible during the measurement or was masked by other sounds including the existing WTGs. Figure 15 provides the 1/3-octave band spectral data for the monitoring period which included hub height wind speeds of 10 m/s. At no time were infrasound levels of sufficient strength to be above the threshold of human hearing.

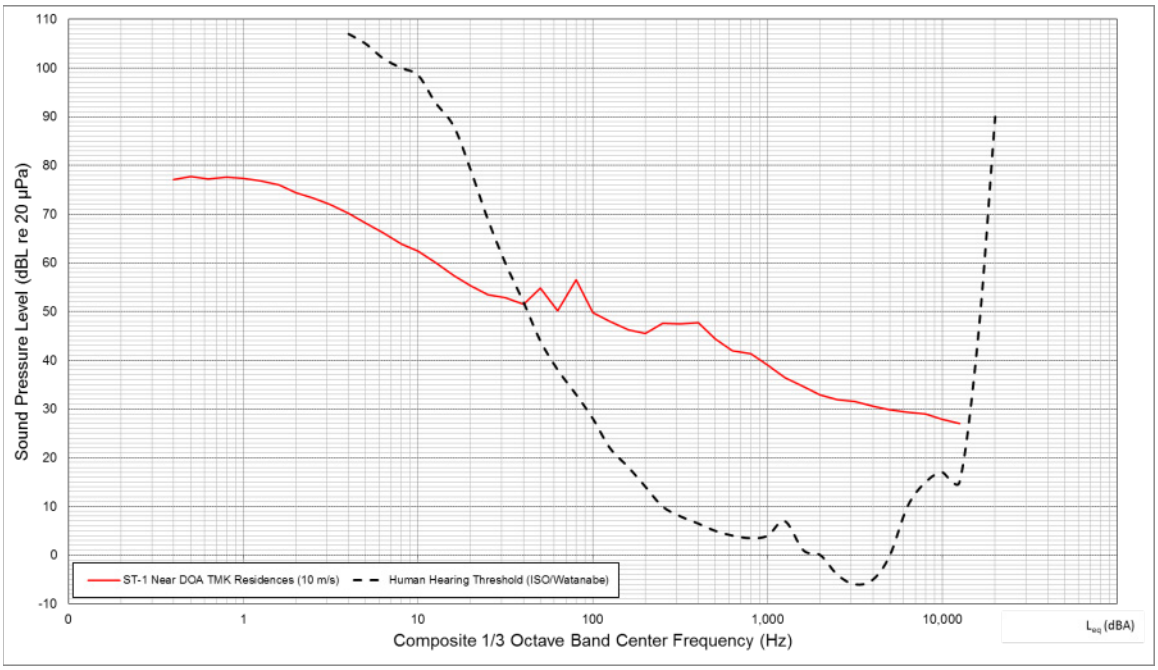


Figure 15. ST-1 1/3-Octave Band Spectral Plot

Monitoring Position: ST-2

The ST-2 measurement was conducted on April 22, 2014 from 2:05PM to 2:35PM along public ROW in the southwest portion of a relatively densely populated housing development referred to as the "Mauka Village". The measurement was conducted to capture monitoring data at these residences where long-term equipment deployment was not allowed. ST-2 is meant to provide additional support data to characterize ambient conditions at these residences which are also represented by LT-2. A daytime measurement was conducted at ST-2 with observed sound sources including the roadway traffic, wind interacting with structures, dogs periodically barking during set up of the meter, people conversing, and periodic helicopter and fixed-wing aircraft flyovers. Figure 16 provides the 1/3-octave band spectral data for the monitoring period which

included hub height wind speeds of 10 m/s. At no time were infrasound levels of sufficient strength to be above the threshold of human hearing.

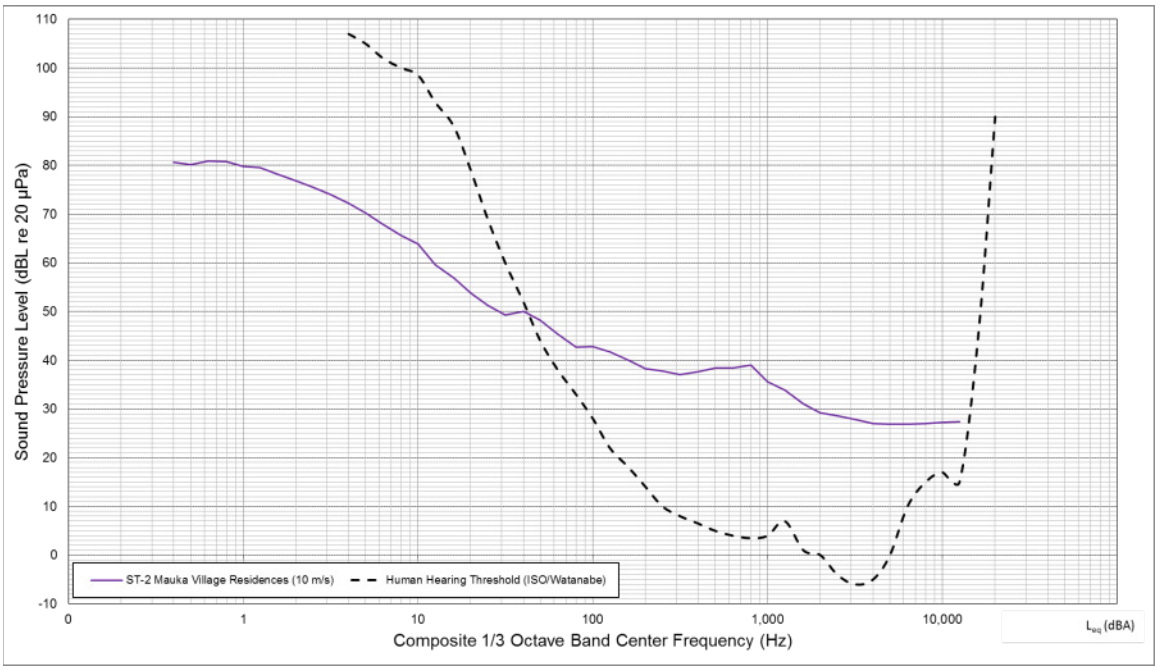


Figure 16. ST-2 1/3-Octave Band Spectral Plot

Monitoring Position: ST-3

Measurements at ST-3 were conducted on April 22, 2014 along public ROW adjacent to the northwest fence line of the Kahuku Elementary School and are representative of the acoustic environment of the schools and residences nearby which are also included in the "Mauka Village". The measurement was conducted to capture monitoring data where long-term equipment deployment was not allowed. ST-3 is meant to provide additional support data to characterize ambient conditions at the schools and residences which are also represented by LT-3. A daytime measurement was conducted from 2:45PM to 3:15PM and a nighttime measurement was conducted from 11:02PM to 11:32PM. Observed daytime sound sources included local roadway traffic, wind interacting with structures and vegetation, distant yard maintenance, people conversing, and periodic helicopter and fixed-wing aircraft flyovers. Nighttime observations included periodic traffic, people conversing at nearby residences, wind interacting with structures and vegetation, and minimal insect noise. Hub height wind speeds during the daytime measurement were 11 m/s and were 9 m/s at night. Figure 17 provides the 1/3-octave band spectral data for the daytime and nighttime monitoring periods. At no time were infrasound levels of sufficient strength to be above the threshold of human hearing.

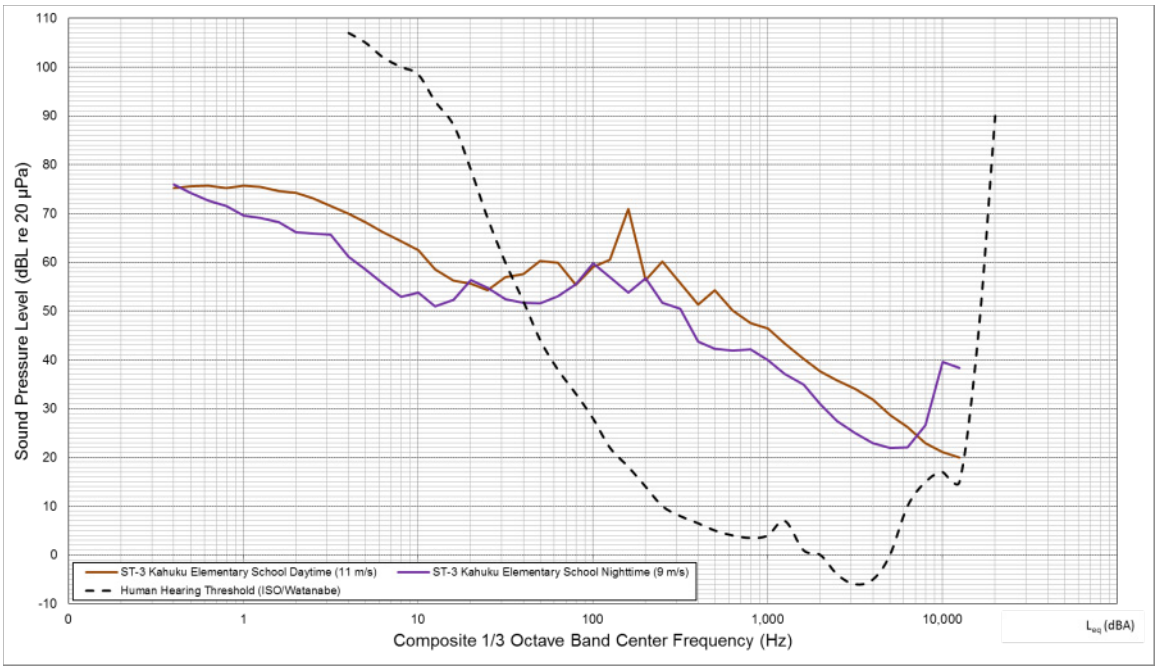


Figure 17. ST-3 1/3-Octave Band Spectral Plot

Monitoring Position: ST-4

Measurements at ST-4 were conducted on April 22, 2014 along limited public ROW near the Gunstock Ranch and are representative of the ranch and nearby rural residences located approximately one kilometer from the Project. The measurement was conducted to capture monitoring data where long-term equipment deployment was not allowed and to verify that long-term monitors at LT-2 and LT-3 are sufficiently representative of this area as well. A daytime measurement was conducted from 3:24PM to 4:03PM and a nighttime measurement was conducted from 10:26PM to 10:56PM. Because the landowners were in the process of locking the limited public access dirt road when field engineers arrived to conduct the nighttime measurement an alternate location was utilized at the entrance off of the Kamehameha Highway. Observed daytime sound sources included periodic local roadway traffic, traffic on the Kamehameha Highway, wind interacting vegetation, distant yard maintenance, people conversing, and periodic helicopter and fixed-wing aircraft flyovers. Nighttime observations included limited traffic on the Kamehameha Highway, wind interacting vegetation, and minimal insect noise. Hub height wind speeds during the daytime measurement were 11 m/s and were 9 m/s at night. Figure 18 provides the 1/3-octave band spectral data for the daytime and nighttime monitoring periods. At no time were infrasound levels of sufficient strength to be above the threshold of human hearing.

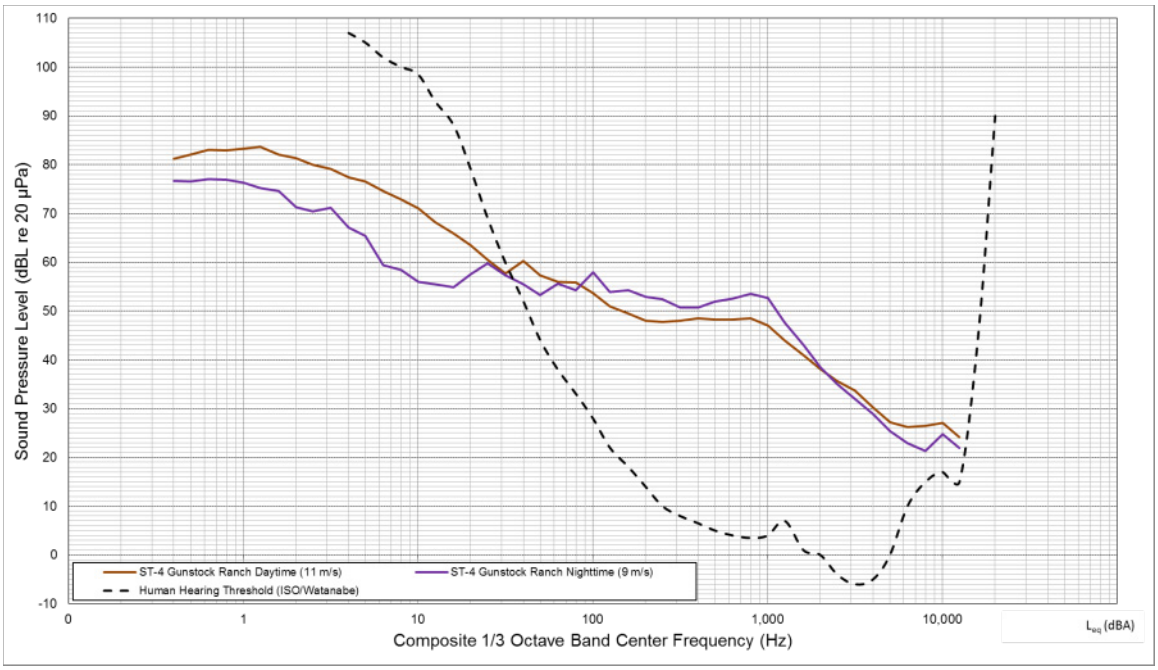


Figure 18. ST-4 1/3-Octave Band Spectral Plot

Monitoring Position: ST-5

Measurements at ST-5 were conducted on May 7, 2014 at the military entrance to the property which contains the Kahuku Wind Farm. The measurement was conducted to capture downwind sound levels from the Kahuku Wind Farm WTGs which are typically louder than in the upwind direction where the Project would be located. A daytime measurement was conducted from 10:00AM to 10:30AM and a nighttime measurement was conducted from 3:11AM to 3:41AM. Observed daytime sound sources included traffic on the Kamehameha Highway, the Kahuku Wind Farm WTGs, wind interacting vegetation, and periodic helicopter and fixed-wing aircraft flyovers. Nighttime observations included minimal traffic on the Kamehameha Highway, the Kahuku Wind Farm WTGs, wind interacting vegetation, and minimal insect noise. Hub height wind speeds during the daytime measurement were 5 m/s and were 6 m/s at night. The dominant sound source at night was from WTGs with the nearest WTG located 476m southwest. To characterize sound levels from just the WTGs to the extent possible was achieved by excluding one minute intervals which included a vehicle pass-by on the Kamehameha Highway. Figure 19 provides the 1/3-octave band spectral data for the daytime and nighttime monitoring periods as well as the nighttime period excluding vehicle pass-bys. At no time were infrasound levels of sufficient strength to be above the threshold of human hearing.

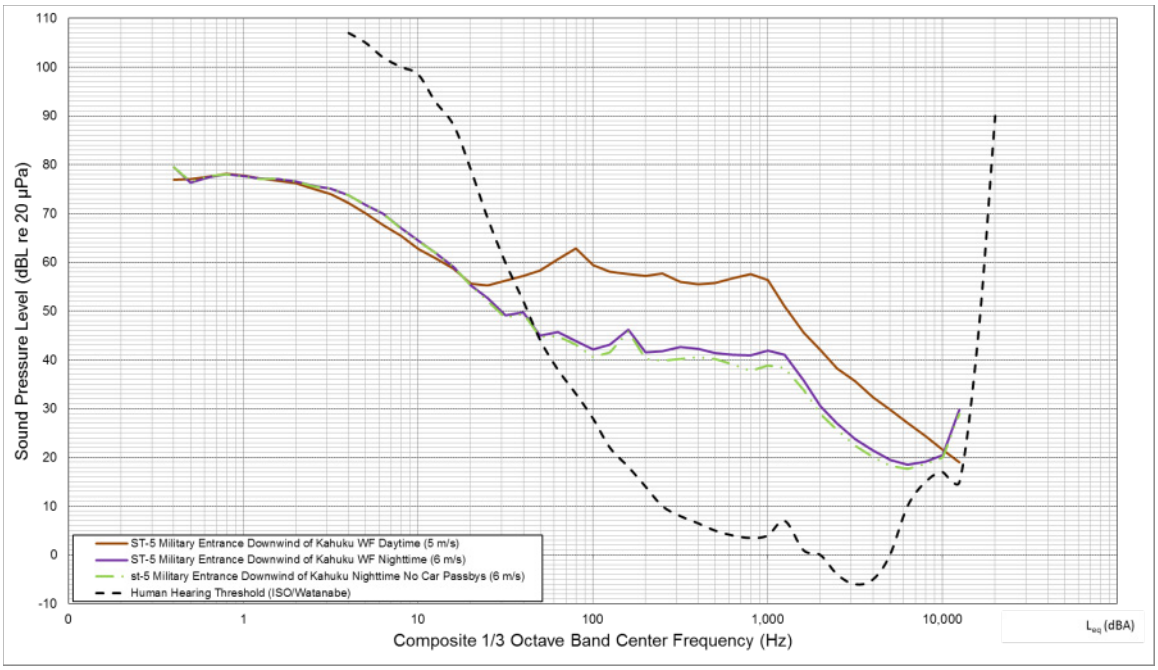


Figure 19. ST-5 1/3-Octave Band Spectral Plot

Monitoring Position: ST-6

The ST-6 measurement was conducted on May 7, 2014 3:54AM to 4:24AM along public ROW near leased DOA parcels that have single-family residences. The measurement was conducted to capture monitoring data at these residences where long-term equipment deployment was not allowed. ST-6 is meant to provide additional support data to characterize these DOA parcels that are located further from the existing Kahuku Wind Farm than those represented by ST-1. A nighttime measurement was conducted at ST-6 with observed sound sources including the existing WTGs at the Kahuku Wind Farm, wind interacting with vegetation, and limited insect noise. Traffic noise along the Kamehameha Highway was not audible during the measurement or was masked by other sounds including the existing WTGs. Figure 20 provides the 1/3-octave band spectral data for the monitoring period which included hub height wind speeds of 10 m/s. At no time were infrasound levels of sufficient strength to be above the threshold of human hearing.

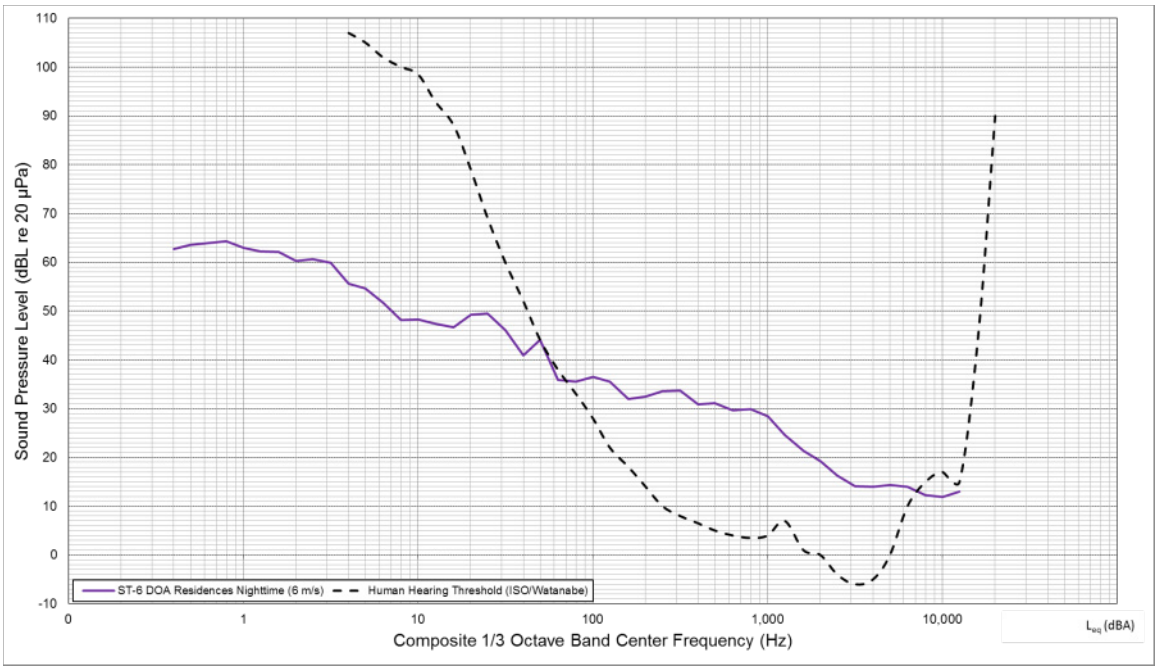


Figure 20. ST-6 1/3-Octave Band Spectral Plot

4.0 ACOUSTIC ANALYSIS METHODOLOGY

Each build alternative was evaluated for construction and operational noise impacts. The No Action Alternative, or Alternative 1, is not discussed here because there would be no noise, other than continued existing sound sources, associated with that alternative. There are two build alternatives under consideration, Alternative 2 (up to 25 MW) and Alternative 3 (up to 39 MW). Noise generated during Project construction and operation was assessed. Project construction was assessed in a semi-qualitative manner using information available at this stage of the design process and using representative equipment information where necessary. The operational acoustic assessment was completed using DataKustic GmbH's CadnaA, the computer-aided noise abatement program (v 4.4.145).

CadnaA is a comprehensive 3-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 due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both 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. The ISO 9613-2 calculation 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, which 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 Project Area. While site-specific meteorological data

was considered in the acoustic assessment, it is important to note that 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 result in over-prediction in sound level at receivers.

In addition to geometrical divergence, attenuation factors (A) include topographical features, terrain coverage, and/or other natural or anthropogenic obstacles that can affect sound attenuation and result in acoustical screening. Topographical information was imported into the acoustic model using the official U.S. Geological Survey (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 semi-reflective value of G=0.5 to represent the average ground absorption of the Project Area. Due to land elevation variability in proximity to the Project, additional conservative factors for sound propagation in complex terrain were also taken into account. Sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings were ignored under all acoustic modeling scenarios.

4.1 WIND TURBINE SOUND CHARACTERISTICS

There are two principal sound sources from an operating wind turbine: mechanical and aerodynamic sound. Mechanical sound is generated at the gearbox, generator, and cooling fan and is radiated from the surfaces of the nacelle and machinery enclosure and by openings in the nacelle casing. Aside from upset conditions that may result in abnormal mechanical noise emissions, the dominant noise generating component of utility scale wind turbines is aerodynamic.

Aerodynamic sound is related to air flow and the interaction with the tower structure and rotor blades when in motion and is the largest component of acoustic emissions for modern wind turbines. Sound originates from the flow of air around the air foils which is very strongly influenced by the tip speed of the blades. Tip speed is the speed of the tip of a rotor blade as it travels along the circumference of the rotor-swept area. The tip speed is directly related to the rotor size, which is fixed, and to the rotor rotational speed. The tip speed ratio is defined as the ratio of the speed of the tip of a rotating blade to the speed of the wind. Aerodynamic noise will vary primarily as a function of rotor rotational speed.

Air flow occurring across the blade produces turbulence at the surface boundary layer, which results in trailing edge boundary sound. Trailing edge sound is considered the principal aerodynamic noise source component of wind turbines. In addition to trailing edge, tip sound is created by vortex shedding as the blade tips pass through the air when in motion. Wind turbine manufacturers have instituted several measures to both reduce aerodynamic sound and increase power generation efficiency by reducing trailing edge and tip sound generation. Efforts to reduce aerodynamic sounds have included the use of upwind rotor designs, noise-reduced nacelle, variable speed operation resulting in lower tip speed ratios, and the use of specially modified rotor blades designed and fabricated to reduce trailing edge noise. Earlier wind turbine designs had the blades located downwind of the support structure. As the blades passed through the vortex shed behind the support tower, the blade would be momentarily displaced, resulting in a pressure pulse. This becomes the mechanism for the generation of excessive acoustic modulation

and low frequency sound. The downwind rotor design is rarely used in modern utility-scale wind turbines that employ the now-standard upwind rotor design with blades upstream of the tower structure. This change in rotor location has greatly reduced many issues associated with the downwind design and resulted in a decrease of 10 dB or greater, which corresponds to a perceived decrease in loudness by a factor of two.

A somewhat unique acoustic characteristic of wind energy facilities is that the sound generated by each individual wind turbine will increase as the wind speed across the site increases, up to a certain maximum sound level reached at full rotation of the rotor blades (i.e., greater than approximately 8 meters per second [m/s]). All wind turbines under consideration for the Na Pua Makani Wind Farm are variable speed-type with sound predominantly determined by the aerodynamic broadband sound of the rotor blades, which is directly related to the circumferential or blade tip speed. Wind turbine sound is negligible when the rotor is at rest, increases as the rotor tip speed increases, and is generally constant once rated power output and full rotational speed is reached. As an offset, as wind speeds increase, the background ambient sound levels likely will continue to increase by the normal sound of wind blowing through trees and around buildings, resulting in acoustic masking effects. Aerodynamic noise is usually only perceived when the turbine rotor is moving and wind speeds are relatively low at ground level.

In order to assist project developers and acoustical engineers wind turbine 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 the International Electrotechnical Commission (IEC) 61400-11:2006 Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques. Table 13 presents a summary of sound power levels during normal mode operation. Sound power levels presented are inclusive of both mechanical and aerodynamic source components. The Vestas and Siemens specification present an expected warranty confidence interval (k-factor) of k=2 dB and k=1.5 dB, respectively. These k-factors were included in all acoustic modeling calculations and incorporates the uncertainty in independent sound power level measurements conducted, the applied probability level and standard deviation for test measurement reproducibility, and product variability. It is expected that the Vestas and Siemens WTGs installed would have similar sound profiles to what was used in the acoustic modeling analysis; however, it is possible that the final warranty sound data could vary slightly.

Table 13. Broadband Sound Power Levels (dBA) Reported in Accordance with IEC 61400-11

Wind Speed at Hub Height (AGL)	WTG Sound Power Level (LW) 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)	22.4 mph (10 m/s)	24.6 mph (11 m/s)	26.8 mph (12 m/s)	29.1 mph (13 m/s)
Vestas V110-2.0	97.3	99.6	103.8	107.5	106.1	106.1	106.1	106.3	106.5	106.7	107
Siemens SWT 3.0-113	N/A	N/A	N/A	105	107.4	107.5	107.5	107.5	N/A	N/A	N/A

Source: Vestas 2013, Siemens 2013

A summary of sound power levels during full rotation for each turbine by octave band center frequency are presented in Table 14.

Table 14. 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	
Vestas V110-2.0	89.9	94.5	97.2	99.6	102.2	100.7	99.1	92.3	107.5
Siemens SWT 3.0-113	85.5	93	100.4	103.7	100.4	92.5	81.6	78.3	107

Source: Vestas 2013, Siemens 2013

Predictions of WTG LFN and IS were conducted to identify potential impacts; however, these predictions are difficult for a number of reasons. For example, WTG manufacturers do not publish LFN and IS sound levels via their IEC 61400-11 testing reports; therefore, surrogate sound levels were needed to conduct the analysis. These surrogate values are the best available data, obtained from other published studies on Siemens WTGs. No data is known to exist on low LFN or IS source levels for Vestas wind turbines, but because the bulk of LFN and IS noise is a result of WTG blades the Siemens data is thought to be representative of the Vestas WTG as well. Additionally, attempts were made to scale the surrogate data to more closely match the Project WTG octave band spectra. Values used in the analysis of Project LFN and IS are given in Table 15.

Table 15. Representative Octave Band 1/1 LFN/IS Frequencies

Frequency (Hz)	Octave Band Sound Power Level (dBA)		
	8	16	31.5
Siemens SWT 3.0-113	59.8	73.7	84.8

Source: Scaled up from data in Epsilon 2010 using Siemens 2013 sound power data.

Another complication of LFN and IS prediction is that standard propagation modeling methodologies (e.g., ISO 9613-2) are not always appropriate because low frequency sounds attenuate at different rates with distance than the mid to high frequencies. Additionally, existing ambient LFN and IS are often already relatively high from the sounds of wind interacting with the environment vegetation or structures, vehicles on roadways, existing wind turbine noise from the Kahuku Wind Farm, and ocean waves crashing on shore. However, comparisons were made to existing LFN and IS levels to ascertain the net increase, if any, with the Project.

4.2 CONSTRUCTION NOISE

Construction noise analysis was evaluated for two Project build alternatives under consideration. Alternative 2 would implement two Vestas V110-2.0 and eight Siemens 3.0-113 WTGs. Alternative 3 would implement two Vestas V110-2.0 and 10 Siemens 3.0-113 WTGs.

4.2.1 Alternative 2

Construction of Alternative 2 would involve constructing of access roads, excavating and forming WTG foundations, works associated with preparing the site for crane-lifting, and actual WTG assembly and commissioning. Typically wind energy projects are constructed in four phases consisting of the following:

- **Site Clearing:** The initial site mobilization phase includes the establishment of temporary site offices, workshops, stores, and other on-site facilities. Installation of erosion and sedimentation control measures will be completed as well as the preparation of initial haulage routes.

- **Excavation:** This phase would begin with the excavation and formation of access roads and preparation of laydown areas. Excavation for the concrete WTG foundations would also be completed.
- **Foundation Work**: Construction of the reinforced concrete WTG foundations would take place in addition to installation of the internal transmission network.
- **Wind Turbine Installation**: Delivery of the WTG components would occur followed by their installation and commissioning.

Work on these construction activities is expected to 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 such as the collection substation, maintenance building, and the overhead transmission lines. The construction of the Project may cause short-term but unavoidable noise impacts depending on the construction activity being performed and the distance to receiver. The sound levels resulting from construction activities vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacturer and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. The list of construction equipment that may be used on the Project and estimates of near and far sound source levels are presented in Table 16.

Table 16. Alternative 2 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)
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

Sources: Federal Highway Administration, "Roadway Construction Noise Model User's Guide," Report FHWA-HEP-05-054 / DOT-VNTSC-FHWA-05-01, January 2006. Power Plant Construction Noise Guide, Bolt Beranek and Newman, Inc. 1977. Federal Highway Administration, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." Code of Federal Regulations, Title 23, Part 772, 1992.

Sounds generated by construction activities would likely require a permit, to be obtained from the DOH, to allow for the operation of construction equipment that result in exceedances of the maximum permissible at property line locations. While the permit and permitting procedures do not limit the sound level generated at the construction site, time restrictions may be placed on time periods when the loudest construction activities are likely to occur, i.e. 7:00 a.m. and 7:00 p.m., Monday through Friday and between 9:00 a.m. and 6:00 p.m. on Saturday. The DOH would require reasonable and standard practices be employed to minimize the impact of noise resulting from construction activities. Provisions to conduct noise monitoring and community meetings may also be required, but will likely be deemed unnecessary given the remote location.

The Project would proactively work with the community and attempt to resolve any complaints or concerns due to noise from construction by coordinating activities and informing the community of the timing of the expected construction noise at the closest NSRs to avoid conflicts, i.e., if blasting for foundation or removal of ledge or other potentially noisy activities are required during the construction period, nearby residents shall be notified in advance.

Construction activity 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 will occur during the initial temporary traffic movements related to turbine delivery, haulage of components and remaining construction; and (2) maintenance and ongoing traffic from staff and contractors, which is expected to be minor. 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 form access roads and foundation platforms for each turbine. Once the access roads are constructed, equipment for lifting the towers and turbine components would arrive. Concrete would be mixed offsite and delivered to the Project site, rather than produced by an on-site concrete batch plant.

Federal laws prohibit state and local governments from regulating off-site 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. Alternative 2 construction would be coordinated with individual landowners regarding the operation of trucks, cars and other vehicles on private site access roadways as necessary to prevent the occurrences of unexpected noise resulting from construction and transport related vehicle movements.

4.2.2 Alternative 3

The first phase of construction of Alternative 3 would be identical to Alternative 2 and the second phase of Alternative 3 would use an identical method as that for the first phase of construction. The variation in construction noise between phases one and two of construction are a result of where construction would take place and that construction would occur at least two years later for the second phase. Like Alternative 2, construction noise is likely to exceed HAR 11-46 limits at some TMKs in the Project Area and therefore a permit from the DOH would likely be required. Mitigation of construction noise would be the same for Alternative 3 as that for Alternative 2.

4.3 OPERATIONAL NOISE

Operational noise analysis was conducted for the same two Project alternatives under consideration (e.g., Alternatives 2 and 3) and for the two WTG types under consideration.

4.3.1 Alternative 2

Operational noise with implementation of Alternative 2 would result from the WTGs and to a lesser extent the proposed substation 50 MVA transformer. Operational broadband (dBA) sound pressure levels were calculated assuming that all Alternative 2 WTGs would be operating

continuously and concurrently at the highest 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 compliance with HAR 11-46, in this case the property or TMK limit. Calculations were completed along each property limit in the acoustic analysis area at a height of 5 ft (1.52 m) above ground (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 completed. Table 17 presents the range of sound levels received at each TMK zoning class along the property line in the acoustic analysis area. These predictions demonstrate that compliance with HAR 11-46 is achieved since Project operational sound levels at the receiving property lines are at or below the controlling noise limit for each zone. Figure 21 provides a map of received sound levels in the acoustic analysis area for Alternative 2.

Table 17. Alternative 2 Range of Property Line Received Sound Levels by HAR 11-46 Zoning Class

HAR 11-46 Zoning Class	Controlling HAR 11-46 Zoning Limit (dBA L_{eq})	Range of Received Sound Levels dBA L_{eq}
Class A	45	8 - 43
Class B	50	37 - 40
Class A (Day Only)*	55	29 – 43
Class C	70	9 - 59

Note: *Class A (Day Only) uses include those at the area schools and golf course.

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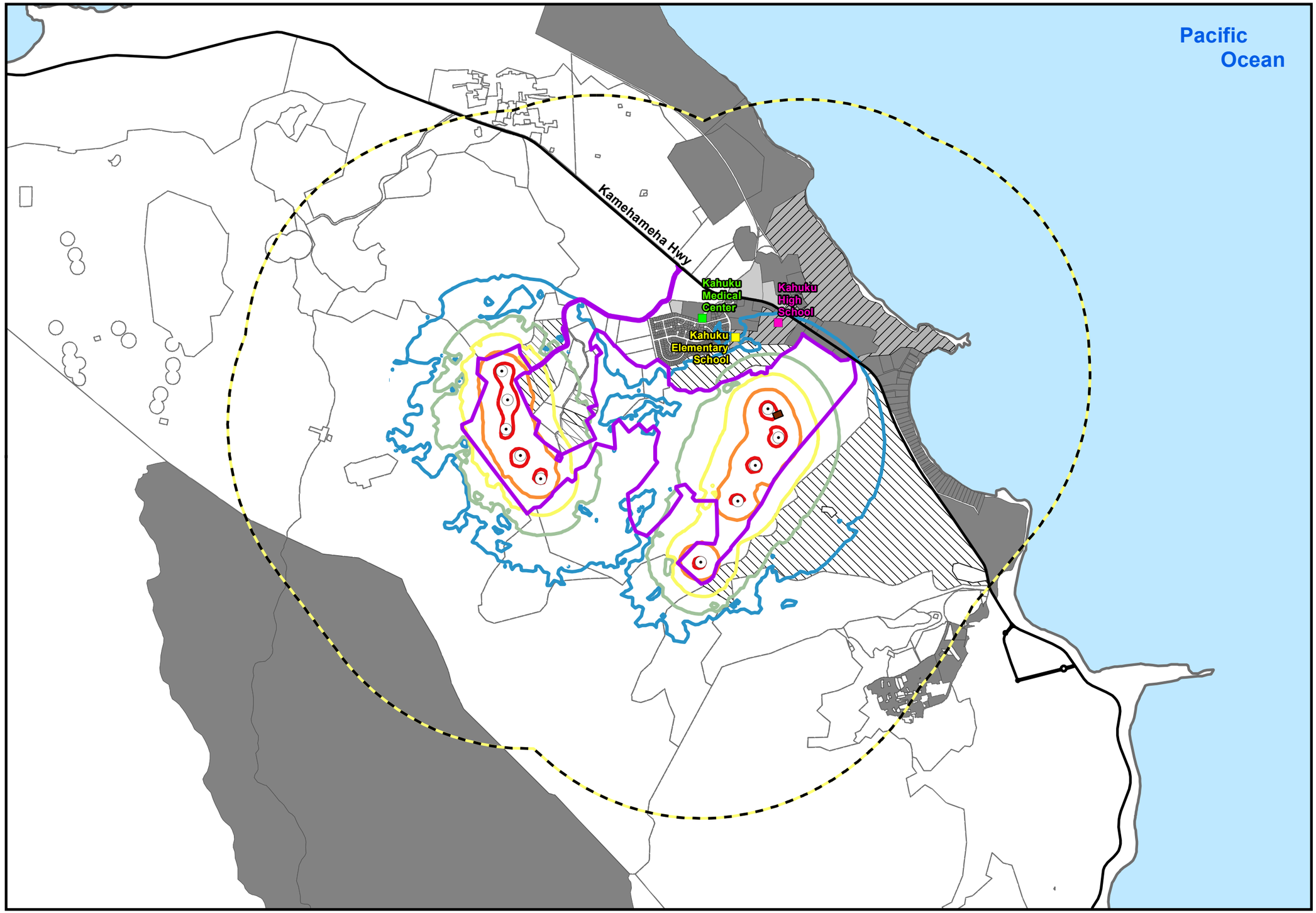


Figure 21

Na Pua Makani Wind Project

Alternative 2 Operational Sound Level Isopleths

Oahu, HI
March 2015

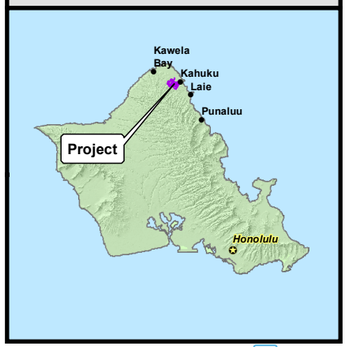
- Wind Farm Site Boundary
- Acoustic Study Area
- Collector Substation and Point of Interconnect
- Local Road
- Kahuku Elementary School
- Kahuku High School
- Kahuku Medical Center
- Potential Turbine Location

HAR Zone

- Class A (45 dBA Limit)
- Class A (55 dBA Limit) - Day Use Only
- Class B (50 dBA Limit)
- Class C (70 dBA Limit) - Has Residence
- Class C (70 dBA Limit) - No Residence or Project TMK

Sound Contour Range (dBA)

- 40
- 45
- 50
- 55
- 60



1:32,000 WGS84 UTM 4

0 0.5 1 2 3 4 5 Miles

Data Sources Champlin: project facilities / ESRI: roads / Hawaii Statewide GIS Program: TMK parcels / Tetra Tech: sound contours generated in CadnaA

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LFN/IS Predictions

As indicated in the regulatory environment description in this document (Section 2.0) there are no federal, state, or local regulations that stipulate LFN/IS noise level limits. Nevertheless, because the community has indicated concern via comments received during scoping, Champlin elected to analyze the contribution of predicted Project LFN/IS to existing LFN/IS levels in order to ascertain if there could be potential Project-related LFN/IS impacts. The analysis was conducted at the nearest NSRs to the Project's WTGs to determine if LFN/IS would exceed the threshold of human hearing, the DEFRA limits, and/or the ANSI S12.9 Part 4 guidelines. The nearest residence is located approximately 673 feet (205 meters) a proposed WTG. Received LFN/IS are predicted to be 83 dB at 8 Hz and 76 dB at 16 Hz which are both well below the threshold of human hearing and the DEFRA limits but higher than the ANS S12.9 Part 4 guideline of 65 dB at 16 Hz. Monitored sound levels in this area would be similar to those monitored at positions LT-1 and ST-1 which shows that existing LFN/IS sound levels range from 69-76 dB at 8 Hz and 63-71 at 16 Hz, all below the threshold of human hearing, but at 16 Hz baseline sound levels are on average above the ANSI S12.9 Part 4. The Project would result in an increase in LFN/IS of but much of this would be masked by existing sound levels. Regardless, because it is unlikely that Project LFN/IS would be audible at these frequencies even the highest increases of LFN/IS would not result in an impact at the nearest residence. With regard to the 65 dB ANSI S12.9 Part 4 guideline, because the baseline sound levels are already above this threshold the likelihood of complaints is low given that Project LFN/IS would also be partially masked. Therefore, there is no anticipated LFN/IS impact from Alternative.

4.3.2 Alternative 3

Operational noise with implementation of Alternative 3 would result from WTGs and to a lesser extent the proposed substation 50 MVA transformer. Additionally, the worst case LFN/IS noise levels would be the same under Alternative 3 as they are under Alternative 2 because the nearest residence is the same for the alternative being located 205 meters from the nearest proposed turbine. Refer to the Alternative 2 discussion of LFN/IS for results.

Operational broadband (dBA) sound pressure levels were calculated assuming that all Alternative 3 WTGs (a total of 13) would be 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 compliance with HAR 11-46, in this case the property or TMK limit. Calculations were completed using receptor points along each property limit in the acoustic analysis area at a height of 5 ft (1.52 m) above ground (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 completed. Table 19 presents the range of sound levels received at each TMK zoning class along the property line in the acoustic analysis area. Compliance with HAR 11-46 is achieved if Project operational sound levels at the receiving property line are at or below the controlling noise limit for each zone. Because sound levels for operation of the Project are all below the controlling HAR 11-46 limit the Project is anticipated to be in compliance.

Table 19. Alternative 3 Range of Property Line Received Sound Levels by HAR 11-46 Zoning Class

HAR 11-46 Zoning Class	Controlling HAR 11-46 Zoning Limit (dBA L_{eq})	Range of Received Sound Levels dBA L_{eq}
Class A	45	9 – 44
Class B	50	37 – 40
Class A (Day Only)*	55	30 – 43
Class C	70	10 – 59

Note: *Class A (Day Only) uses include those at the area schools and golf course.

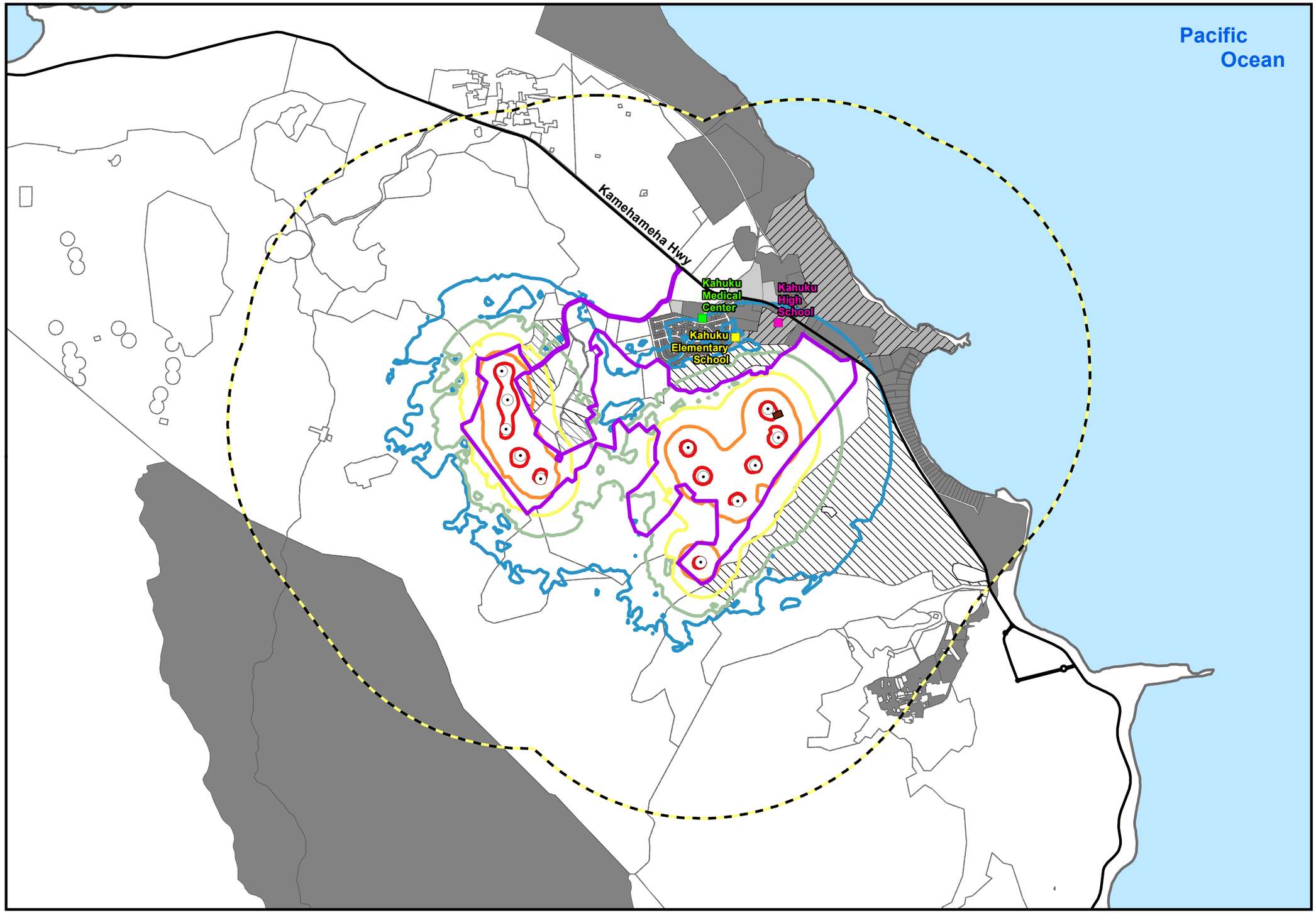


Figure 22

Na Pua Makani Wind Project

Alternative 3 Operational Sound Level Isopleths

Oahu, HI
March 2015

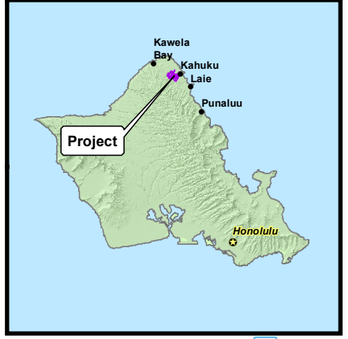
- Wind Farm Site Boundary
- Acoustic Study Area
- Collector Substation and Point of Interconnect
- Local Road
- Kahuku Elementary School
- Kahuku High School
- Kahuku Medical Center
- Potential Turbine Location

HAR Zone

- Class A (45 dBA Limit)
- Class A (55 dBA Limit) - Day Use Only
- Class B (50 dBA Limit)
- Class C (70 dBA Limit) - Has Residence
- Class C (70 dBA Limit) - No Residence or Project TMK

Sound Contour Range (dBA)

- 40
- 45
- 50
- 55
- 60



1:32,000 WGS84 UTM 4

0 0.5 1 2 3 4 5 Miles

Data Sources Champlin: project facilities / ESRI: roads / Hawaii Statewide GIS Program: TMK parcels / Tetra Tech: sound contours generated in CadnaA

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5.0 CONCLUSIONS

To conclude, Alternative 2 results in lower overall sound levels than Alternative 3 due to the smaller number of WTGs being constructed and operated. Both Alternatives would be able to be constructed in compliance with HAR 11-46, but only if the construction contractor obtains a noise permit from DOH. Operationally neither Alternative is predicted to exceed the HAR 11-46 sound level limits, but both alternatives are predicted to increase sound levels in the acoustic analysis area by greater than 2 dBA at some Zone A or B TMKs, therefore operationally both Alternatives are similar although Alternative 3 results in slightly higher noise levels than Alternative 2. LFN/IS are not predicted to be a concern for the Project and are predicted to be below the threshold of human hearing. Additionally, there have been no known scientifically peer reviewed studies to date concluding a relationship between LFN and IS to health effects. Even so, the LFN/IS sound levels predicted with the Project are considered low level as they are below the threshold of human hearing and are not thought to pose a health risk to humans. Furthermore, monitored ambient LFN/IS levels would mask some of the Project LFN/IS further reducing the potential for public complaint. Nevertheless, to respond to potential future public concerns Champlin may decide to implement a noise complaint resolution process. This process might include a post construction sound survey to ascertain the net increase, if any, in sound levels in the acoustic analysis area. Regardless, because there are no predicted operational noise impacts, mitigation of operational noise is not necessary.

6.0 REFERENCES

ANSI (American National Standards Institute).

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Siemens

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APPENDIX A CALIBRATION SHEETS

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	72.6	°F
Model Number:	831		22.56	°C
Serial Number:	3140	Rel. Humidity:	10.9	%
Customer:	TMS Rental	Pressure:	1004.1	mbars
Description:	Sound Level Meter		1004.1	hPa

Note: As Found / As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the Stated tolerance of the manufacturer's specification

Calibration Date: 29-Jan-14 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due	Traceability No.
Larson Davis	LDSigGen/2239	0760/0109	4/12/2014	2012-161465

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Wayne Underwood Signature:

THE MODAL SHOP INC.
A PCB GROUP CO.

The Modal Shop, Inc.
3149 East Kemper Road
Cincinnati, OH 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

PRD-F242 revNR December 2, 2008 Page 1 of 1

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-175223

Instrument Model 831, Serial Number 0001350, was calibrated on 10JUN2013. The instrument meets factory specifications per Procedure D0001.8310, ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985 ; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 1; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 1; 61252-2002.

Instrument found to be in calibration as received: YES
Date Calibrated: 10JUN2013
Calibration due: 10JUN2015

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Stanford Research Systems	DS360	61746	12 Months	06JUL2013	61746-070612

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 24 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM831-010875

Signed: Ron Harris
Technician: Ron Harris

Page 1 of 1

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.30716

Instrument: **Sound Level Meter**
Model: **140**
Manufacturer: **Norsonic**
Serial number: **1402796**
Tested with: **Microphone 1225 s/n 112883**
Preamplifier 1209 s/n 13442
Type (class): **1**
Customer: **Scantek, Inc.**
Tel/Fax: **410-290-7726 / 410-290-9167**

Date Calibrated: **3/3/2014** *Cal Due:* **3/4/2015**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No
Calibration service: __ Basic _X_ Standard
Address: **6430 Dobbin Road, Suite C, Columbia, MD 21045**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2013	Scantek, Inc./ NVLAP	Oct 7, 2014
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 30, 2013	ACR Env. / A2LA	Sep 30, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30,2013	ACR Env./ A2LA	Sep 30, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24.4 °C	101.260 kPa	34.1 %RH

Calibrated by:	Lydon Dawkins	Authorized signatory:	Mariana Buzduga
Signature	Lydon Dawkins	Signature	[illegible]
Date	3/3/2014	Date	3/5/2014

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Document stored Z:\Calibration Lab\SLM 2014\Nor140_1402796_M1.doc

Page 1 of 2

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES[1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
CALIBRATION OF SOUND LEVEL METER - ANSI S1.4 CLAUSE 3.2	Passed	0.2
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: LINEAR NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
FAST-SLOW TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
IMPULSE TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.3	Passed	0.25
IMPULSE TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.15
FILTER TEST 1/1OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.
[2] Parameters are certified at actual environmental conditions.
[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone:	Norsonic 1225 s/n 112883 for acoustical test
Preamplifier:	Norsonic 1209 s/n 13442 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests	
Accompanying acoustical calibrator:	none
Windscreen:	none

Measured Data: in Test Report # 30713 of 12 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

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Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27879

Instrument: **Sound Level Meter**
Model: **140**
Manufacturer: **Norsonic**
Serial number: **1403045**
Tested with: **Microphone 1225 s/n 91814**
Preamplifier 1209 s/n 12742
Type (class): **1**

Customer: **Scantek, Inc.**
Tel/Fax: **410-290-7726 / 410-290-9167**

Date Calibrated: **5/8/2013** *Cal Due:* **5/9/2014**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard

Address: **6430 Dobbin Road, Suite C, Columbia, MD 21045**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 14, 2012	Scantek, Inc./ NVLAP	Sep 14, 2013
DS-360-SRS	Function Generator	33584	Sep 9, 2011	ACR Env./ A2LA	Sep 9, 2013
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 12, 2012	ACR Env. / A2LA	Sep 12, 2013
HM30-Thommen	Meteo Station	1040170/39633	Dec 6, 2012	ACR Env./ A2LA	Dec 6, 2013
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.9 °C	100.010 kPa	51.5 %RH

Calibrated by:	Mariana Buzduga	Authorized signatory:	Valentin Buzduga
Signature		Signature	
Date	5/9/2013	Date	5/09/2013

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Page 1 of 2

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES[1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
CALIBRATION OF SOUND LEVEL METER - ANSI S1.4 CLAUSE 3.2	Passed	0.2
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: LINEAR NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
FAST-SLOW TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
IMPULSE TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.3	Passed	0.25
IMPULSE TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.15
FILTER TEST 1/1OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone:	Norsonic 1225 s/n 91814 for acoustical test
Preamplifier:	Norsonic 1209 s/n 12742 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests	
Accompanying acoustical calibrator:	none
Windscreen:	none

Measured Data: in Test Report # 27879 of 12+1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

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Page 2 of 2

APPENDIX E
BIOLOGICAL SURVEY REPORT

BIOLOGICAL RESOURCES SURVEY

NA PUA MAKANI WIND ENERGY PROJECT

KAHUKU, KOOLAULOA, OAHU, HAWAII

by

Robert W. Hobdy
Environmental Consultant
Kokomo, Maui
July 2013

Prepared for:
Tetra Tech, Inc.

BIOLOGICAL RESOURCES SURVEY
NA PUA MAKANI WIND ENERGY PROJECT
KAHUKU, KOOLAULOA, OAHU

INTRODUCTION

The Na Pua Makani Wind Energy Project lies on 685 acres of land above Kahuku Town, Koolauloa, Oahu TMK's (1) 5-6-08:06 and (1) 5-6-06:16. It is surrounded by agricultural farm lands to the north and east and by undeveloped forested lands to the west and south. This biological study was initiated in fulfillment of environmental requirements of the planning process.

SITE DESCRIPTION

The project consists of steep, dissected ridges surrounding gently sloping valleys. Elevations rise steeply behind Kahuku Town to about 250 ft., while the inland ridges rise to nearly 350 ft. Soils include Kaena Stony Clay, 12-20% slopes (KaeD), Paumalu Badlands Complex (PZ), which is highly dissected and steep, and with coral outcrops (CR) at elevations below 100 ft. (Foote et al. 1972). Rainfall averages 45 in. to 50 in. per year with most falling during a few winter storms (Armstrong, 1983). Vegetation consists mostly of low, windblown shrubs and trees on the ridge tops and larger trees and brush on the slopes and in the gullies.

BIOLOGICAL HISTORY

In pre-contact times the lower, more gently sloping lands would have been extensively farmed by a large Hawaiian population that lived in the lower valleys and along the sea shore. The ridges would have been covered by a dense tangle of native shrubs such as ʻūlei (*Osteomeles anthyllidifolia*), ʻakia (*Wikstroemia oahuensis*), ʻiliahi aloʻe (*Santalum ellipticum*), and ʻuhaloa (*Waltheria indica*).

In the late 1800s much of the area was converted to sugar cane agriculature. The land was cleared, plowed, burned and harvested in continuous cycles for about 100 years. Much of the steeper land was used to pasture plantation horses and mules. This reduced the numbers and diversity of native plants considerably. Sugar was discontinued in the 1980's and the land was put into truck crop agriculture or left idle. Today the area is a largely non-native shrubland and forest consisting of a diverse array of aggressive weedy species and a few tough and persistent native plants that have been able to compete and survive.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Na Pua Makani Wind Energy Project which was conducted during June 2013. The objectives of the survey were to:

1. Document what plant, bird and mammal species occur on the property or may likely occur in the existing habitat.

2. Document the status and abundance of each species.

3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.

4. Determine if the project area contains any special habitats, which if lost or altered, might result in a significant negative impact on the flora and fauna in this part of the island.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used following multiple routes to ensure complete coverage of the area. Areas most likely to harbor native plants such as open ridge tops, gullies or rock outcrops were more intensively examined. Notes were made on plant species, distribution and abundance as well as on terrain and substrate.

DESCRIPTION OF THE VEGETATION

The vegetation on this property is a mixture of aggressive weedy species that have taken over since the abandonment of sugar cane agriculture, but there is also a complement of native shrubby species remnant on windy ridge tops. Most abundant throughout the project area is the common ironwood (*Casuarina equisetifolia*). Other common species are koa haole (*Leucaena leucocephala*), octopus tree (*Schefflera actinophylla*), (*Bidens alba*) no common name, Guinea grass (*Megathyrsus maximus*), pitted beardgrass (*Bothriochloa pertusa*), parasol leaf tree (*Macaranga tanarius*), Formosa koa (*Acacia confusa*), kaimi clover (*Desmodium incanum*), ‘uhaloa, Koster’s curse (*Clidemia hirta*), Java plum (*Syzygium cumini*), strawberry guava (*Psidium cattleianum*), huehue haole (*Passiflora suberosa*), ‘ulei, ‘akia and Jamaica vervain (*Stachytarpheta jamaicensis*).

A total of 100 plant species were recorded during the course of the survey. Of this total, 19 were common native species: ni’ani’au (*Nephrolepis exaltata*), kilau (*Pteridium aquilinum* var. *decompositum*), ‘uki’uki (*Dianella sandwicensis*), (*Carex wahuensis*) no common name, ‘akia, pala’a (*Sphenomeris chinensis*), uluhe (*Dicranopteris linearis*), moa (*Psilotum nudum*), pi’ipi’i (*Chrysopogon aciculatus*), pili grass (*Heteropogon contortus*), pukiawe (*Leptecophylla tameiameiae*), kauna’oa pehu (*Cassytha filiformis*), ‘uhaloa, huehue (*Cocculus orbiculatus*), ‘ulei, alahe’e (*Psydrax odorata*), ‘ala’alawainui (*Peperomia latifolia*), naupaka kahakai (*Scaevola taccada*), and ‘iliahi alo’e (*Santalum ellipticum*). None of these are rare species, and all are known from multiple islands. The native species are mixed in with non-native species for the most part with the exception of a few spots on the ridge tops where ‘ulei forms large monotypic patches.

DISCUSSION AND RECOMMENDATIONS

The vegetation on this property is dominated by non-native agricultural weeds and tree species, although a fair number of common native species occupy some of the ridge tops. No officially listed Endangered or Threatened plant species (USFWS, 2013) were found on the property, nor were any found that are proposed for such status. No special habitats were found either.

Due to the lack of unique or sensitive species or habitats there is little of botanical concern with regard to this property, and the proposed project is not expected to have a significant negative impact on the botanical resources in this part of Oahu.

If, however, there is any re-vegetation planned along road cuts or on the margins of tower pads, it is suggested that some of the native species listed above be selected for propagation and outplanting.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of three groups: Ferns, Monocots and Dicots. Taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999) and Staples and Herbst, (2005). Ferns follow Palmer, (2003).

For each species, the following information is provided:

1. Scientific name with author citation

2. Common English or Hawaiian name.

3. Bio-geographical status. The following symbols are used:

endemic = plants native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.

indigenous = plants native to the Hawaiian Islands and also to one or more other geographic area(s).

non-native = plants brought to the islands intentionally or accidentally after western contact.

Polynesian = plants brought to Hawaii by the Polynesians during their migrations

4. Abundance of each species within the project area:

abundant = forming a major part of the vegetation within the project area.

common = widely scattered throughout the area or locally abundant within a portion of it.

uncommon = scattered sparsely throughout the area or occurring in a few small patches.

rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
FERNS			
BLECHNACEAE (Chain Fern Family)			
Blechnum appendiculatum Willd.	----------	non-native	uncommon
DENNSTAEDTIACEAE (Bracken Fern Family)			
Pteridium aquilinum (L.) Kuhn *var. decompositum* (Gaud.) R.M. Tyron	*kilau*, bracken fern	endemic	rare
GLEICHENIACEAE (False Staghorn Fern Family)			
Dicranopteris linearis (Burm.f.) Underw.	*uluhe*	indigenous	rare
LINDSAEACEAE (Lindsaea Fern Family)			
Lindsaea ensifolia Sw.	----------	non-native	rare
Sphenomeris chinensis (L.) Maxon	*pala'a*	indigenous	rare
NEPHROLEPIDACEAE (Sword Fern Family)			
Nephrolepis brownii (Desv.) Hovencamp & Miyam.	Asian sword fern	non-native	rare
Nephrolepis exaltata (L.) Schott	*ni'ani'au*	indigenous	uncommon
POLYPODIACEAE (Polypody Fern Family)			
Phlebodium aureum (L.) J. Sm.	rabbit's foot fern	non-native	rare
Phymatosorus grossus (Langsdon&Fisch.) Brownlie	*laua'e*	non-native	uncommon
PSILOTACEAE (Whisk Fern Family)			
Psilotum nudum (L.) P. Beauv.	*moa*	indigenous	rare
PTERIDACEAE (Brake Fern Family)			
Cheilanthes viridis (Forssk.) Sw.	green cliff brake	non-native	uncommon
Pityrogramma austroamericana Domin	gold fern	non-native	rare
Pityrogramma x *mckenneyi* W.H. Wagner	hybrid gold fern	non-native	rare
THELYPTERIDACEAE (Marsh Fern Family)			
Christella parasitica (L.) H. Lev.	----------	non-native	rare
MONOCOTS			
ARECACEAE (Palm Family)			
Cocos nucifera L.	*niu*, coconut	Polynesian	rare
Phoenix x *dactylifera*	hybrid date palm	non-native	rare
ASPARAGACEAE (Asparagus Family)	----------	non-native	rare
Agave sisalana Perrine	sisal	non-native	rare
COMMELINACEAE (Spiderwort Family)			
Commelina diffusa N.L. Burm.	honohono	non-native	rare
CYPERACEAE (Sedge Family)			
Carex wahuensis C.A. Meyen	----------	endemic	rare
Cyperus rotundus L.	nut sedge	non-native	uncommon
HEMEROCALLIDACEAE (Hemerocallis Family)			
Dianella sandwicensis Hooker & Arnott	'uki'uki	indigenous	uncommon
ORCHIDACEAE (Orchid Family)			
Arundina graminifolia (D.Don) Hochr.	bamboo orchid	non-native	rare
POACEAE (Grass Family)			
Andropogon virginicus L.	broomsedge	non-native	uncommon
Axonopus fissifolius (Raddi) Kuhlm.	narrow-leaved carpetgrass	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	non-native	common
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Chloris radiata (L.) Sw.	plushgrass	non-native	rare
Chrysopogon aciculatus (Retz) Trin.	*pi'ipi'i*	indigenous	uncommon
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	rare
Digitaria ciliaris (Roetz.) Koeler	Henry's crabgrass	non-native	rare
Digitaria insularis (L.) Mez ex Ekman	sourgrass	non-native	rare
Eleusine indica (L.) Gaertner	wiregrass	non-native	uncommon
Heteropogon contortus (L.) Beauv.	*pili* grass	indigenous	rare
Hyparrhenia rufa (Nees) Stapf	thatching grass	non-native	rare
Melinis minutiflora P. Beauv.	molasses grass	non-native	rare
Melinis repens (Willd.) Zizka	Natal redtop	non-native	rare
Oplismenus hirtellus (L.) P.Beauv.	basketgrass	non-native	uncommon
Panicum maximum Jacq.	Guinea grass	non-native	common
Paspalum conjugatum Bergius	*Hilo* grass	non-native	uncommon
Paspalum dilatatum Poir.	Dallis grass	non-native	uncommon
Paspalum fimbriatum Kunth	Panama grass	non-native	rare
Paspalum scrobiculatum L.	ricegrass	non-native	rare
Pennisetum polystachion (L.) Schult.	feathery pennisetum	non-native	uncommon
Pennisetum purpureum Schumach.	Napier grass	non-native	rare
Saccharum officinarum L.	sugar cane	non-native	rare
Setaria parviflora (Poir.) Kerguelen	yellow foxtail	non-native	rare
Sorghum halapense (L.) Pers.	Johnson grass	non-native	uncommon
Sporobolus africanus (Poir.) Robyns & Tournay	African dropseed	non-native	uncommon
Urochloa mutica (Forrsk.) T.Q.Nguyen	California grass	non-native	rare
ACANTHACEAE (Acanthus Family)			
Asystasia gangetica (L.) T.Anderson	Chinese violet	non-native	common
AMARANTHACEAE (Amaranth Family)			
Alternanthera pungens Kunth	khaki weed	non-native	rare
Amaranthus spinosus L.	spiny amaranth	non-native	uncommon
ANACARDIACEAE (Mango Family)			
Schinus terebinthifolius Raddi	Christmas berry	non-native	uncommon
ARALIACEAE (Ginseng Family)			
Polyscias guilfoylei (W.Bull) L.H.Bailey	panax	non-native	rare
Schefflera actinophylla (Endl.) Harms	octopus tree	non-native	common
ASTERACEAE (Sunflower Family)			
Bidens alba (L.) DC	----------	non-native	common
Calyptocarpus vialis Less.	straggler daisy	non-native	rare
Conyza bonariensis (L.) Cronq.	hairy horseweed	non-native	uncommon
Crassocephalum crepidioides (Benth.)S.Moore	redflower ragleaf	non-native	rare
Cyanthillium cinereum (L.) H. Rob.	little ironweed	non-native	uncommon
Emilia fosbergii Nicolson	red pualele	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Emilia sonchifolia (L.) DC.	violet pualele	non-native	rare
Pluchea carolinensis (Jacq.) G.Don	sourbush	non-native	rare
Pluchea indica (L.) Less.	Indian fleabane	non-native	rare
Sonchus oleraceus L.	*pualele*	non-native	uncommon
BIGNONIACEAE (Bignonia Family)			
Spathodea campanulata P.Beauv.	African tulip tree	non-native	rare
CASUARINACEAE (She-oak Family)			
Casuarina cunninghamiana Miquel	river she-oak	non-native	rare
Casuarina equisetifolia Stickm.	common ironwood	non-native	abundant
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea obscura (L.) Ker-Gawler	----------	non-native	uncommon
Ipomoea triloba L.	little bell	non-native	rare
Merremia tubersoa (L.) Rendle	wood rose	non-native	rare
CUCURBITACEAE (Melon Family)			
Coccinea grandis (L.) Voigt	ivy gourd	non-native	uncommon
Momordica charantia L.	balsam pear	non-native	rare
ERICACEAE (Heath Family)			
Leptecophylla tameiameiae (Cham.&Schlect.) C.M. Weiller	*pukiawe*	indigenous	rare
EUPHORBIACEAE (Spurge Family)			
Aleurites moluccana (L.) Willd.	*kukui*	Polynesian	rare
Euphorbia hirta L.	hairy spurge	non-native	rare
Euphorbia hypericifolia L.	graceful spurge	non-native	rare
Euphorbia prostrata L.	prostrate spurge	non-native	rare
Macaranga tanarius (L.) Mull. Arg.	parasol leaf tree	non-native	common
Phyllanthus debilis Klein ex Willd.	niruri	non-native	common
Ricinus communis L.	Castor bean	non-native	rare
FABACEAE (Pea Family)			
Acacia confusa Merr.	Formosa koa	non-native	common
Alysicarpus vaginalis (L.) DC.	alyce clover	non-native	rare
Canavalia cathartica Thouars	*maunaloa*	non-native	rare
Chamaecrista nictitans (L.) Moench	partridge pea	non-native	uncommon
Crotalaria pallida Aiton	smooth rattlepod	non-native	rare
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	rare
Desmodium incanum DC.	*ka'im*i clover	non-native	common
Desmodium triflorum (L.) DC.	three-flowered beggarweed	non-native	uncommon
Falcataria moluccana (Miq.) Barneby & Grimes	albizia	non-native	rare
Indigofera hendecaphylla Jacq.	creeping indigo	non-native	rare
Leucaena leucocephala (Lam.) de Wit	*koa haole*	non-native	uncommon
Mimosa pudica L.	sensitive plant	non-native	rare
Neonotonia wightii (Wight & Arnott) Lackey	glycine	non-native	rare
Senna occidentalis (L.) Link	coffee senna	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
GOODENIACEAE (Goodenia Family)			
Scaevola taccada (Gaertner) Roxburgh	*naupaka kahakai*	indigenous	rare
LAMIACEAE (Mint Family)			
Hyptis pectinata (L.) Poit.	comb hyptis	non-native	rare
Leonotis nepetifolia (L.) R. Brown	lion's ear	non-native	uncommon
LAURACEAE (Laurel Family)			
Cassytha filiformis L.	*kauna'oa pehu*	indigenous	rare
Cinnamomum burmanni (Nees) Blume	Padang cassia	non-native	rare
MALVACEAE (Mallow Family)			
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	non-native	rare
Malvastrum coromandelianum (L.) Garcke	false mallow	non-native	rare
Sida rhombifolia L.	Cuban jute	non-native	rare
Sida spinosa L.	prickly sida	non-native	rare
Waltheria indica L.	*'uhaloa*	indigenous	common
MELASTOMATACEAE (Melastoma Family)			
Clidemia hirta (L.) D.Don	Koster's curse	non-native	common
MENISPERMACEAE (Moonseed Family)			
Cocculus orbiculatus (L.) DC.	*huehue*	indigenous	uncommon
MORACEAE (Mulberry Family)			
Ficus microcarpa L.	Chinese banyan	non-native	uncommon
MYRSINACEAE (Myrsine Family)			
Ardisia elliptica Thunb.	shoebutton ardisia	non-native	rare
MYRTACEAE (Myrtle Family)			
Pimenta dioica (L.) Merr.	allspice	non-native	uncommon
Psidium cattleianum Sabine	strawberry guava	non-native	common
Psidium guajava L.	common guava	non-native	uncommon
Syzygium cumini (L.) Skeels	Java plum	non-native	common
NYCTAGINACEAE (Four-o'clock Family)			
Bougainvillea spectabilis Willd.	bougainvillea	non-native	rare
PASSIFLORACEAE (Passion Flower Family)			
Passiflora edulis Sims	passion fruit	non-native	rare
Passiflora foetida L.	love-in-a-mist	non-native	rare
Passiflora suberosa L.	*huehue haole*	non-native	common
PHYTOLACCACEAE (Pokeberry Family)			
Rivinia humilis L.	Coral berry	non-native	rare
PIPERACEAE (Pepper Family)			
Peperomia latifolia Miquel	*'ala'alawainui*	endemic	rare
PLANTAGINACEAE (Plantain Family)			
Plantago lanceolata L.	narrow-leaved plantain	non-native	uncommon
POLYGALACEAE (Milkwort Family)			
Polygala paniculata L.	----------	non-native	rare
ROSACEAE (Rose Family)			
Osteomeles anthyllidifolia (Sm.) Lindl.	*'ulei*	indigneous	common

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
RUBIACEAE (Coffee Family)			
Morinda citrifolia L.	*noni*	Polynesian	rare
Psydrax odorata (G.Forst.) A.C. Smith & S.P. Darwin	*alahe'e*	indigenous	rare
Spermacoce assurgens Ruiz & Pav.	buttonweed	non-native	rare
SANTALACEAE (Sandalwood Family)			
Santalum album L.	white sandalwood	non-native	rare
Santalum ellipticum Gaud.	*'iliahi alo'e*	endemic	uncommon
SAPOTACEAE (Sapodilla Family)			
Chrysophyllum mexicanum T. Brandegee	satin leaf	non-native	rare
SOLANACEAE (Nighshade Family)			
Solanum torvum Sw.	pea aubergine	non-native	rare
THYMELAEACEAE ('Akia Family)			
Wikstroemia oahuensis (A. Gray) Rock	*'akia*	endemic	common
VERBENACEAE (Verbena Family)			
Lantana camara L.	lantana	non-native	uncommon
Stachytarpheta australis Moldenke	*owi*	non-native	rare
Stachytarpheta cayennensis (Rich.) Vahl	nettle-leaved vervain	non-native	uncommon
Stachytarpheta jamaicensis (Jacq.) Vahl	Jamaican vervain	non-native	common

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species, abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. In addition, an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

RESULTS

MAMMALS

Four species of mammals were observed within the project area during six site visits. Taxonomy and nomenclature follow Tomich (1986). Two species were of uncommon occurrence, the small Indian mongoose (*Herpestes auropunctatus*) and the domestic cat (*Felis catus*). Two others, the domestic dog (*Canis familiaris*) and the endemic and Endangered *'ōpe'ape'a* or Hawaiian hoary bat (*Lasiurus cinereus semotus*) were rare.

The bat survey was conducted at three separate locations within the project area during the evening of June 24, 2013. A bat detecting device (Batbox IIID) was employed, set to the frequency of 27,000 Hertz that these bats are known to use to echolocate for flying insects. A single bat was detected in the northwestern portion of the area along the road to a meteorological tower site. Echolocation calls were produced in two second bursts of modulated sound, and were repeated every few seconds as the bat located and homed in on flying insects. These calls were followed for several minutes.

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

BIRDS

There was moderate birdlife diversity observed within this project area during six site visits. A total of fourteen species of non-native birds were observed. Taxonomy and nomenclature follow American Ornithologists' Union (2011). One species was abundant throughout the project area, the red-vented bulbul (*Pycnonotus cafer*). Also common were the zebra dove (*Geopelia striatus*) and the common myna (*Acridotheres tristis*). The remaining species were uncommon or rare.

This study area is situtated about ¾ mile above the substantial wetlands of the James Campbell National Wildlife Refuge that provides habitat for three Endangered waterbirds, the *'alae 'ula* or common moorhen (*Gallinula chloropus sandvicensis*), the *'alae ke'oke'o* or Hawaiian coot (*Fulica alai*), and the *ae'o* or Black-necked stilt (*Himantopus mexicanus knudseni*) as well as other commoner waterbirds and shorebirds. These birds fly substantial distances and could overfly the project area enroute to other wetland habitats. This area, however, has no wetland habitat to attract such waterbirds and none were seen.

INSECTS

Diverse insect life was observed across this large property during six site visits. Taxonomy and nomenclature follow Nishida et al. (1992). Eighteen insect species were observed in seven Orders. Three non-native species were common throughout the area, the cabbage butterfly (*Pieris rapae*), the honey bee (*Apis mellifera*) and the Southern house mosquito (*Culex quinquefasciatus*). The remaining species were uncommon or rare. One native dragonfly, the globe skimmer (*Pantala flavescens*) was seen. This indigenous dragonfly is widespread and common throughout the tropics worldwide.

MOLLUSKS

Two non-native snails, the giant East African snail (*Achatina fulica*) and the roseate cannibal snail (*Euglandina rosea*), were seen at scattered locations across the property.

DISCUSSION AND RECOMMENDATIONS

Most of the wildlife observed on the property is non-native and generally unremarkable from an environmental protection standpoint. One native species, however, the Hawaiian hoary bat which was detected near the lower margins of the project is a federally Endangered species with all of the protections that are associated with this status.

The Hawaiian hoary bat is currently known from the six largest islands, but is considered rare on the island of Oahu where a few recent confirmed sightings have been made on the rural northern end of the island.

The Hawaiian hoary bat is a highly mobile creature that is known to move about in response to temperature changes and insect population spikes. They are solitary (rather than colonial) bats whose roosting sites appear to be opportunistic and ever-changing. They have been recorded from almost every conceivable habitat including high and low elevations, forests, pastures, lava flows, bogs and even rural communities. They can occupy an area when flying insects are abundant and be absent when feeding opportunities have moved elsewhere. Thus, no critical habitats have been established for them. The more we focus on these cryptic, nocturnal bats, the more of them we find and the more widespread we find them to be.

None-the-less, the presence of these Endangered flying mammals in the vicinity of proposed wind turbines is of concern and merits consideration as to how to minimize threats to their well-being.

In the same vein, there is also a small possibility that Endangered water birds from the not too distant James Campbell National Wildlife Refuge might overfly the project area and place themselves in harms way. The situations with both the water birds and the bats may need to be addressed in consultation with the U.S. Fish and Wildlife Service.

No other concerns regarding the wildlife in this project area are anticipated.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within four groups: mammals, birds, insects and mollusks. For each species the following information is provided:

1. Common name

2. Scientific name

3. Bio-geographical status. The following symbols are used:

   endemic = animals native only to Hawaii; not naturally occurring anywhere else in the world.

   indigenous = animals native to the Hawaiian Islands and also to one or more other geographic area(s).

   non-native = animals brought to Hawaii intentionally or accidentally after western contact.

   migratory = spending a portion of the year in Hawaii and a portion elsewhere. In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

4. Abundance of each species within the project area:

   abundant = many flocks or individuals seen throughout the area at all times of day.

   common = a few flocks or well scattered individuals throughout the area.

   uncommon = only one flock or several individuals seen within the project area.

   rare = only one or two seen within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MAMMALS			
Herpestes auropunctatus Hodgson	small Indian mongoose	non-native	uncommon
Felis catus L.	domestic cat	non-native	uncommon
Canis familiaris L.	domestic dog	non-native	rare
Lasiurus cinereus semotus Allen	*'ōpe'ape'a,* Hawaii hoary bat	endemic	rare
BIRDS			
Pycnonotus cafer L.	red-vented bulbul	non-native	abundant
Geopelia striata L.	zebra dove	non-native	common
Acridotheres tristis L.	common myna	non-native	common
Zosterops japonicus Temminck & Schlegel	Japanese white-eye	non-native	uncommon
Estrilda astrild L.	common waxbill	non-native	uncommon
*Lonchura punctulat*a L.	nutmeg mannikin	non-native	uncommon
Copsychus malabaricus Scopoli	white-rumped shama	non-native	uncommon
Carpodacus mexicanus Muller	house finch	non-native	uncommon
Streptopelia chinensis Scopoli	spotted dove	non-native	uncommon
Pycnonotus jocosus L.	red-whiskered bulbul	non-native	rare
Bubulcus ibis L.	cattle egret	non-native	rare
Cettia diphone Kittlitz	Japanese bush-warbler	non-native	rare
Cardinalis cardinalis L.	northern cardinal	non-native	rare
Gallus gallus L.	chicken	non-native	rare
INSECTS			
Order ARANEAE - true spiders			
ARANEIDAE (Orb Weaver Family)			
Araneus diadematus Clerck	European garden spider	non-native	rare
Order DIPTERA - flies			
CULICIDAE (Mosquito Family)			
Culex albopictus Skuse	tiger mosquito	non-native	uncommon
Culex quinqefasciatus	southern house mosquito	non-native	common
DROSOPHILIDAE (Fruit Fly Family)			
Drosophila melanogaster Meigen	common fruit fly	non-native	uncommon
SYRPHIDAE (Hoverfly Family)			
Eristalinus aeneus Scopoli	drone fly	non-native	rare
Order HYMENOPTERA - bees, wasps & ants			
APIDAE (Honey Bee Family)			
Apis mellifera L.	honey bee	non-native	common
Xylocopa sonorina Smith	Sonoran carpenter bee	non-native	uncommon
FORMICIDAE (Ant Family)			
*Anopolepis longipe*s Jerdon	long-legged ant	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Pheidole megacephala Fabricius	big-headed ant	non-native	rare
Order LEPIDOPTERA - butterflies & moths			
CRAMBIDAE (Grass Moth Family)			
Spoladea recurvalis Fabricus	beet webworm moth	non-native	rare
LYCAENIDAE (Gossamer-winged Butterfly Family)			
Lampides boeticus L.	long tail blue butterfly	non-native	uncommon
NOCTUIDAE (Owlet Moth Family)			
Ascalapha oderata L.	black witch moth	non-native	rare
NYMPHALIDAE (Brush-footed Butterfly Family)			
Agraulis vanillae L.	passion flower butterfly	non-native	uncommon
PIERIDAE (White and Sulphur Butterfly Family)			
Phoebis agarithe Boisduval	large orange sulfur butterfly	non-native	rare
Pieris rapae L.	cabbage butterfly	non-native	common
Order ODONATA - dragonflies & damselflies			
LIBELLULIDAE (Skimmer Dragonfly Family)			
Pantala flavescens Fabricius	globe skimmer	indigenous	uncommon
Order ORTHOPTERA - grasshoppers & crickets			
ACRIDIDAE (Grasshopper Family)			
Oxya japonica Thunberg	small rice grasshopper	non-native	uncommon
Order SPIROBOLIDA - round-backed millipedes			
TRIGONIULIDAE (Rusty Millipede Family)			
Trigoniulus corallinus Gervais	rusty millipede	non-native	rare
MOLLUSKS			
Achatina fulica Ferussac	giant East African snail	non-native	rare
Euglandina rosea Ferussac	roseate cannibal snail	non-native	rare

Figure 1 - Project Area outlined in black

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APPENDIX F
ARCHAEOLOGICAL INVENTORY SURVEY (AIS)

Pacific Legacy

Historic Preservation

DRAFT

ARCHAEOLOGICAL INVENTORY SURVEY FOR THE PROPOSED NĀ PUA MAKANI WIND PROJECT IN THE AHUPUAʻA OF KAHUKU, KEANA, AND MĀLAEKAHANA, DISTRICT OF KOʻOLAU LOA, ISLAND OF OʻAHU

[TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006]

Pacific Legacy: Exploring the past, informing the present, enriching the future.

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1.0 INTRODUCTION

Pacific Legacy, Inc., under contract to Nā Pua Makani Power Partners, LLC, a subsidiary of Champlin Hawai‘i Wind Holdings, LLC, conducted an archaeological inventory survey (AIS) of the proposed site for the Na Pua Makani Wind Project [TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006] in the *ahupua‘a* of Kahuku, Keana and Mālaekahana, on the North Shore of the Island of O‘ahu (Figure 1). An Archaeological Inventory Survey Plan (AISP) was produced prior to the initiation of fieldwork (Cleghorn 2014) and was accepted by the State Historic Preservation Division (LOG NO. 2014.02981, DOC NO. 1408NN02; see Appendix A).

The purpose of the AIS is to identify and document archaeological properties and cultural sites within a delineated area, gathering sufficient information to evaluate the significance of identified properties and sites (HAR §13-275). If significant cultural resources are identified during the survey, effect determinations are made and mitigation measures are recommended.

The current AIS presents the results of the pedestrian survey of the project area as defined as the Area of Potential Effect (APE). All construction related activities will be confined to the defined APE, as depicted in Figure 1. The current AIS also presents the results subsurface testing via backhoe trenching and hand excavated test units.

1.1 PROJECT AREA

The proposed Project is located in the Ko‘olau Loa District, west of the town of Kahuku in the City and County of Honolulu and covers three *ahupua‘a*: Kahuku, Keana, and Mālaekahana [TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006]. It includes portions of two parcels which would be leased from the DLNR (approximately 234 acres [95 hectares]) and from the Mālaekahana Hui West, LLC (MHW) (approximately 452 acres [183 hectares]), as well as the use of non-leased State land for roadways into the project area.

The leased area plus the State-owned access measures approximately 707 acres (286 hectares). Within this leased area is the defined 464-acre (188 hectares) APE. All proposed Project activities would occur within this smaller approximately 464-acre (188 hectares) project area. This area constitutes the maximum footprint of the Project within which all ground disturbing activities would occur and which would be occupied by permanent Project facilities (Figure 1). The AIS was conducted in this 464-acre (188 hectares) APE.

The Project is located adjacent to Kamehameha Highway at its closest point, southwest of the Town of Kahuku. It is accessible via local roads off of Kamehameha Highway, and is located east of the existing Kahuku Wind Farm. Most of the land leased from MHW is under active small-scale commercial truck farming while the State land is largely undeveloped and forested foothills with some small leased farm lots.

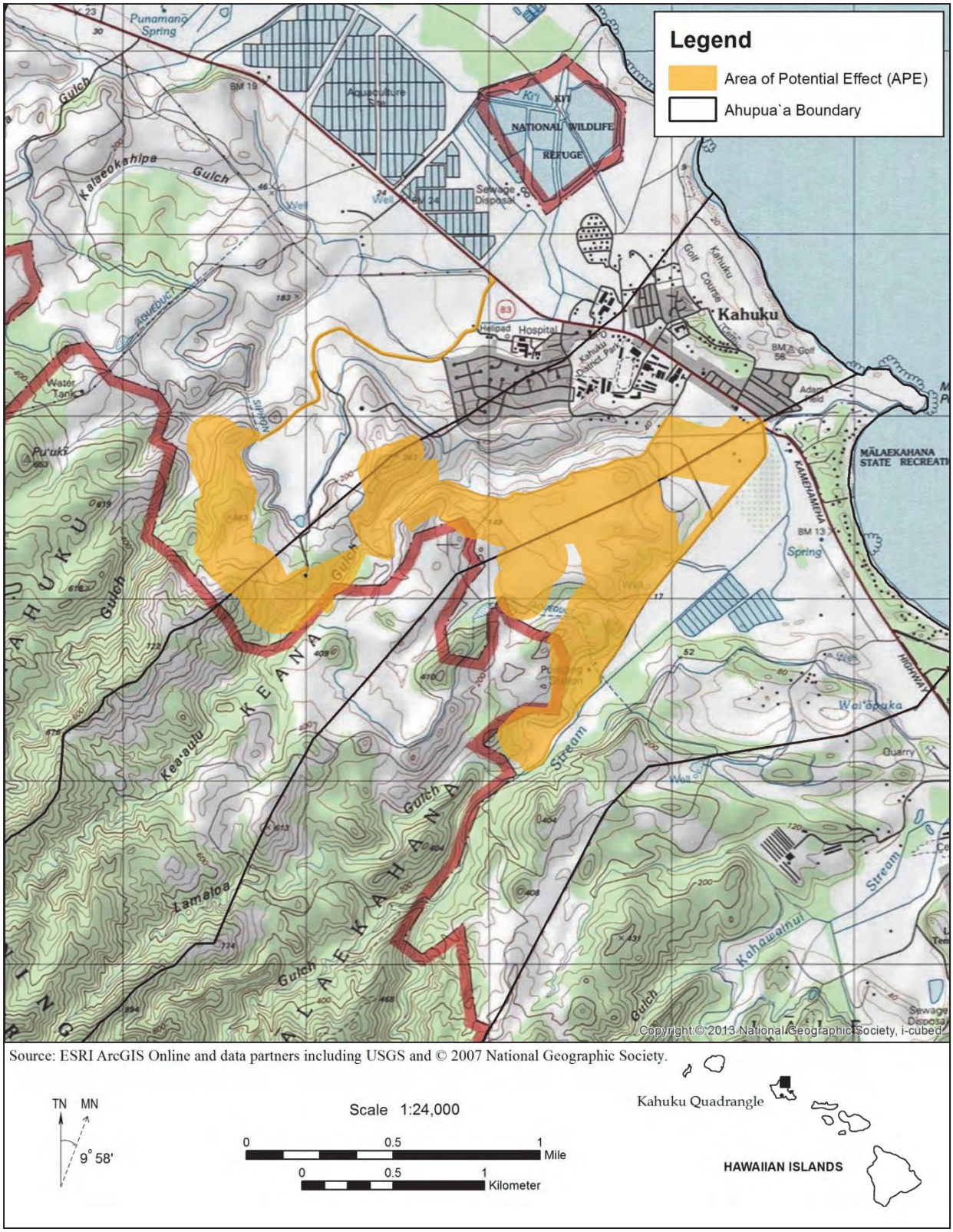

Figure 1. Project Area/APE on USGS map.

1.2 ENVIRONMENT

The dominant trade winds are out of the northeast and the average annual rainfall within this portion of Kahuku is less than 60 inches (1,524 mm) per year (Juvik and Juvik 1998: 56). Vegetation within the project area is quite diverse and varied and consists of *kī* (*Cordyline fruticosa*), *hau* (*Hibiscus tiliaceus*), *kukui* (*Aleurites moluccana*), *kalo* (*Colocasia esculenta*), *liliko'i* (*Passiflora edulis*), *noni* (*Morinda citrifolia*), *'ōlapa* (*Cheirodendron* spp.), *olonā* (*Touchardia latifolia*), *hala* (*pandanus tectorius*), *laua'e* (*Phymatosorus sclopendria*), mango (*Mangifera* spp.), coconut (*Cocos nucifera*), eucalyptus (*Eucalyptus* spp.), shower tree (*Cassia* spp.), banana (*Musa* sp.), *koa haole (Leucaena leucocephala*), guava (*Psidium guajava*), strawberry guava (*Psidium cattleianum*), *'ulu* (breadfruit; *Artocarpus altilus*), jackfruit (*Artocarpus heterophyllus*), tamarind (*Tamarindus indica*), java plum (*Syzygium cumini*), Christmasberry (*Schinus terebinthifolius)*, iron wood (*Casuarina equisetifolia*), century plant (*Agave Americana sp.*), sugarcane (*Saccharum officinarum*), banyan (*Ficus* spp.), bamboo (*Schizostachyum glaucifolium*), and various grasses and ferns. Also present are numerous other cultivated commercial crops and herbs on the active farm lots.

1.2.1 Soils

Soils within the project area are comprised of the Coral Outcrop, Haleiwa Series, Kaena Series, Kawaihapai Series, Lahaina Series, Mokuleia Series, Paumalu Series, and Waialua Series.

Coral Outcrop

Coral outcrop (CR) consists of coral or cemented calcareous sand on the island of Oahu. The coral reefs formed in shallow ocean water during the time the ocean stand was at a higher level. Small areas of coral outcrop are exposed on the ocean shore, on the coastal plains, and at the foot of the uplands. Elevations range from sea level to approximately 100 feet. The annual rainfall amounts to 18 to 40 inches. Coral outcrop is geophysically associated with Jaucas, Keaau, and Mokuleia soils…This land type is used for military installations, quarries, and urban development. Vegetation is sparse and consists of kiawe, koa haole, and fingergrass (Foote et al. 1972:29).

Haleiwa Series

This series consists of well-drained soils on fans and drainageways along the coastal plains. Theses soils are on the islands of Oahu and Molokai. They developed in alluvium derived from basic igneous material. They are nearly level to strongly sloping. Elevations range from sea level to 250 feet. The annual rainfall amounts to 30 to 60 inches, most of which occurs between November and April…Haleiwa soils are geographically associated with Waialua and Kawaihapai soils on Oahu and Kalaupapa soils on Molokai…These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of koa haole, lantana, guava, Christmasberry, Bermuda grass, and fingergrass (Foote et al. 1972:33).

Haleiwa silty clay, 2 to 6 percent slopes (HeB). - On this soil, the runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, pineapple, and truck crops (Foote et al. 1972:34).

Kaena Series

This series consists of very deep, poorly drained soils on alluvial fans and talus slopes on the islands of Oahu and Kauai. These soils developed in alluvium and colluviums from

basic igneous material. They are gently sloping to steep and are commonly stony. Elevations range from 50 to 150 feet. The annual rainfall amounts to 30 to 45 inches, most of which occurs between November and April…Kaena soils are geographically associated the Honouliuli, Lualualei, and Waialua soils…These soils are used for sugarcane, truck crops, pasture, and homesites. The natural vegetation consists of kiawe, klu, lantana, koa haole, and fingergrass (Foote et al. 1972:49).

Kaena clay, 2 to 6 percent slopes (KaB). - This soil has a profile like that of Kaena stony clay, 6 to 12 percent slopes, except that there are few or no stones in the surface layer. Runoff is slow, and the erosion hazard is slight. This soil is used for sugarcane, truck crops, pasture, and urban development (Foote et al. 1972:50).

Kaena clay, 6 to 12 percent slopes (KaC). - This soil has a profile like that of Kaena stony clay, 6 to 12 percent slopes, except that there are few or no stones in the surface layer…This soil is used for sugarcane and pasture (Foote et al 1972:50).

Kawaihapai Series

This series consists of well-drained soils in drainageways and on alluvial fans on the coastal plains on the islands of Oahu and Molokai. These soils formed in alluvium derived from basic igneous rock in humid uplands. They are nearly level to moderately sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 30 to 50 inches…Kawaihapai soils are geographically associated with Haleiwa, Waialua, and Jaucas soils. These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of kiawe, koa haole, lantana, and Bermudagrass (Foote et al. 1972:63-64).

Kawaihapai clay loam, 0 to 2 percent slopes (KIA). - This soil occupies smooth slopes…The natural vegetation consists of guava, honohono, kukui, and hala…Permeability is moderate. Runoff is slow, and the erosion hazard is no more slight…This soil is used for sugarcane, truck crops, pasture, and orchards (Foote et al. 1972:64).

Lahaina Series

This series consists of well-drained soils on uplands on the islands of Lanai, Maui, Molokai, and Oahu. These soils developed in material weathered from basic igneous rock. They are nearly level to steep. Elevations range from 10 to 1,500 feet. The annual rainfall amounts to 20 to 35 inches, most of which occurs in fall and winter…Lahaina soils are geographically associated with Helemano, Hoolehua, Kahana, Molokai, Pamoa, and Wahiawa soils. These soils are used for sugarcane and pineapple (Foote et al. 1972:78).

Lahaina silty clay, 3 to 7 percent slopes (LaB). - This soil is on smooth uplands…Cobblestones are common on the surface in a few places. In some places near the coastal plains, the profile contains fragments of coral, stone gravel, or sand…Permeability is moderate. Runoff is slow, and the erosion hazard is slight (Foote et al. 1972:78).

Lahaina silty clay, 7 to 15 percent slopes (LaC). - On this soil runoff is medium and the erosion hazard is moderate…This soil is used for sugarcane and pineapple. Small acreages are used for truck crops, pasture, and wildlife habitat (Foote et al. 1972:79).

Mokuleia Series

This series consists of well-drained soils along the coastal plains on the islands of Oahu and Kauai. These soils formed in recent alluvium deposited over coral sand. They are shallow to nearly sea level. Elevations range from nearly sea level to 100 feet. The annual rainfall amounts to 15 to 40 inches on Oahu…Mokuleia soils are geographically associated with Hanalei, Jaucas, and Keaau soils (Foote et al. 1972:95).

Mokuleia clay loam (Mt). - This soil occurs as small areas on the coastal plains…Permeability is moderate in the surface layer and rapid in the subsoil. Runoff is very slow, and the erosion hazard is more than slight…This soil is used for sugarcane, truck crops, and pasture (Foote et al. 1972:95).

Paumalu Series

This series consists of well-drained silty clay soils on uplands in the northern part of Oahu. These soils developed in old alluvium and colluviums derived from basic igneous rock. They are gently sloping to very steep. Elevations range from 700 to 1,000 feet. The annual rainfall amount to 50 to 70 inches and is well distributed throughout the year. Paumalu soils are geographically associated with Kemoo soils, near Kahuku. These soils are used for pasture and sugarcane. The natural vegetation consists of guava, waiwe, Christmasberry, ricegrass, and carpetgrass (Foote et al. 1972:110).

Paumalu silty clay, 3 to 8 percent slopes (PeB). - On this soil, runoff is slow and the erosion hazard is slight. Workability is easy. This soil is used for sugarcane and pasture (Foote et al. 1972:111).

Paumalu silty clay, 8 to 15 percent slopes (PeC). - On this soil, runoff is slow to medium and the erosion hazard is slight to moderate. Workability is slightly difficult. This soil is used for sugarcane and pasture (Foote et al. 1972:111).

Paumalu-Badland complex (PZ). - In this complex Paumalu soils make up 40 to 80 percent of the acreage. The slope is 10 to 70 percent…Runoff is medium to rapid, and the erosion hazard is moderate to severe…Badland consists of nearly barren land that has remained after the Paumalu soils were removed by wind and water erosion. Runoff is rapid, and the erosion hazard is very severs. This complex is used for pasture and military purposes (Foote et al. 1972:111).

Waialua Series

This series consists of moderately well drained soils on alluvial fans on the island of Oahu. These soils developed in alluvium weathered from basic igneous rock. They are nearly level to steep. Elevations range from 10 to 100 feet. Annual rainfall amounts to 25 to 50 inches; most of it occurs between November and April. Waialua soils are geographically associated with Honouliuli, Kaena, and Kawaihapai soils. These soils are used for sugarcane, truck crops, orchards, and pasture. The natural vegetation is swollen fingergrass, koa haole, and uhaloa (Foote et al. 1972:128).

Waialua silty clay, 0 to 3 percent slopes (WkA). - This soil is on smooth coastal plains…Permeability is moderate. Runoff is slow, and the erosion hazard is no more than slight…This soil is used for sugarcane, truck crops, and pasture (Foote et al. 1972:128).

Waialua silty clay, 3 to 8 percent slopes (WkB). - On this soil, runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, truck crops and pasture (Foote et al. 1972:128).

2.0 HISTORIC BACKGROUND

2.1 TRADITIONAL PERIOD

At the time of European contact, the Kahuku area was a rich cultivated landscape. Lieutenant James King remarked: "nothing can exceed the verdure of the hills, the variety of wood and lawn, and the rich cultivated valleys which the whole face of the country displayed" (Cook 1784:115, as cited in Handy and Handy 1991:462). This comment indicates the wealth of the Kahuku region. However, a short time later, the explorer George Vancouver paints a picture of an area in great decline:

> "Our examination confirmed the remark of Capt. King excepting that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to be so numerously inhabited, as he represented at that time, occasioned most probably by the constant hostilities that existed since that period" (Vancouver 1798 vol. 3:71, as cited in Handy and Handy 1991:462).

Handy and Handy write of the abandoned terraces which once dotted the Kahuku landscape and the population decline:

> In 1833 Hall (1839) observed at Kahuku that "much taro land now lies waste because the diminished population of the district does not require its cultivation" (Handy and Handy 1991:462).

Based upon these descriptions, it is evident that the Kahuku area was once fairly densely inhabited and that agricultural activities flourished. However, after European contact it appears that there was a marked population decline with an associated decrease in agricultural activity.

2.2 HISTORIC PERIOD

Ranching in the Kahuku area began in the 1850s when the Kahuku Ranch was established on land purchased from Kamehameha III (Korn 1958: 211-212). The cattle and sheep ranch grew and soon the once rich vegetation of Kahuku began to disappear, as the result of free-range overgrazing (Stride et al. 2003:16). This took a toll on the natural resources, the small unprotected family gardens, and the native population. "At the same time the *hala* forests began to disappear, the Hawaiian population also began to disappear" (Stride et al. 2003:16). Presumably the population continued to decline between the 1830s and the 1850s.

By the 1890s, James Campbell had control of a large portion of the Kahuku tract which laid the groundwork for the creation of the Kahuku Plantation (Stride et al. 2003). This was the start of large-scale commercial agriculture that altered the landscaped of Kahuku with agriculture and a railroad segment that changed the landscape and redefined the region.

> Much of the uplands above Kahuku Village were once planted in sugar cane and pineapple. These fields were established wherever possible except on steep hillsides and on the crests of ridges and knolls (Stride et al. 2003:5).

The plantation continued to expand into the 1930s when Japanese, Filipino, and Portuguese worked the fields (Stride et al. 2003:20). The plantation was responsible for shaping the town of Kahuku and the life of its workers by introducing "concrete stoves for laborer's cottages and sanitation drains that were used as models for other plantations…Kahuku…introduced the first plantation day nursery and high school…baseball diamond, the first golf course…" (Stride et al. 2003:22). The growth quickly slowed in 1955 when the last of the locomotives hauling sugarcane stopped. In 1971, the Kahuku Plantation closed (Stride et al. 2003:23).

3.0 ARCHIVAL RESEARCH SUMMARY

This section is a synthesis of records documenting traditional and mythological accounts associated with the Nā Pua Makani Wind Project lands and surrounding areas as well as Historical documentation and archaeological record. The names and locations of *ahupuaʻa* used in this section of the report are largely derived from information in the *Oʻahu Pre-Māhele Moku and Ahupuaʻa* map created by Kamehameha School's Hawaiian Studies Institute in 1987 (Figure 2) and *Place Names of Hawaiʻi* (Pukui et al. 1974). According to this map, the project area spans an area that incorporates inland portions of three *ahupuaʻa*: Kahuku, Keana, and Mālaekahana.

The subject *ahupuaʻa* are located within the district, or *moku*, of Koʻolau Loa, within which the Nā Pua Makani Wind Project lands are located, extends from the *ahupuaʻa* of Kaʻaʻawa on the central east side of Oʻahu, rounding the northern tip of the island to Pūpūkea. In *Sites of Oʻahu* (Sterling and Summers 1978:142), writer for *Ka Nūpepa Kuokoa*, S. M. Kaui, holds that Koʻolau Loa District stretches from Keahu-o-Hapuʻu to the Point of Kaʻōʻio, which is between Kualoa and Kaʻaʻawa (Figure 3). The name of this district, spelt as "Koʻolau Loa" by Pukui et al. (1974:117), literally translates to "long Koʻolau" (ibid.), Koʻolau being the windward mountain range that runs along the entire eastern side of Oʻahu.

3.1 PRE-EUROPEAN CONTACT CULTURAL LANDSCAPE

In general, traditional and mythological accounts from pre-European contact Hawaiʻi represent a belief system explaining all aspects of the physical universe and spirit realm, the origin and nature of mankind, and the history of the community, as well as collectively remembering the heroic adventures, exceptional feats, and cautionary tales of their ancestors. These traditional accounts are contained in the hearts and minds of cultural practitioners and customarily passed on through oration. Throughout the passage of time, figures transcend earthly legends into the cosmic, divine, and fearsome realm of the gods that is only separated from the mundane world by a thin veil and has the power to interact with and cast influence on the mundane. To this day, a sense of respect, reverence, and fear is still held on to by cultural practitioners and those indoctrinated in these traditions, as it is believed that the very landscape is imbued with the *mana* (life force or supernatural energy) of the divine.

3.1.1 The Natural World

Conversely, the mundane, or lifeways and land use, of pre-European contact Hawaiians are also part of the cultural landscape and are interpreted through archaeological research in conjunction with oral histories and recorded traditional accounts. Handy and Handy (1991) provide some commentary on general land use patterns of ancient Hawaiians that are applicable to the general Kahuku area. As marine resources represent the main source of protein in the traditional Hawaiian diet, Handy and Handy (ibid.) suggest that upland agriculture was typically preceded by or correlated with the productiveness of an area's coastal fishing grounds. *Mauka* lands were intensively developed in areas where coastal fishing

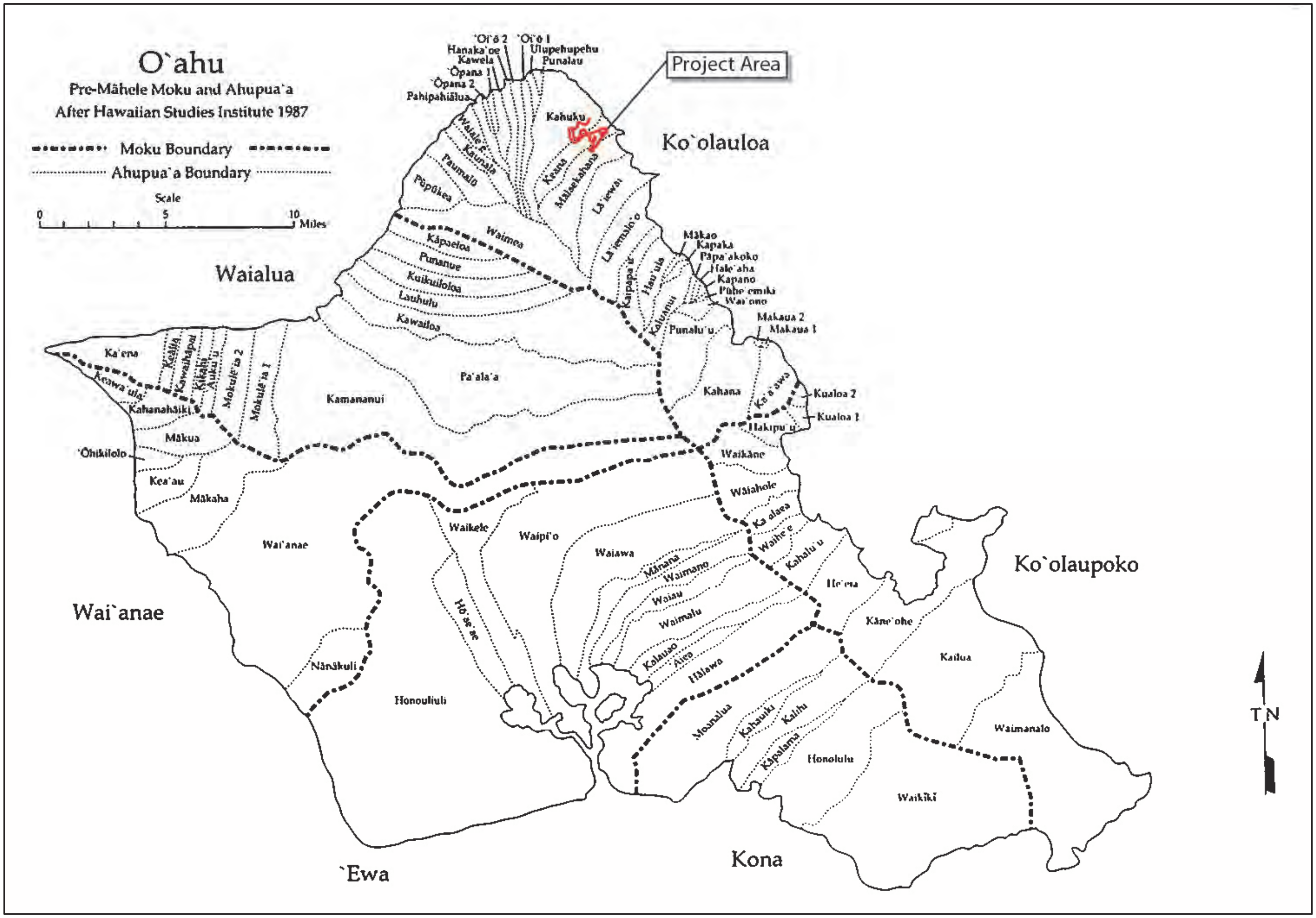

Figure 2. Map of Oʻahu, showing approximate location of project area in relation to pre-Māhele *moku* and *ahupuaʻa* (courtesy of Hawaiian Studies Institute 1987).

grounds were easily accessed. On Oʻahu, sweet potatoes were cultivated to supplement taro, the main starch of the Hawaiian diet, when soils were too sandy or dry to grow taro. Further, sweet potato cultivation, typically grown inland, appeared to correlate with high population densities in general.

Traditionally in Hawaiʻi, environmental zones were perceived and determined by various natural features and resource criteria (Handy and Handy 1991:54-56). . The following is a summary of Handy and Handy (1991:54-56) description of the terrestrial environmental zones:

1. *Ko Kaha Kai*: Land by the sea, or coastal region providing marine resources (fish and other marine animals, seaweed and salt). "Kaha was a special term applied to areas facing the shore but not favorable for planting.
2. *Kula*: The plains or sloping lands (without trees) above the coastal region.
   a) *Kula kai:* Seaward plains.
   b) *Kula uka*: Inland or upland slopes (towards the mountains).
3. *Kahawai:* The place (having) water. The area beyond or intersecting the *kula* lands. This upland zone provided suitable agricultural sites and abundant naturally occurring resources which were used for religious, domestic, and economic purposes.
4. *Wao:* Wilderness
   a) *Wao kanaka:* Region of man. Lower forest, providing hard wood (*koa*) for spears, utensils, and logs for canoes; *lau hala* (pandanus leaves) for thatch and mats; *māmaki* for bark cloth (*tapa*); *kukui* (candlenut) for oil; wild yams, roots, and sandalwood.
   b) *Wao akua*: Region of deities. …remote, awesome, seldom penetrated, source of supernatural influences, both evil and beneficent.
   c) *Wao maʻukele*: Rain forest. Here grew giant trees and tree ferns (*ʻamaʻu*) under almost perpetual cloud and rain.

The Nā Pua Makani Wind Project lands are predominantly located in the following environmental zones: *Kula uka* and *Wao kanaka.* Numerous traditional accounts, *moʻolelo*, and Land Claim Native Testimonies allude to the cultivation of lands, varying in intensity, from *kula* to *wao* (Hall 1839; Fornander 1917; Thrum 1919; Handy 1940; Handy and Handy 1991; Sterling and Summers 1978; Silva 1984; Maly and Maly 2003; Hammatt 2008; Vogeler et al. 2011).

3.1.2 Life in the Ahupuaʻa

With great variations of geological features, each *ahupuaʻa* had its own dynamic resource management system that was based on traditional customs upheld by the *kapu* system, or ancient religious law. The *ahupuaʻa* typically extended form the coast to the nearest mountain top or ridge and resources from the land and sea were equally distributed within the *ahupuaʻa*. Lyons (1875) describes the geographic nature of the *ahupuaʻa* as well as the movement of resources from mountain to sea and vice versa, stating:

> The Ahupuaa ran from the sea to the mountain, theoretically. That is to say the central idea of the Hawaiian division of land was emphatically central, or rather radial. Hawaiian life vibrated from *uka,* mountain, whence came wood, kapa, for clothing, olona, for fish line, ti-leaf for wrapping paper, *ie* for rattan lashing, wild birds for food, to the *kai,* sea, whence came *ia*, fish, and all connected therewith.

> Mauka and makai therefore fundamental ideas to the native of an island (Lyons 1875: 104).

The *ahupua‘a* was also an important socio-political unit in the pre-Contact era, each unit with its own hierarchy. Kirch (1985) holds that *moku* were independent chiefdoms, divided into a number of radial land divisions, referred to as *ahupua‘a,* with subdivisions of *‘ili* and *mo‘o* within. According to Kirch (1985),

> Each ahupua‘a was controlled by a lesser chief, who in turn appointed one or more stewards to oversee production, organize work parties, collect tribute, and in other ways represent the chief. Ahupua‘a were economically self-sufficient to some degree, although differences in the local resource base (agricultural land, water resources, stone for tools, and so on) resulted in differences in the production patterns of individual land sections. Within the ahupua‘a, there were yet smaller sections and divisions, especially the ‘ili and mo‘o, which were held and worked by extended households or groups of commoners.

According to Handy and Handy (1991), for the purpose of taxation, the chief political subdivision of the pre-Contact era was the *ahupua‘a,* which was generally under the management of the *konohiki* (steward or caretaker). The term *ahupua‘a* itself is derived from the fact that each coastal *ahupua‘a* boundary was marked with an altar (*ahu*) which held a carved wooden effigy of a pig (*pua‘a*) head during the Makahiki festival, when harvest tributes (taxes) were offered to the god of rain. Handy and Handy (1991) refer to the lower chief who represented the *ahupua‘a* as *ali‘i ‘ai ahupua‘a*, which translates to English as "chief who eats the ahupua‘a" (1991:48). Yet, according to Malo (1951:142) the *konohiki* was tasked with collecting levies from the *maka‘āinana* (commoners; literally "people that attend the land") of the *ahupua‘a* for the king and of the *ali‘i ‘ai ahupua‘a.* The word *konohiki* is defined by Pukui and Elbert (1986) as the, "Headman of an ahupua‘a land division under the chief; land or fishing rights under control of the konohiki; such rights are sometimes called konohiki rights" (1986:166). Thrum (1924) wrote that the *konohiki* was a local representative or steward of the landlord owner whose privileges and duties were, "…practically those which go with that position in any land and in common with his brethren today in Russia or Ireland he had his failings and was not always popular among his fellows…" (1924:60).

Handy and Handy (1991) liken the *ahupua‘a* tenure system to western share cropping, where "sharing between the chief and tenant was comprehensive and reciprocal in benefits" (1991:48). Kirch and Sahlins (1992) delve further into the social dynamics of the *ahupua‘a* in their historical ethnography, *Anahulu: The Anthropology of History in the Kingdom of Hawai‘i, Volume One*. Kirch and Sahlins (1992:17) state the following about variations in land use in the ancient *ahupua‘a*:

> Economically more highly valued, the coastal areas were also generally preferred for chiefly residence. Here were the most extensive wet taro lands, offshore and onshore fish ponds, as well as access to the sea and the fishing and surfing that in Hawaii were sports of kings. Still, the uplands were also necessary for the Hawaiian existence. In addition, to things mentioned by Lyons, people were specifically dependent on the uplands for the timber and thatching of their houses; the materials for their canoes, bowls, weapons, images, agricultural tools, and other objects using hardwoods; rope, line, fishnetting; lighting (from

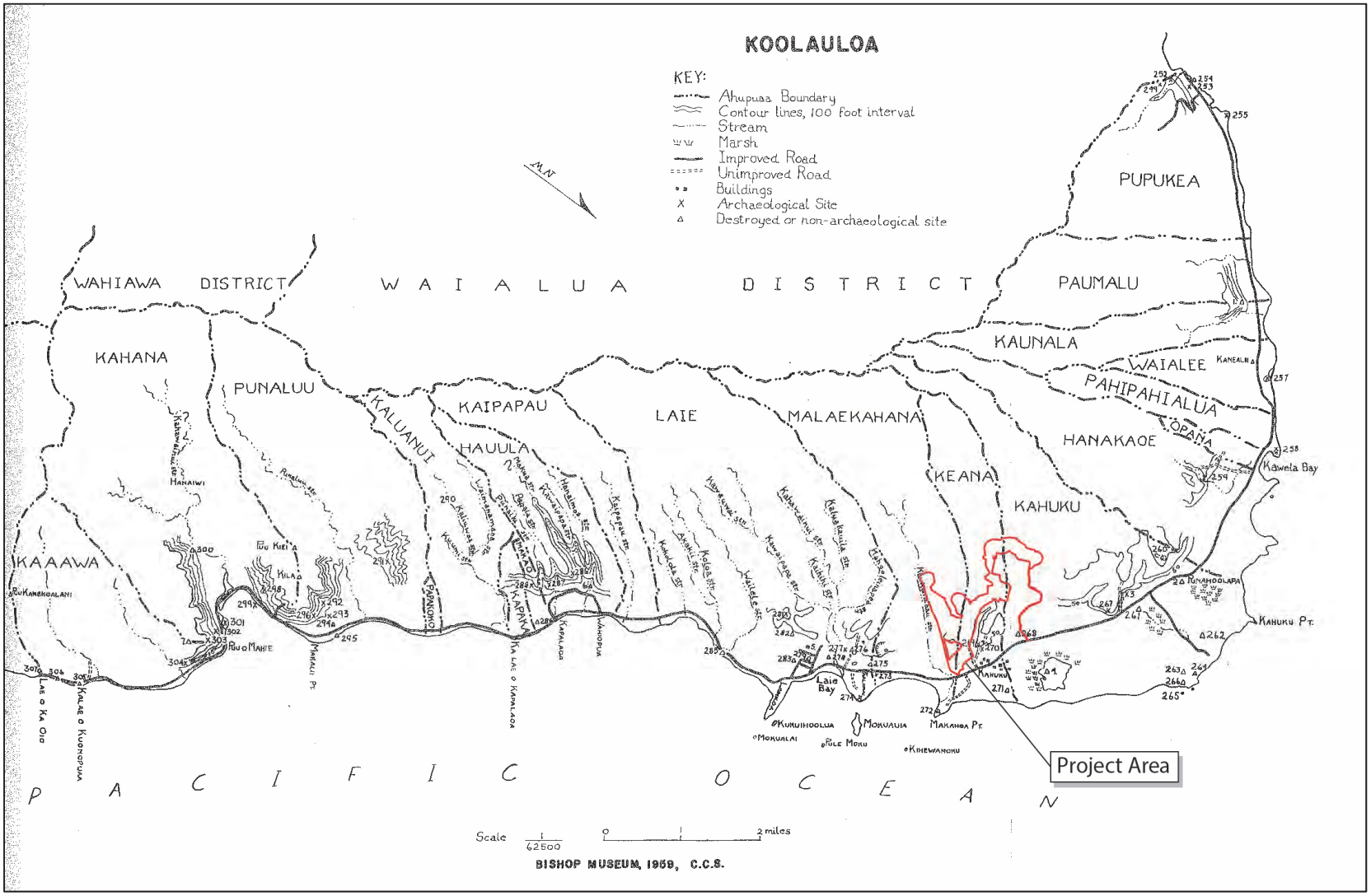

Figure 3. Sterling and Summers (1978) map of Koʻolau Loa showing approximate location of project area.

> candlenuts); pasture for domestic animals (in the nineteenth century); various fruit trees; and more (Kirch and Sahlins 1992:19).

Thus, resources needed for daily life were best grown in or collected from the habitats that they were best suited for and likely distributed, through trade, gifting, or taxes, from *mauka* to *makai* or vice versa within the *ahupuaʻa*. Further evidence of this is found in the archaeological record, where most upland habitation features in the area contain significant amounts of marine shell and fish bone in midden deposits, which suggests that people inhabiting the *mauka* areas of the *ahupuaʻa* had a steady diet of marine resources (Jensen 1989; Williams and Patolo 1998).

3.1.3 Traditional Hawaiian Land Divisions

The pre-Contact economy of the Hawaiian Islands was based upon agricultural production that worked within a tiered system of land divisions (Lyons 1875; Malo 1951; Handy and Handy 1991; Kirch 1985; AKAC 2010). In 1875, Curtis J. Lyons, the distinguished surveyor published an article in *The Islander* on land issues, which identified the *ahupuaʻa* as the principal subdivision in a *moku* (district). In this article, he states:

> ...Its name is derived from the *Ahu* or altar; (literally, pile, *kuahu* being the specific term for altar) which was erected at the point where the boundary of the land was intersected by the main road, *alaloa,* which circumferenced each of the islands. Upon this altar at the annual progress of the *akua makahiki* (year god) was deposited the tax paid by the land whose boundary it marked, and also an image of a hog, *puaa,* carved out of kukui wood and stained with red ochre. How long this was left on the altar, I do not know, but from this came the name, *ahupuaʻa,* of the pile of stones, which title was also given to the division of land marked thereby…(Lyons 1875:103-104).

The islands are divided into several sections called *moku* (districts), in which are particular subdivisions referred to as *ʻokana* (a portion) or *kalana* (a division) (Lyons 1868:67-68; Malo 1951:16-17). According to Curtis J. Lyons (1868) in *Nūpepa Kuakoa*, these units are further divided into *ahupuaʻa*, which are the main units of traditional Hawaiian land division. Within *ahupuaʻa* are *ʻili*, followed by *ʻili paʻa, ʻili kūpono, ʻili lele, lele, moʻo, moʻo ʻāina, paukū, kīhāpai, kōʻele,* and *kuleana* (Pukui and Elbert 1986). However, in some cases, the *ʻili kūpono* or *kū* were a type of sovereign *ʻili* within an *ahupuaʻa* that were not made to pay tribute to the chief (Thrum 1890:106). Within the *paukū* are dry land patches, referred to as *kōʻele*, *hakuone*, and *kuakua* (cultivated specifically for the chief; listed from smallest to largest). In general, high elevations or mountains are called *mauna,* but mountains or mountain summits located centrally on the island are termed *kuahiwi*, while the peaks or ridges on top of the *kuahiwi* are called *kualono.* In 1868, Lyons continues to describe the geography of the typical *ahupuaʻa* as well as the Hawaiian names for these geological features, stating:

> The place where trees are small below the fern belt is termed kuahea (hillock section); below it is the wao (wild place), also called waonahele (wilderness) and wao eiwa (ninth wilderness). The place where trees grew taller below the wao eiwa is the wao maukele, and a little below it again is the waoakua (spirit region) ; next below that is where voices increase and, hence, called wao kanaka (people's sphere), because there the people cultivate food. Below that is apaa, and next is ilima (where this plant of the Sida genus is found), and below it is pahu (stake or land mark). Below pahu is kula (open country) adjoining habitations,

> and seaward of the village is the shore, where it joins the sea. Such was the island divisions by the ancient people of Hawaii.
>
> …Places that stand high up in this and that locality are called puu (mounds or peaks) ; if they stand in a row they are a lalani puu, or pae puu (a line or range of peaks or hills)…High places of the earth lying narrow is a lapa (ridge), or kua lapa (shoulder ridge). If the ridges are many they are called olapalapa (rough protuberances). Deep places lying lengthwise are called kahawai, awawa, or owawa (streams, valleys or ditches). Lengthy, solitary places are called alanui (roads), and kuamoo (paths), and if it continues circuiting the island it is a highway. In places where the path is steep it is called piina or hoopiina (ascending path), kooku (hill slope), and auku (up hill road). Descending paths are termed ihona, alu, kalua, and hooihona, and the place where men would rest is oioina (a resting place). Places where water flows continually are streams (kahawai). Inland places are kumu (source) and seaward places are called nuku (point or outlet). Where water is led to places of cultivation, that is called an auwai (watercourse); where the water joins the sea is a muliwai (river) ; waters borne within the land are lokos (lakes or ponds) (C.J. Lyons 1868 as cited in Thrum 1921:67-68).

Perhaps the ancient Hawaiians created names for an array of topographical features and slight variations within the *ahupuaʻa* as a way to help keep the dynamic *mauka-makai* economic structure organized.

The names of the three *ahupuaʻa,* Kahuku, Keana, and Mālaekahana, in which the project area are located within each have traditional meanings. According to Pukui et al. (1974:67) Kahuku literally translates as "the projection" and is the name of a village, land division, northernmost point, golf course, ranch, schools, forest reserve, as well as surfing beach on Oʻahu. Keana literally translates into English as "the cave," according to Clark (2002:177), perhaps due to the fact that one of its most prominent sites is an ancient rock shelter (Site No. -270) known as Keana Cave (McAllister 1933:233; Sterling and Summers 1978:154). Mālaekahana Ahupuaʻa, which is named after the mother of legendary figure, Lāʻie-i-ka-wai, is also the name of the large bay and stream found within the land division (Pukui et al. 1974:143).

3.1.4 Traditional Names of Topographical Features

The Nā Pua Makani Wind Project lands are within Kahuku, Keana, and Mālaekahana Ahupuaʻa. The great majority of the project area is within the *kula* (plains/fields) and *wao* (upland) areas of Keana and Mālaekahana Ahupuaʻa. Several culturally significant landmarks and noted topographical are located in and around the Nā Pua Makani Wind Project lands. These landmarks possessed Hawaiian names in the pre-Contact era, which were based on distinguishing characteristics, *moʻolelo*, or traditional use of the area. These traditional names are seldom used to refer to these landmarks in the modern era.

Kahuku Ahupuaʻa covers the largest area and has a relatively large amount of noteworthy topographical features as well as an extensive mythological background. Due to the fact that only the northwest extreme of the project area is located in Kahuku Ahupuaʻa, noteworthy Kahuku traditional landmarks within the southern half of the *ahupuaʻa* will be mentioned in this study. Only two landmarks within the southern half of Kahuku Ahupuaʻa were found to have

traditional names. Punamanō, which translates as "shark spring," is a spring-fed wetland located a little more than one kilometer north of the project area (Clark 2002:310). Also within the southern portion of Kahuku Ahupuaʻa is Kaauhelemoa Fishpond (Site No. -268), which was an ancient fishpond named after its *moʻo* (guardian), named Kaauhelemoa. This fishpond was once located only several hundred meters west of Kahuku Village. According to legend, "Kaauhelemoa was half man and half chicken, a being of supernatural power who could change himself at will into a man or a chicken" (McAllister 1933 as cited in Sterling and Summers 1978:152). Before being destroyed for sugarcane cultivation, the pond was said to have been fed by a spring (ibid). McAllister (1933) holds that Kiʻi Wetlands, also referred to by some as Kahuku Fishponds, was always simply a swamp and never used as a fishpond (ibid.). Kiʻi Wetlands, now a National Wildlife Refuge, is located just under two kilometers north of the project area.

In Keana Ahupuaʻa, northwest of Makahoa Point is a noted fishing ground, referred to as Kaluahole, which translates as the "pit, or cavern of the ahole fish" (Clark 2002:155; Pukui et al. 1974:78). The *āhole* (Hawaiian Flagtail; *Kuhlia sandwicensis*), is described by Titcomb as "a common shore fish" that inhabits the coral and lava caverns of the reef when mature (1972:59). North of Kaluahole is Kaʻohana, or "the family," which is a calcareous sand beach near the Japanese Cemetery (Clark 2002:161). The coastline fronting the Kahuku Golf Course was traditionally referred to as Keoneʻōʻ io, or "the ʻoʻio sands," where *ʻōʻio* is the Hawaiian word for *Albula vulpes,* commonly known as bonefish (Clark 2002:137). This is also the traditional name for the channel that is most suitable for swimming in the area. Pōlou is the name of a pool of water that once existed *makai* of the Kahuku Mill, recorded by McAllister (1933) as Site No. -271 (as cited by Sterling and Summers 1978:154). This pool was said to have been the anchoring spot where the fabled "floating island" of Kahuku attaches to the rest of the island of Oʻahu (ibid.).

Mālaekahana has also been referred to in local mythology. Less than 800 meters *makai* (seaward) of the project area is Makahoa Point, which is located on the north coast of Mālaekahana Ahupuaʻa. The beach ends at the south end at Makahoa Point in Mālaekahana Ahupuaʻa. Makahoa translates to English as "friendly" or "a companion" according to Pukui et al. (1974:140) and Clark (2002:228). Where the mouth of Keaʻaulu Stream pours into Mālaekahana Bay marks the boundary Keana and Mālaekahana Ahupuaʻa. The name Keaʻaulu means "the growing root," (Pukui et al. 1974:100), which may indicate that traditional Hawaiian agricultural practices likely occurred along Keaʻaulu stream and gulch. Also in Mālaekahana Ahupuaʻa is Site No -275, referred to as Waiʻāpuka, which is a pool mentioned in the legendary story of Lāʻie-i-ka-wai and was said to be the opening of a subterranean cavern with fresh spring that a person could swim underwater for a great distance prior to it being filled in with sediment in the historic era (Sterling and Summers 1978:155). This site is located approximately 1.5 kilometers to the south of the project area.

3.1.5 Traditional Names of the Winds of Koʻolau Loa

Traditional Hawaiian stories and legends (*moʻolelo*) have been told and retold; shortened and changed; published in turn-of-the-century Hawaiian language newspapers; and collected for books. In 1902, Moses Kuaea Nakuina published *Moolelo Hawaii o Pakaa a me Ku-a-Pakaa, na Kahu Iwikuamoo o Keawenuiauni, ke Alii o Hawaii, a o na Moopuna hoi a Laamaomao* wherein he

retold a "traditional legend collected from various sources, edited, and expanded" (Nakuina 1992:vii) upon in order to preserve its knowledge. In 1992, an English version of Nakuina's *moʻolelo* was published as *The Wind Gourd of Laʻamaomao: The Hawaiian Story of Pākaʻa and Kūapākaʻa, Personal Attendants of Keawenuiaʻumi, Ruling Chief of Hawaiʻi and Descendants of Laʻamaomao*, with the translation done by Esther T. Mookini and Sarah Nākoa.

This moʻolelo retells the story of Pākaʻa and Kūapākaʻa, who were personal attendants to the ruling chief of Hawaiʻi, Keawenuiaʻumi. Pākaʻa was the son of a Hawaiʻi Island aliʻi, Kūanuʻuanu, and Laʻamaomao, a "cherished keiki, brought up with care and refinement" in a family of status on Kauaʻi (Nakuina 1992:2). Before the birth of his son, Kūanuʻuanu returned to Hawaiʻi Island and Laʻamaomao was shunned by most of her ʻohana and left to care for Pākaʻa alone in a cave by the beach. When Pākaʻa was a boy, he pestered his mother, always asking 'who is my father?' When Laʻamaomao finally answered she told him, "as for your real father, you must look for him. I'll tell you this: to find him, you must look to the east, where the sun rises and a certain local wind blows. Your father lives there." Pākaʻa determined that he would search for his father when he was "old enough to travel the seas between the islands" (Nakuina 1992:2).

As he grew up, Pākaʻa worked hard to help his mother and learned the ways of a fisherman. Pākaʻa was clever and determined and when he learned that an *aliʻi* of Kauaʻi would be touring the islands, he asked his mother's permission to join the traveling company. "'ʻAe, go,' said his mother. 'But go with humility and modesty;…and when you arrive in the presence of Keawenuiaʻumi, you'll know you've arrived at the place where your father lives'" (Nakuina 1992:14). Then:

> Laʻamaomao lifted the lid of a large calabash and took out a small, long, highly polished gourd in a woven bag. The gourd was covered securely. She turned to her keiki and said, "I'm giving you this gourd which belonged to your extraordinary kupunawahine for whom I was named. Her bones are inside the gourd. While she was alive, she controlled all the winds of the islands-she had them under a supernatural power. She gathered all the winds and put them into this gourd, where they're still kept. She memorized one by one the names of all the winds from Hawaiʻi to Kaʻula. On windless days, she could remove the cover and call out the name of a wind, and the wind in this gourd would blow. This gourd, called 'the wind gourd of Laʻamaomao,' was famous.
>
> Before she died, she entrusted me to put her bones inside this gourd and care for them until I had a child. Then I was to give the gourd to the child to watch over. You're my only child, so now I'm giving the gourd to you. You must look after it according to the wishes of your extraordinary kupunawahine.
>
> You must care for this gourd because it has been handed down from the kupuna. This gourd has great value-you may not think so now, but when you sail with the aliʻi and arrive at an area where no wind blows and the canoes are becalmed, say that the winds are at your command; all you have to do is call, and the winds will blow.
>
> When you're laughed at, remove the lid of the gourd and call for a wind. The wind will blow and bring the canoes to shore. The aliʻi will be grateful to you, and you'll be loved and valued by him.

> Before Pāka‘a sailed off, La‘amaomao taught him the names of all the winds, along with the prayers, songs and chants concerning them, and when she was done, Pāka‘a had memorized everything. Then he took the wind gourd and tied it with a cord he had made, prepared his other things for the voyage, and left home (Nakuina 1992: 14-15).

The "grand traveling company" landed first at Waikīkī and from O‘ahu, then continued on to Moloka‘i, Maui, and eventually, Hawai‘i Island, where he found his father in the chief's court (Nakuina 1992:15). He trained under his father, Kūanu‘uanu, to become a *kahu iwikuamo‘o* (personal attendant). When his father died, Pāka‘a took on the role of *kahu* for the old *ali‘i*. There were those jealous of Pāka‘a's position and skill and eventually, he fell out of favor with the old *ali‘i* and his court. Pāka‘a left Hawai‘i Island, taking the wind gourd his mother had given him, and sailed to Moloka‘i where he met and married Hikauhi. They had a son named Kūapāka‘a, who was dutiful and learned all his father had to teach (Nakuina 1992).

Many years after Pāka‘a left Hawai‘i Island, the old *ali‘i* became tired of the poor service and greedy manners of his *kahu* and went in search of Pāka‘a. Word traveled that Keawenuia‘umi was searching for him, so Pāka‘a and Kūapāka‘a "gathered their supplies for catching uhu…took along with them the wind gourd of La‘amaomao" (Nakuina 1992:30) and paddled out in their fishing canoe to await the entourage of his *haku* (master, lord). A fleet of canoes ladened with the people of Keawenuia‘umi's court was approaching and each time they encountered a canoe, Kūapāka‘a would ask his father, 'Is this perhaps my haku?' and Pāka‘a would reply, 'It is not your haku' (Nakuina 1992:33). Kūapāka‘a asked that same question throughout the night and finally Pāka‘a said, 'When you see the first rays of the sun, you'll see your haku' (Nakuina 1992:33). At first light, Pāka‘a ordered Kūapāka‘a to call out to his *haku*, and the *keiki* began to chant:

> The canoe is yours,
> Great Hawai‘i of Kāne,
> Great Hawai‘i, land of the sun,
> The sun emerges, emerges,
> The sun emerges at Ha‘eha‘e,
> With a strong affectionate love for my haku,
> Not my real haku,
> But a companion of the giddy sun,
> The Kona sun without food,
> Its loved one has arrived,
> Arrived along with Hilo of Kāne,
> Hilo of Kāneakapu,
> Hilo, land of Kanilehua,
> Beloved companion of Keawenuia‘umi mā,
> There sits Keawenuia‘umi,
> The canoe is yours
> (Nakuina 1992:37-38).

Once greetings were exchanged, the *keiki*, Kūapāka‘a, asked Kahikuokamoku, the Kuhina Nui, to bring the canoe fleet ashore, because, "'Tomorrow is a calm day for sailing; today will be stormy: there are thick cumulus clouds resting above Kawainui and the ridge of Wailau; when

these clouds are blown with full force, a terrible storm will rage; when the clouds are at rest again, then good weather will follow'….There were no clouds yet-only the clouds in the wind gourd" (Nakuina 1992:38). The Kuhina Nui asked, "how is it a calm day like today can be a bad day for sailing? The sky is clear, the mountain tops are exposed, and the banks of clouds are asleep at the horizon" (Nakuina 1992:39). Kūapākaʻa responded, "This will be a stormy day, a windy day. You came here from Hawaiʻi with the winds from there; Hawaiʻi is a windy land and they blow here from behind you." The Kuhina Nui challenged Kūapākaʻa, a *keiki* of Molokaʻi, on his knowledge of the winds of Hawaiʻi Island. Kūapākaʻa chanted the names of the winds for the west side of the island; he chanted the names of the winds for the east side of the island. Kahikuokamoku asked his advisers if it would storm and they contradicted Kūapākaʻa. Encouraged by a look from his *haku*, Kūapākaʻa chanted the rest of the names of the winds of Hawaiʻi (Nakuina 1992). Kahikuokamoku answered:

> "The aliʻi's canoes won't go ashore with you, ē ke keiki. These winds you've called out belong to Hawaiʻi. They blow over the sea of ʻAlenuihāhā and die out there. The winds of Hawaiʻi won't reach here."
> Kūapākaʻa said, "Since you deny the winds of Hawaiʻi, here in front of you is Oʻahu, another windy land."
> Kahikuokamoku said, "Let's hear the names of the Oʻahu winds."
> Kūapākaʻa chanted the winds of Oʻahu:
>
> There are our clouds, my father's and mine,
> Covering the mountains;
> The clouds rise with a sudden shower,
> The whirling winds blow,
> The source of the storm of the keiki,
> Ku a ē-ho is at sea
> From the sea, the storm comes sweeping toward shore,
> The windward Kui-lua wind churns up the sea,
> While you're fishing and sailing,…
>
> …The sea wind blows hard,
> Mālualua comes from the northeast,
> Peapueo is of Kaunala,
> Ahamanu is of Kahuku,
> Lanakilia is of Hauʻula,
> Moaʻe is of Punaluʻu,
> ʻĀhiu is of Kahana,
> Holopali is of Kaʻaʻawa and Kualoa,…
>
> …The Kona winds turn, the Koʻolau winds turn,
> The winds will turn before you and find you,
> You will be overwhelmed, O deaf aliʻi,
> The winds will gather,
> The naʻenaʻe leaves will bend,
> You'll be swept ashore at ʻAwawamalu,
> Caught in the fishing net of the head fisherman,
> Your thigh bone and upper arm bone
> Will be made into fishhooks,
> To catch pāoʻo and ʻōpakapaka,
> Your flesh will be without bones,

> The black crab, the shearwater will eat your remains,
> The life from the parents will be broken off,
> Here I am, the ʻaumakua kanaka,
> Listen to my life-giving words,
> Keawenuiaʻumi, come ashore, a storm is coming,
> When you sailed yesterday, it was calm.[1]
> After the winds of Oʻahu had been named, the kānaka were uncertain: they didn't believe fully in the keiki's words, yet they were afraid that the words might be right and that some of them might die at sea... (Nakuina 1992:42-44).

The tale continues, Pākaʻa urging Kūapākaʻa to call out the names of the winds of Kauaʻi; chant of the destruction to be caused by the wind; call out the names of the winds of Maui and Molokaʻi; and chant of terrible storms and rough seas. Pākaʻa had a plan of revenge that required the *aliʻi*, who had blackened his name to Keawenuiaʻumi, go ashore. At that time, Pākaʻa would then be reunited with his *hānai* (provider). In the end, "Pākaʻa was victorious over his enemies who had come between him and his hānai. With the help of Kūapākaʻa, his keiki, Pākaʻa returned to enjoy the comforts and honors and carry out the responsibilities of an aliʻi of Hawaiʻi" (Nakuina 1992:106).

According to Handy and Handy (1991), the gourd is a personification (*kino lau*) of Lono, the Hawaiian god of agriculture and fertility. "Lono is the gourd; the cosmic gourd is the heavens whence some winds, clouds, and rain" (Handy and Handy 1991:220). In a rite called the "Gourd Prayer" (*Pule Ipu*), a male child was blessed in order that he grow with the vigor of the gourd vine. Lines in the *Pule Ipu* refer to the gourd Lono-kui-kui, Lono-the-punisher, and his wife, Ka-papa-ia-kea, who bore him 12 children. They "dwelt in an underground cavern (*lua*), in which grew famous gourds (his children)….One of these gourd-children…was undoubtedly the great wind-gourd named Laʻa-maʻo-maʻo. Laʻa-maʻo-maʻo (Distant-Laʻa), or Ka-ipu-makani-a-Laʻa-maʻo-maʻo (the-wind-gourd-of-the-far-away-heavens-of-Laʻa) was a name for the sky and its horizons whence come the winds and rains" (Handy and Handy 1991:219-220).

In consonance with the *moʻolelo* of the Wind Gourd of Laʻamaomao, there is only one named wind within the project area. It is the Ahumanu wind of Kahuku. "Ahu" (lit. to gather or collect) and "manu" (the general name for fowls or the feathered tribe) together literally mean bird gathering or gathering of birds (Andrews 1865; K aleinohea Cleghorn, personal communication 2015) suggesting that birds, and possibly bird hunting/gathering activities, were common in the area.

3.1.6 Moʻolelo of Kahuku, Keana, and Mālaekahana Ahupuaʻa

Each *ahupuaʻa* in which the Nā Pua Makani Wind Project lands are located has a traditional background from the pre-Contact era. Ancient *moʻolelo* for each *ahupuaʻa* helps to explain their traditional names, what kinds of natural resources were found within, what stories and

[1] One of the greatest fears of the *aliʻi* was the desecration of their bones by fishermen who used human bones to make fishhooks. The *mana* (spiritual power) of a person resided in the bones, and this *mana* could be passed on to descendants only if the bones were taken care of. (Thus Pākaʻa carries the bones of his grandmother Laʻamaomao with him in his gourd.) Fishermen preferred the thigh bone and upper-arm bone for making hooks. If they were lucky enough to find a corpse at sea or washed ashore, they baked it in an *imu* and stripped off the flesh. Sometimes the flesh was used as bait to catch *niuhi* (tiger shark); or it could be left to scavengers, such as crabs and sea birds.

mythological figures are associated with them, as well as the chronicles and conflicts may have occurred there. These facets of the cultural landscape help to provide a connection for modern day cultural practitioners to the land and their ancestors who dwelt in these *ahupuaʻa*. In addition, traditional *moʻolelo* about each *ahupuaʻa* is integral to understanding the cultural, historic, and spiritual significance of these lands.

Kahuku Ahupuaʻa

The name Kahuku appears to be used not only as the name of an *ahupuaʻa* and village, but as a district or place name for the area roughly between ʻŌʻio and Keana Ahupuaʻa. Of the three *ahupuaʻa* represented in the project area, Kahuku has the most extensive traditional and mythological background.

Traditional accounts of natural resources and environmental conditions are relatively abundant for the *ahupuaʻa* of Kahuku. Traditional land use in Kahuku is also made apparent through legend. The landscape of Kahuku appears to have had several configurations, from the pre-European contact era to the present. During Hawaiian settlement prior to the arrival of Europeans, many parts of the landscape were used for traditional agriculture, habitation, and ceremony, varying from intense to moderate. In the early European Contact period, a good portion of the land lay fallow due to severe population decline and was overgrown in some areas with exotic plant species. Thus, there are several conflicting accounts of what the landscape was like and how it was used prior to European contact. Several themes are tied to Kahuku's landscape, including its abundance of *hala,* or pandanus, and its importance to ancient Kahuku's cultural identity.

Fresh water springs were mentioned in several traditional accounts of the Kahuku area. For instance, in the tale of Makanikeoe, the celebrated adventurer, Makanikeoe stopped at Punahoʻolapa, "a deep spring on the plain of Kahuku," where he found the spring that the legendary *kapa* anvil fell into and ended up in Waipahu, at ʻEwa (Maly and Maly 2003:91). Subsequently, Makanikeoe "crawled along another path" arriving at another Kahuku spring known as Punamanō (ibid.). A lone rock here, Kū's Rock Spring, was said to give forth pure spring water (Sterling and Summers 1978:153). Further, Handy (1940:88), disclosed that a spring, referred to as Kaainapele Spring, was located *mauka* of the Kahuku Ranch house.

Agricultural terraces were also said to exist in northern Kahuku in the pre-European contact era, which was made possible with the presence of natural springs (Handy 1940:88). There is some debate, however, on the origin of these terraces, where some informants claim that the terraces pre-date European contact and were used in the late 19th Century by the Chinese for rice paddies and some claim that the terraces were built by the Chinese for this purpose (ibid.). On the district of Koʻolau Loa in general, Hall (1839) states that, "…much taro land now lies waste, because the diminished population of the district does not require its cultivation," which upholds the abandonment of taro patches in various locations in Koʻolau Loa due to population decline (as cited in Sterling and Summers 1978:148).

The presence of fish and fishing practices of pre-Contact Kahuku are recalled in legends. In the legend of Kaneaukai, as told by Thrum (1976:254) from April through July, schools of mullet, or *ʻanae-holo*, and surgeonfish, or *āa,* move from Maui to Waimea, passing by Kahuku. Further, in

the tale, *Two Fish from Tahiti*, Westervelt (1915:138-140) alludes to *kapu* being placed on the catching and eating of certain species of reef fish associated with the Tahitians that fell victim to cannibalism in this story. The story of Punamanō Spring in Kahuku eludes to locals net fishing at the beach at night, which is telling of traditional fishing methods used in Kahuku (Sterling and Summers 1978:150). The story of Kūkiʻo Pond holds that the pond was once much larger and had contained a variety of fish. This story suggests that these natural ponds were utilized as brackish water fish ponds in ancient times.

Numerous proverbs, prayers, and *mele* about Kahuku in general elude to its abundance of *hala*, or pandanus trees. Pukui (1983:248) recites the proverb, *Nani i ka hala ka ʻōiwi o Kahuku*, which translates to, "the body of Kahuku is beautified by hala trees." In Fornander's translation of the prayer of Kualiʻi, Kahuku is described as a *hala* tree (Fornander 1917:28). Thrum (1919) also associates pandanus with Kahuku in his translation of Comparison of Kualiʻi, in the following lines:

> …Not like the paua [clam or abalone] which cuts the pandanus,
> To weave its blossoms at the social gatherings,
> That was the knife to cut Kahuku's pandanus.
> [He is] Not like these.
> (Thrum 1919:459)

This *mele* compares Kualiʻi with a host of euphemisms that often call upon various localities and objects often associated with them. In a section titled: "Various Heathen Prayers," Fornander (1920:46-51) translates an untitled prayer with a line that states: "He hala o Kahuku…" which Fornander interprets as, "Full of pandanus is Kahuku…" (1920: 50). Intending to win back the affections of his wife, Halemano, composed a chant that referring to the *hala* trees of Kahuku, stating:

Ku au nana I laila,	I stood and gazed, then
Haloiloi Kuu waimaka e uwe,	Tears filled my eyes causing me to weep.
Nani na hala ka oiwi o Kahuku,	How beautiful are the hala, native trees of Kahuku.
I ka lawe a ka makani he mikioi	As they are being fanned by the Mikioi wind.
	(Elbert 1965:281)

Another tearful sentiment about the *hala* of Kahuku comes from the tragic tale of Kaopulupulu, who's failed prophecy sealed his death warrant in the time of Kahahana. According to Thrum (1912:210):

> …In the morning, ascending a hill, they turned and looked back over the sea-spray of Wailua to the swimming halas of Kahuku beyond. Love for the place of his birth so overcame Kaopulupulu for a time that his tears flowed for that he should see it no more (as cited in Silva 1984:C-4).

Further, Apuakehau wrote in the Hawaiian newspaper, *Kuokoa*, in 1922 that "the first Kahuku" was covered by a *hala* grove (as cited in Sterling and Summers 1978:149). The association of *hala* with Kahuku is even repeated in the traditional Hawaiian myth of Pele and Hiʻiaka (Silva 1984). In this portion of the myth, while Hiʻiaka is in Kahuku (Kahipa), she rebukes two bad-mannered individuals, Puna-heʻe-lapa and Pahi-pahi-alua, who did not pay her the proper respects by stating:

> We enter the fragrant groves,
> Hala groves whose heads make a calm,
> Wild growths by the sea of Kahuku,
> But what, indeed are your halas?
> Shall their murmur forbid you speech?
> Make you dumb to my salutation?
> I make this kindly entreaty
> To you who sit in the grove
> (Emerson 1915:97-8 cited in Silva 1984:C-5).

Silva (1984) adds that Emerson (1915) gathered that there was some word play in the chant, where the word "*hala*" stood for the pandanus tree as well as a fault or a sin. As late as the late 1820s, Chamberlain holds that the Kahuku area was "beautified with lauhala and some other trees" in his manuscript, "Trip Around Oahu in 1826" (as cited in Sterling and Summers 1978:149).

The wearing of *hala*, in the form of plaited *lau* (leaves) *hala* or *leis* made of the *hala* fruit/seed was a way in which the people of Kahuku represented their homeland. In the tale of Kalelealuaka, the strong and brave young warrior who fought for King Kakuhihewa, went to Kahuku and fashioned wreaths of pandanus fruit and sugarcane to disguise himself. He then was able to convince the King's marshal, who was disabled, that he was from Kahuku and that he would carry the marshal to his destination. As a reward, the marshal granted Kalelealuaka the district of Koʻolau Loa for his services (Thrum 1976:100). Cummins (1913) also calls the Kahuku area as "land of the hala tree" and stated that people should not leave Kahuku for Waimea or Waialua without a wreath of Hala-fruit (as cited in Sterling and Summers 1978:149).

Kahuku was infamous for several other landmarks that stand out in Kahuku's cultural and physical landscape. Some legends explain the occurrence of these distinctive natural features, such as the tale relayed by Pukui et al. (1974:67) where, Lono-ka-ʻeho (Lono the stone), who is described as a chief with eight stone foreheads, severed Kahuku Point from the island. Emerson (1909) translates the verses of a *hula* that describes a few of these landmarks of Kahuku in a rather colorful way. He preludes the translation with the quip, "Whether there is any connection between the name of the hula—breast-beating—and the expression in the first verse of the following mele is more than the author can say." The verses for this *hula* are translated by Emerson into English as:

> ʻTis Kahipa, with pendulous breasts;
> How they swing to and fro, see-saw!
> The teeth of Lani-wahine gape—
> A truce to upper and lower jaw!
> From Lihue we look upon Ewa;
> There swam the monster, Miko-lo-lou,
> His bowels torn out by Pa-piʻ-o.
> The shark was caught in grip of the hand.
> Let each one stay himself with wild herbs,
> And for comfort, turn his hungry eyes
> To the rustling trees of Lei-walo.
> Hark! The whistling-plover—her old-time seat,

> As one climbs the hill from Echo-glen,
> And cools his brow in the breeze.
> (Emerson 1909:206)

Emerson goes on to say that, "The thread of interest that holds together the separate pictures composing this mele is slight. It will, perhaps, give to the whole a more definite meaning if we recognize that it is made up of snapshots at various objects and localities that presented themselves to one passing along the old road from Kahuku, on Oʻahu, to the high land which gave the tired traveler his first distant view of Honolulu before he entered the winding canyon of Moana-lua" (ibid.). He adds that Kahipa is the name of a fabled female character, which was then applied to a locality in Kahuku where the mountains resemble two female breasts. Further, he describes Lani-wahine as, "A benignant *moʻo*, or water-nymph, sometimes taking the form of a woman, that is said to have haunted the lagoon of ʻUkoʻa, Waialua, Oʻahu" (ibid.).

Another tale of the distinguished promontory, referred to as Kalaeokahipa is as follows:

> Nawai-o-lewa is on the northwest side of the rocky brow of Kalaeokahipa and now only one breast is left to move in the gusty winds of Kuhuku-lewa. The other was broken off by that supernatural son of Ku and Hina…Between Kalaeokahipa and Nawaiolewa, just above is a small round opening to a secret cave…The small secret cave belonged to Kaalae-huapi (Red head mud hen) and others in the first Kahuku that was covered by a hala grove (J.K. Apuakehau, Kuokoa, June 29, 1922 in Sterling and Summers 1978:152).

Sterling and Summers (1978:151-2) list numerous historic references to Kalaeokahipa, most enlisting the use of the word "breast(s)"to describe the peak(s).

Also of note are the harsh currents and surf of Kahuku's coasts, which are mentioned in *The Birth Chant of Princess Bernice Pauahi Bishop,* as translated by Ahuena Taylor, which follows:

> …Who builds the heat, the oven, until the long fires
> Become like a wild sea.
> From "Kama" to "Waialua."
> And comes close the head lands of "Kahuku,"
> And the hawk-like scratching sea of "Kahuku,"
> The night was spent at "Waialua,"
> For a voice was at the sea of "Ewa."
> Listening for the response.
> Respond! Oh Heavenly one…
> (Kanahele 2002: 223-226)

This chant lends a rather rough image to the coast of Kahuku.

Kamakau (1964) tells of a famous hiding cave, referred to as Pohukaina, thought to be a considerable distance *mauka* of the Turtle Bay Resort area. This cave, which had an entrance in Kahuku, is described by Kamakau:

> The mountain peak of Konahuanui was the highest point of the ridgepole of this burial cave "house," which sloped toward Kahuku. Within the cave are pools of

> water, streams, creeks, and decorations by the hand of man (*hana kinohinohʻia*), and in some places level land (Kamakau 1964:38).

The great cave of Pohukaina is also said have been the refuge and storage place of "much wealth" for Oʻahu's chiefs (ibid.).

Although Kahuku lacked physical evidence of taro terraces along Kahuku Stream, informants interviewed by Handy and Handy in 1991 claimed that there was taro cultivation in ancient times (Handy and Handy 1991).

Hawaiian legend holds that Kahuku was once a floating island blown here and there by the trade winds and is recounted by many sources in several different ways. Pukui (1983) writes of the traditional proverb, *Kahuku ʻāina lewa,* which translates as "Kahuku, an unstable land…" and later writes that, "Oʻahu, according to legend, was once two islands that grew together. Kahuku is the part that bridges the gap" (Pukui 1983:144). Yet, there are many variations to this legend. In one version, the people of Kahuku grew tired of the moving island bumping against Oʻahu, so they fastened Kahuku to Oʻahu with fishhooks. McAllister (1933:155) retells this story in great detail:

> A story is told that Kahuku was once a land afloat, wafted about by the winds, drifting over the ocean. Just how it came to Oahu is not told, but old Hawaiians point out to Polou, the place where Kahuku is fastened to Oahu. Formerly it was possible to dice into the pool and when a depth of 40 fathoms was reached, a shelf of rock was found upon which to rest. Forty fathoms deeper Punakea (white line from coral) was reached and on looking toward Malaekahana, the hook by which Kahuku was made fast could be seen. This hook was intricately fashioned of Kawila (Alphitonia excelsior). Seaward of the Waialee Industrial School, in another pool of water, known as Kalou, is the spot where Kahuku is attached to Waialee… (McAllister 1933:155).

In addition, when McAllister (1933) relays the story about Kāne and Kanaloa, one line repeats the common tale that Kahuku was not attached to Oʻahu in ancient times, stating that "Kane and Kanaloa lived in the vicinity of the ridge (Kalaiokahipa ridge); but that was at the time when the Kahuku plain was still under water, and the waves lapped about Kalaiokahipa" (as cited by Wong-Smith 1989:A-2).

Silva (1984) lists several stories of how Kahuku was reattached to Oʻahu. One colorful account holds that the floating island of Kahuku belonged to the *menehune*, stating as follows:

> Ka-hu-ku section of Oʻahu was once a separate island…It was an islet whose people were the Mene-hune, or Dwarfs as they are called today. Many stories are told about the miraculous feats performed by the Little People of ancient Hawaiʻi. It is known, that they always worked from just after sunset until just before dawn.
>
> Legend tells us that Kahuku was a floating island situated several miles out to sea. For a long time, the people of Oʻahu had planned to make the island part of their land, for they saw it come close to Oʻahu's shores. The floating island of the Menehune did not have any fresh water springs because there were no high

> mountains covered with verdure and trees to capture the rains. So, the Little Folk used to paddle their islet into the bays of Oʻahu at night to haul water from the springs of the large island.
>
> One day, a resident of Kahuku suggested that all the people gather together to make strong hooks of whalebone and attach them to a stout rope made of sacred olonā fibers. This was done.
>
> The Menehune came to take water as usual, then the residents of Oʻahu attached the large hooks to the floating isle while the Menehune started to paddle off again, but they could not move their islet or free it from the ivory hooks and olonā ropes.
>
> Today, many people who travel Kahuku section of Oʻahu and see the many islets seeming to float off shore, and hear the sea singing its songs, they say, 'Listen to the Menehune grumbling while they try to move their island that used to float!'
>
> The rumbling and grumbling is heard only at night, for that is the time for the Menehune to be working at Kahuku. (Paki 1972:53 as cited in Silva 1984:2-3)

Another account of Kahuku being an island was provided by Silva (1984), which also links the locality with a legendary princess, named Lāʻieikawai, and reads as follows:

> Kahuku District, according to legend, was once a floating island blown about by the winds. As it banged against Oʻahu, it made noises which disturbed the old women guarding the princess Laieikawai. The old women grappled the island with fishhooks and attached it securely to Oʻahu. Polou pool on the sea side of the Kahuku mill is one spot where the hook was fastened. The other end was fastened at Kūkiʻo pond 300 feet inland at Kahuku Point (Boswell 1958:68 as cited in Silva 1984:2).

Other versions provide a political motive for uniting the two islands. A portion of the tale of "The Hole of Kahipa and Nawaiuolewa" was told to Mary Pukui by a one-hundred and five year old woman named, Kanui, who described how two ruling chiefs united Kahuku with Oʻahu. In this tale, "the two were brother and sister. In order to make it one, the two sat down and hooked their fingers together and drew them together. The hole marks the place where they sat (Kamakau Part II, Moolelo o Hawaii, Note 4, Chap 12, as cited by Sterling and Summers 1978:151). Kamakau (1991:38-9) holds that Oʻahu was a floating island, rather than Kahuku. However there are some consistencies with the previously mentioned versions. He writes:

> According to traditions of some people, Oʻahu was said to have once been a floating land, *he ʻāina lewa o Oʻahu*. The Kahuku side was a wide open gap (*puka hāmama*) and this was called *Ka Puka o Kahipa a me Nawaiuolewa*, "The opening of Kahipa and Nawaiuolewa." The piece of land that closed it up was called Kahuku, and the hooks that made fast the piece of land and joined it to the island were called Kilou and Polou (Kamakau 1991:38-39).

Another variation of the story told holds that there was an underground canal or tunnel where the two islands joined. In 1828, Levi Chamberlain, a missionary accountant, tells of a 5-7 mile

long by 1-2 mile wide underground canal leading from the sea inland at the convergence of the two islands (Chamberlain 1957:35-36). He reiterated the following in regards to this legend:

> The natives tell a marvelous story respecting the origin of this destrict [sic], which they say floated in from the sea, and attached itself to the ancient shore of the island, that there was a subterranean communication between the sea and the ancient shore, by which a shark used to pass, and make depredations up on the land. The basis of the tract, which is from five to seven miles in length, and from one to two miles in breadth, appears to be of coral; and it was evidently redeemed from the sea, as a good deal of land, in many places along the shore around the whole circuit of the island, evidently has been (Chamberlain 1957:35-6).

McAllister (1933) relays a story about a secret underwater passage way marked by two stones off of Kahuku Point that led to another land referred to as Ulukaa or Kahuna Moku. The story is as follows:

> Two stones known as Kahoa in water about 250 ft. from the beach just opposite from Kalaehila heiau, Kahuku Point. Many years ago a woman who lived on this beach was frequently seen to swim to these stones and disappear. At times she would be gone for as much as a week. Sometimes she was seen to put her clothes in a watertight calabash and swim away. When she returned she usually wore a kou lei. It was finally discovered that this was the entrance to another land, known as Ulukaa or Kahuna Moku (as cited by Silva 1984:A-5).

The theme of an underground canal is echoed in Thrum's (1911) "Legend of the Tapa Log," which largely takes place in Punahoolapa Marsh, located in the southeast corner of the Turtle Bay Resort property and currently a wildlife preserve. Thrum's story is as follows:

> A kapa-beating log of peculiar sound, unlike any other known on the island, which was placed in its waters at the close of the kapa-making season to keep it smooth and free from cracks that would impart an impression to the cloth in its manufacture, was missed, and, believing it to have been stolen, search was made all through the Koolau, Waialua and other districts 'til at last it was found in use at Waipahu. Recognizing it by its resonant tone, it was claimed by the searching owner, and right thereto by those in possession was vigorously maintained. To test the truth of ownership as claimed, the 'Ewa people accompanied the claimant back to Kahuku to visit the scene and witness a test of the underground stream theory. A bundle of ti leaves were gathered, which was wrapped together and consigned to the waters of Punahoolapa. In the course of a few days they were lost to sight, whereupon the party set out for 'Ewa, and after careful watching, as predicted, the bundle of ti leaves came forth on the bosom of the waters of the Waipahu stream. The kapa log was thereupon recognized as the rightful property of the Kahuku claimant (Thrum 1911:130 as cited in Sterling and Summers 1978:149).

Associated with Kahuku's underground canal are several legends of man-eating sharks, where a shark once traversed to consume people (Chamberlain 1957:35-36). In Handy (1922:111), Manō-niho-kahi (shark with one tooth) is a man who had the power to shape-shift into a shark. This version of the tale presents him as normal looking, except for the shark mouth on his back

that he always covered with a cloak of *tapa*. When Manō-niho-kahi found out that people, specifically women, were going to the sea to fish or collect *limu*, he would rush out to where they were and bite them with his single shark tooth, killing them. When the killings became too regular, the chief of the region and his *kahuna* gathered all of his people and ordered them all to disrobe. When Manō-niho-kahi refused to take off his *tapa* cloak, he was stripped, revealing the shark mouth on his back. At once, he was put to death, ending the streak of deaths of women in those waters. Another, albeit less gruesome, tale about man-eating sharks associated with Kahuku is told by McAllister (1933), where a shark was caught and kept as a pet in Punamanō marsh, which is located just east of Turtle Bay Resort lands. The story, as reiterated from an informant's testimony is as follows:

> One time when the people of Kahuku were fishing they caught a small shark. Putting him in a calabash of water they carried him to their houses near the beach. Here he was cared for and put in larger and larger calabashes as he grew bigger. Finally haven outgrown even the largest calabash that could be found, it was decided to place him in one of the pools of brackish water which came to be known as Punamanō. A man and woman living near the pool became guardians. They had lived in their grass huts with a breadfruit tree near the pool and taro and potato patches near the mountains for several years when the brother of the woman came to live with them. Sometime after, the man and his wife went to the mountains to gather taro and potatoes. The brother, who was staying at home, thought that he would like to have some food prepared when the sister and her husband returned. He climbed the breadfruit tree and gathered several, throwing the fruit into the water instead of on the ground, where it would have been bruised in the fall. After picking enough for a few days he descended the tree and gathered most of the fruits from the bank. Two had floated to the middle of the pond and he could not reach them. Now this man knew of the shark that lived in the pool, but he had frequently bathed in the pool and no thought of fear crossed his mind as he swam to the breadfruit. He did not know, however, that his sister and her husband had warned the shark not to allow anyone to steal breadfruit when they were gone. When the sister and her husband returned they could not find brother. Neither was the shark to be found, but they saw the breadfruit floating in the pool and the reddish color to the water. They guessed what had occurred. For nearly a mile they followed the bloody trail until they came to a spring known as Punahoolapa. Not only was the brother never seen, but the shark has never been seen to this day (as cited in Wong-Smith 1989:A-7).

In this case, it appears that the shark was simply looking out for its keeper's interests. Kuapuu (1861) wrote a very similar account of the Punamanō man-eating shark in the *Ka Hae Hawaii* newspaper (as cited in Sterling and Summers 1978:151).

Other supernatural beings and demigods associated with Kahuku are mentioned in Beckwith (1940). On a quest to find his brother, Lono-ka-ehu brought his "great dog" or the dog-man, Kū-ʻīlio-loa (Kū long dog), to Oʻahu from Kahiki. In the search, Kū-ʻīlio-loa "pierced the hill Kāne-hoa-lani at Kualoa, cleft Kahuku and Kahipa apart, and broke Ka-pali-hoʻokuʻi at Kailua" according to Beckwith (1940:321). She later describes Kū-ʻīlio-loa as "a dog with a human body and supernatural power, 'a great soldier and famous warrior,' who terrorizes Kahiki" (Beckwith 1940:321).

Kahuku is also a place where the manifestation of ancient *kapu* law had become a permanent part of the landscape in the form of two stone outcrops. According to Beckwith (1970:48), Kamakau mentioned the story of two stones in the cave of Ke-ana at Kahuku that are said to be the bodies of two boys who disobeyed their mother's injunction to keep silence during a thunderstorm. Kāne-hekili, the god of thunder, is associated with several gods whose names are also suggestive of the phenomenon experienced during thunderstorms, such as Kāne-wawahi-lani (Kāne breaking through heaven) and Ka-uila-nui-maka-kehaʻi-i-ka-lani (Lightning flashing in the heavens). The gods in their humpbacked forms can be seen flying through the air during storms with Na-kolo-i-lani, who are the humpbacked brothers of Pele. According to the ancient *kapu* laws, all containers should be turned bottom side up and people should lie face down without any outcry, for silence is the law of Kāne-hekili (Beckwith 1970:48).

Another well known *moʻolelo* is the Legend of Kamapuaʻa, a supernatural being and a deity attributed to agriculture, rain, and fertility (Elbert 1965:200-1; Maly and Maly 2003:9). While he had the ability to shape-shift into multiple bodily forms (*kino lau*), Kamapuaʻa was most noted for his pig-like appearance. In one of his many exploits, Kamapuaʻa was caught stealing chickens from Olopana, the head chief of Oʻahu at the time. To catch Kamapuaʻa, Olopana enlisted the residents of Kahuku, who capture him, bind him to a pole, and carry him towards Punaluʻu. Upon seeing this, his grandmother, Kamaunuaniho, recited a chant that gave him the power to kill the captors from Kahuku.

In *The Hawaiian Romance of Laieikawai,* the people of Waianae on Oʻahu offered their version of the story, which mentions the high chief who ruled Kahuku named, Kahoʻaliʻi. In this account, Kahoʻaliʻi instructs his son to, "Fly about Oʻahu while I chew the *ʻawa;* before I have emptied it into the cup return to me and rehearse to me all that you have seen" (Beckwith 1918:30). The tale goes on to list the places his son passed on his journey. Further, Kahuku is mentioned in the chant of Kualiʻi as one of the major landmarks of Oʻahu for those travelling to the island from Kauaʻi (Beckwith 1918:30).

In the tale, *Two Fish from Tahiti*, Westervelt (1915:142-144) recounts two great canoes filled with men from Tahiti, referred to as two "fish," journeyed to Oʻahu. The purpose of the journey was to "find the wonderful fire-land of Hawaii about which they had been taught in the stories of returned travelers…" and "…find an appropriate location for a settlement. Possibly they planned to make a permanent home or hoped to meet some good community into which they might be absorbed" (Westervelt 1915:140). Upon their arrival on the shores of Makapuʻu, the travelers found an "unfriendly coast" and decided to separate and circle the island, with one canoe going north and one going south. Westervelt continues:

> The boat which sailed toward the north found no good resting-place until it came to the fishing-village of Hauula…Evidently there, was dissension and at last a battle. The whole story is summed up by the Hawaiian legend in the saying: "The fish from Tahiti was caught by the fishermen of Hauula. They killed it and cut it up into pieces for food." Thus the visitors found death instead of friendship, and cannibalism was thereby veiled by calling the victims "fish" and the victory a "catch…"
>
> …The second fish from Tahiti had gone on southward in its journey around the island of Oahu. It passed the rough and desolate craters of Koko Head on the

eastern end of the island. It swam by Diamond Head and the beautiful Waikiki Beach. Either the number of the inhabitants was so large that they were afraid to make any stay or else they preferred to make the complete circuit of the island before locating, for they evidently made only a very short stay wherever they landed, and then hurried on their journey. By the time they reached Kaena, the northwestern cape of Oahu, they were evidently anxious concerning their missing companions. Not a boat on the miles of water between Kaena and Kahuku, the most northerly point on the island. The legend says that the fish changed itself into a man and went inland to search the coast for its friend, but the search was unsuccessful. It was now a weary journey from point to point, watching the sea and exploring all the spots on the beach where it seemed as if there was any prospect of finding a trace of their expected friends. Where a break in the coral reef permitted their boat to approach the land they forced their way to shore. Then when the thorough search failed again, the boat was pushed out over the line of white in rolling breakers to the great sea until at last the Tahitians came to Kahuku.

Now they appeared no longer as "fish," but went to the village at Kahuku as men. They made themselves at home among the people and were invited to a great feast. They heard the story of a battle with a great fish at Hauula and the capture of the monster. They heard how it had been cut up and its fragments widely distributed among the villages on the northwest coast. Evidently provision had been made for several great feasts. The people of Kahuku, although several miles distant from Hauula, had received their portion. The friendly strangers must share this great gift with them. But the men from Tahiti with heavy hearts recognized the fragments as a part of their companion. They could not partake of the feast, but by kindliness and strategy they managed not only to decline the invitation, but also to secure some portions of the flesh to carry down to the sea. These were thrown into the water, and immediately came to life. They had the color of blood as a reminder of the death from which they had been reclaimed. Ever after they bore the name "Hilu-ula," or "the red Hilu."

Then the "fish" from Tahiti went on around to Hauula. They went up to the tabu land back of Hauula. They pulled up the tabu flags. Then they dammed up the waters of the valley above the village until there was sufficient for a mighty flood. The storms from the heavy clouds drove the people into their homes. Then the Tahitians opened the flood-gates of their mountain reservoir and let the irresistible waters down upon the village. The houses and their inhabitants were swept into the sea and destroyed. Thus vengeance came upon the cannibals. The Tahitians were "fish," therefore they went back into the ocean to swim around the islands. Sometimes they came near enough to the haunts of fishermen to be taken for food. They bear the name "hilu." But there are two varieties. The red hilu is cooked and eaten, but never eaten without having felt the power of fire. The trace of the cannibal feast is always over its flesh. Therefore it has to be removed by purification of the flames over which it is prepared for food. The blue hilu, the natives say, is salted and eaten uncooked. Thus the legend says the two fish came from Tahiti, and thus they became the origin of some of the beautiful fish whose colors flash like the rainbow through the clear waters of Hawaii (ibid.:142-144).

This account calls attention to the political control of resources, *kapu* systems, variations in conduct with outsiders as well as warfare and cannibalism in pre-European contact Kahuku and Hauʻula.

Keana Ahupuaʻa

Few traditional legends mention Keana Ahupuaʻa specifically. One of which is the section of the Pele and Hiʻiaka legend, where Hiʻiaka passes through Lāʻie, Mālaekahana, and Keana to make her way to Kahauku (Emerson 1915:233). However, there are a number of traditional sites associated with legendary stories in the *ahupuaʻa.*

For example, two large stones in the Keana Cave or Rock Shelter (Site No. -270) are said to be the remains of two boys who failed to follow their mother's orders to stay silence during a thunderstorm, which was the *kapu* (law) of the god of thunder, Kane-hekili (Beckwith 1940:48). According to Beckwith (1940:48) "During such a storm all containers should be turned bottom side up; all persons should lie face down-ward and make no outcry." Emerson's (1915) rendition of this tale is as follows:

> In Kahuku, island of Oahu, at a place not far from the sugar-mill, is a cave, known as Keana. In former times this cave was the home where lived a mother and her two sons. One day, having occasion to journey to a distance, she left them with this injunction, "If during my absence you hear the sound of thunder, keep still, make no disturbance, don't utter a word. If you do it will be your death." During her absence, there sprang up a violent storm of thunder and lightning, and the young lads made an outcry of alarm. Thereupon a thunderbolt struck them dead, turning their bodies into stone. Two pillar-shaped stones standing at the mouth of the cave are to this day pointed out in confirmation of the truth of the legend (Emerson 1915:233).

Additionally, Pōlou (Site No. -271), which was described by McAllister (1933) as once being, "a pool of water, sea side of the Kahuku mill," was located in Keana Ahupuaʻa. This was said by some *kūpuna* to be the place where the "floating island" of Kahuku attached to the Island of Oʻahu. It was also said to be the location of a "stone" known as Kanaloa (ibid).

Mālaekahana Ahupuaʻa

Several legendary stories reference Mālaekahana as a locality, and the name itself is shared with a great heroin of ancient myth and the mother of Lāʻie-i-ka-wai and her twin sister, Lāʻielohelohe. In the story of Lāʻie-i-ka-wai, Beckwith (1940:526-527) describes the nature of the twin's birth, betrothals, and trials in finding the right suitor:

> Laie-i-ka-wai and her twin sister Laie-lohelohe are born at Laie on Oahu of Kahauokapaka the father, chief of the northern lands of the island, and Malaekahana the mother. Since the father has vowed to let no daughter born to his wife live until she bears him a son, the mother conceals the birth of the twins and gives them to her own relatives to rear, Laie-lohelohe to Ka-puka-i-haoa to bring up at the heiau at Ku-kani-loko, and Laie-i-ka-wai to Waka, who first hides her in a cave near Laie which can be reached only by diving into the pool which conceals the entrance, and then takes her to the uplands of Puna. Here she builds a tapu house for her ward thatched with bird feathers, and gives her birds to

wait upon her and mists to hide her from the sight of men until such time as a suitable lover shall appear to make her his wife.

The first whose suit seems acceptable is Kauakahi-aliʻi, ruling chief of Kauai and husband of Ka-ili-o-ka-lau-o-ke-koa (Skin like the leaf of the koa). The reappearance of his wife whom he had mourned for dead prevents the appointed meeting, but on his return to Kauai he relates the adventure and the young chiefs of that island are stirred by the story. Aiwohikupua meets her nightly in dream and goes to woo her, but even the presence of his four sweet-scented kupua sisters, named after the four varieties of maile vine whose scent they inherit, cannot shake her refusal. Enraged by the insult, he abandons the sisters in the forest. His fifth and favorite sister, Ka-hala-o-mapuana (The fragrant hala blossom) refuses to abandon them. Through her clever management she attracts the attention of Laie-i-ka-wai and the five are adopted as sisters and made the guardians of Paliuli. They drive off their brother upon his second attempt to win the chiefess, and a guardian moʻo named Kiha-nui-lulu-moku (Great moʻo shaking the island) completes his discomfiture. Another and more favored young chief from Kauai named Hauailike is also expelled by the watchful youngest sister.

Waka now arranges a match with Ke-kalukalu-o-ke-wa, younger brother of Ka-ili-o-ka-lau-o-ke-koa and successor with her to Kauakahi as ruling chief of Kauai. Just as the formal marriage (hoao) is about to be consummated, a young rascal from Puna named Hala-aniani, aided by his sorceress sister, carries her off on his surfboard in place of the legitimate lover. Waka finds them sleeping together and abandons the girl in a rage, stripping her of mist and bird guardians and of the house thatched with feathers whose protection her loose conduct has forfeited. The five sisters and the great moʻo, however, refuse to abandon their mistress. Since the Kauai chief has made her twin sister Laie-lohelohe his wife in place of their disgraced mistress, they determine to retrieve her fortunes by providing a more splendid match, and the clever youngest sister is despatched, with the great moʻo as carrier, to fetch their oldest brother who lives as a god in a tapu house in the very center of the sun in the highest heavens. While she is away on this errand the group leave Paliuli and travel about the island and, meeting an old family guardian and seer named Hulu-maniani, make their home with him as adopted daughters at Honopuwai-akua on Kauai. Throughout the course of the story this old seer (kaula) has been following around the islands after the rainbow sign which hovers over the place where Laie-i-ka-wai is hidden, determined to make this new divinity his chief and thus provide for his own old age.

Ka-onohi-o-ka-la (Eyeball of the sun) looks favorably upon his sister's proposal and, putting off his nature as a god, he descends to earth, strips the enemies of Laie-i-ka-wai of their lands and power and, leaving Ke-kalukalu-o-ke-wa and the twin sister rulers over Kauai, gives to each of the sisters rule over one of the other islands of the group and takes Laie-i-ka-wai up on a rainbow to live with him in Ka-hakaekaea. All goes well until, on one of his visits to earth to see that all goes well there, he notices the budding beauty of his sister-in-law. He presses his attentions and succeeds in securing her. His wife in the heavens wonders what important affairs keep him so long on earth. In the temple at Kahakaekaea stands the gourd Lau-ka-palili which reveals to one who looks within what is going on below. Laie-ika-wai discovers her husband's infidelity and reports him to his

> parents, who live with her in the heavens. They banish him to become a wandering spirit, the first lapu (ghost) in Hawaii. Laie-i-ka-wai returns to earth and lives like a god with her sister. Today she is worshiped as Ka-wahine-o-ka-liula (Lady of the twilight, mist, or mirage) (Beckwith 1940: 526-527).

Another fable that takes place in primarily in Mālaekahana Ahupuaʻa area is that of "Manuwahi: A Legend of Oahu" in *Hawaiian Legends* (Rice 1923), which is told as follows:

> At Laie lived Manuwahi, Free Gift, with his son, Ka haku loa, The-Lord-of-a-Long-Land; his grandson, Kaiawa, Bitter Sea, and his great-grandson Kauhale-kua The-Village-on-the-Ridge. These men were the keepers of the akua at Laie.
>
> Manuwahi and his children were hairless and were possessed of supernatural powers.
>
> Manuwahi planted black and white area far up in the mountains for the use of the akua. Every awa root planted was given one of these names, Kaluaka, The-Hole-That-Gives-a-Shadow; Kumumu, Blunt-Edged; Kahiwa, Best-Awa, or Kumilipo, The-Root-of-Unconsciousness. This was done so [that] Manuwahi, when sending one of his sons for a piece of awa could designate the exact one he wished.
>
> When the awa a was given to him, Manuwahi would prepare it, and then summon the akua from the North, South, East, and West, as well as from above and below, to drink of it. They prayed in this wise, before they drank:
>
> > Gods of the Morning,
> > Gods of the Night,
> > Look at your progeny:
> > Grant them health,
> > Grant them long life;
> > Amama ua noa - it is free!
>
> It happened that during this time Kamehameha I had come to conquer Oahu. He had succeeded in subduing all the island except Malae-kahana, between Laie and Kahuku. Determined to add this place to his conquests, the king sent one of his body guard, Ka-hala-iu, In-the-Shadow-of-the-Hala-Tree, with many of his bravest soldiers to subdue Malae-kahana.
>
> Ka-hala-iu marched as far as Hanapepe the first day, where he spent the night. Early the next morning he set out and meeting Manuwahi, whom he did not recognize, asked him where the powerful kahuna of Malae kahana lived.
>
> Manuwahi answered, "Pass over the river and you will see a spring and nearby a hut with trees about it. This is his home."
>
> Ka-hala-iu did as he was told and had soon surrounded the hut with his soldiers. When Manuwahi's son came out Ka-hala-iu asked him, "Where is your father?"
>
> "Did you meet a bald headed man?" asked the boy in turn.
>
> "Yes," replied Ka-hala-iu.
>
> "Well, that was my father. Why did you come here?"

"I came to kill your father by the orders of King Kamehameha," answered the King's man. Deciding it would profit them nothing to kill the son, the soldiers departed for Hanapepe by the makai side of the hill, and failed to meet Manuwahi, who had returned to his home by the mauka side.

The next morning the King's body-guard again surrounded with his soldiers the home of the kahuna. Manuwahi came out and asked, "What are you here for? Did you come for battle?"

"Yes," answered the fearless soldier, "We came to kill you."

Whereupon Manuwahi called to his assistance all the akua from the North, South, East and West as well as those from above and below. They came at once and gave battle to the soldiers of the king. The akua fought by biting and scratching their assailants and before long they had killed all but Ka-hala-iu.

Ka-hala-iu cried out, "Spare my life, kahuna of the gods, and I will stay with you."

"What can you do if you stay with me?" asked Manuwahi.

"I will plant awa for you. I came from Hawaii, where I lived by planting awa," answered Ka-hala-iu.

But Manuwahi said, "I do not need you. Go back and tell your king that even his bravest soldiers were not able to conquer Malae-kahana. Tell him that all but you were killed by the akua there."

When Kamehameha had heard these words he sent Ka-hala-iu back with another body of soldiers with orders that he must conquer Malae-kahana.

In the meantime, Manuwahi had moved with his sons up to the cave of Kaukana-leau, where the natives made their stone adzes. There the King's soldiers met them. As before, Manuwahi called all the akua to his aid. Again the soldiers were quickly put to death and only Ka-hala-iu was left. So Malae-kahana was not conquered.

Ka-hala-iu respected and admired Manuwahi so much that he was very anxious to remain with him, and so he asked again to be allowed to remain as an awa grower. Manuwahi consented this time and gave him one side of the valley to cultivate in awa.

One day as Ka-hala-iu was preparing the side hill for its cultivation. He noticed that on the opposite side of the valley, trees and bushes were falling in every direction, as if a whirlwind were uprooting them. This frightened him very much, as he could not understand the phenomenon, so he ran in great haste to Manuwahi, and asked what it meant. Manuwahi told him that his akua were helping in the clearing of the side hill, and that if he wished them to help him they would gladly do so. Ka-hala-iu was only too happy to have help so he called upon the akua, and in a short time both sides of the valley were cleared, and were growing luxuriantly with the most beautiful awa.

After the battle, between Ka-hala-iu and the akua for the possession of Malae-kahana, Manu-ka, Frightener-of-Birds, one of Manuwahi's sons, moved to Kaneohe, where he died some time later. He was buried makai of the present

> road. The natives dug a very large grave but before they could cover the body the akua brought red dirt from Ewa, in a cloud, which filled the grave, and made a red hill above it, which can be seen to this day. There is no other red dirt in that district (Rice 1923:113-115).

In Fornander's (1920) "Legend of Halemano," the hero, Halemano, passed through the area, mentioning Kahuku and Mālaekahana. In this story, Halemano's companion, Kumukahi, arrived at Hauula after they fled Hawai'i and so admired an upright image, named Mālaekahana, that he decided to stay in the area while the rest of his party continued on (Fornander 1920:236). It is possible that the statue was created in the likeness of its heroin namesake. The site of this statue may have been McAllister's Site No. -273, which is described as the *kauahale*, or house, foundation that once belonged to the *kahuna* (priest/sorcerer), Manuwahi, who was the keeper of the god of Mālaekahana (Sterling and Summers 1978:154). This site was located just within southern boundary of Mālaekahana Ahupua'a, near the present day entrance to the Mālaekahana State Recreation Area, which is approximately 1.5 kilometers southeast of the project area.

Mālaekahana is also associated with one of the many legends of shark gods. In this tale, Manō-niho-kahi (Shark with one tooth), resides near a spring in Mālaekahana located somewhere between Lā'ie and Kahuku, perhaps Wai'āpuka (Site No. -275). When Manō-niho-kahi spies a woman going to gather fish or *limu* (seaweed) from the ocean, he tells her to be wary of sharks, before attacking and killing her himself (Beckwith 1940:142). Subsequently, the chief detected Manō-niho-kahi out of a line-up of villagers when his tapa cloak is removed, revealing the mark of the shark's mouth on his back.

Wai'āpuka (Site No. -275), located in the *kula* of Mālaekahana, is noted in 1888 by King David Kalākaua in his book, *The Legends and Myths of Hawaii,* as a significant feature of Mālaekahana's landscape as well as an important locale in "The Story of Laieikawai." He iterates the acts of Waka, Laieikawai's grandmother, who provided the infant Laieikawai sanctuary from her father's wrath for not being born male, as follows:

> In his absence she was delivered of twin girls, who were named Laieikawai and Laielohelohe. They were surpassingly beautiful children, and, desirous of saving their lives, the mother consigned the first-named to the care of Waka, the child's grandmother, and the other to Kapukaihaoa, a priest of discretion and sanctity.
>
> On the return of the husband he was told that the expected child came into the world without life. He knew that a birth in his house had occurred during his absence, for he had heard two distinct claps of thunder.
>
> Waka took her foster-child to the cavern which opens into the pond of Waiapuka, and which can be entered only by diving. Laielohelohe was taken by her priestly protector to the sacred enclosure of Kukaniloko, on the western side of the island, and there tenderly cared for.
>
> The moment Waka entered the cavern of Waiapuka with Laieikawai a rainbow appeared over the place, and was constantly visible so long as the child remained there. Even when the sun was obscured by clouds the rainbow could be seen.

> At length the rainbow was observed by the great prophet Hulumaniani on the distant island of Kauai. For twenty days in succession he saw it, and knew its significance. He secured a canoe and fifteen men from Poloula, the chief of Wailua, provided himself with a black pig, white fowl and red fish for sacrifice, and, when the star Sirius rose, set sail for Oahu.
>
> Reaching that island he landed at Waianae, and, guided by the rainbow, in due time arrived at the pool of Waiapuka.
>
> Waka had just dived into the cave, and he noticed ripples on the water. During the day Waka started to leave the cavern, but caught a glimpse of the prophet sitting on the bank, and quickly returned, again ruffling the water.
>
> The prophet remained by the pool all night, and in the morning saw a rainbow over Kukaniloko. Traveling in that direction, he ascended Mount Kaala, when he saw the rainbow over the island of Molokai. Finding a canoe bound thither, he took passage and landed at Haleolono, near the western shore.
>
> In a dream Waka had been directed by Kapukaihaoa to remove Laieikawai to some securer place, and had accordingly taken her to Malelewaa, a secluded spot on the north side of Molokai (Kalākaua 1990:457-458).

Another mythical tale attributed to Mālaekahana Ahupuaʻa concerns Laniloa, which the name given to a point of land that extends *makai* from Lāʻie. According to Rice (1923) this legend, referred to as *Laniloa, The Moʻo*, this point was said to have been a *moʻo*, or a standing lizard in this case. Rice (1923) holds that this *moʻo* was ready at any time to kill passersby. In Rice's version of the legend, he states:

> After Kana and his brother had rescued their mother from Molokai and had taken her back to Hawaii, Kana set out on a journey around the islands to kill all the mo-o. In due time he reached Laie, where the mo-o was killing many people. Kana had no difficulty in destroying this monster. Taking its head, he cut it into five pieces and threw them into the sea, where they can be seen today as the five small islands lying off Malae-kahana: Malualai, Keauakaluapaaa, Pulemoku, Mokuaaniwa and Kihewamoku.
>
> At the spot where Kana severed the head of the mo-o is a deep hole which even to this day has never been fathomed (Rice 1923:112).

One might speculate that this "deep hole" is the legendary site, Waiʻāpuka (Site No. -275).

3.2 EUROPEAN CONTACT

At European Contact and shortly thereafter, the general Kahuku area was commented on by several maritime officials, with observations that point to a drastic change in land use from initial contact in the mid-1780s to the mid-1830s.

Approximately two weeks after the death of British Captain James Cook, Charles Clerke took over the helm of the H.M.S. Resolution. As the ship rounded the northern point of Oʻahu,

Captain Clerke provided the first post-Contact account of the Kahuku area. Clerke wrote on February 28, 1779:

> SUNDAY 28th. . . Winds Eterly [Easterly]. fresh breezes with open Cloudy Weather. Run round the Noern [Northern] Extreme of the Isle which terminates in a low Point rather projecting; off it lay a ledge of rocks extending a full Mile into the Sea, many of them above the surface of the Water; the Country in this neighborhood is exceedingly fine and fertile; here is a large Village, in the midst of it is run up a high Pyramid doubtlessly part of a Morai. I stood into a Bay just to the Westward of this point the Eastern Shore of which was far the most beautifull [sic] Country we have yet seen among these Isles, here was a fine expanse of Low Land bounteously cloath'd with Verdure, on which were situated many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sandy Beach. . . (Beaglehole 1967:I:572 in Silva 1984:C-10).

This description paints a pleasant picture of the Kahuku area, with a thriving community and large ceremonial structures. At about the same period, H.M.S. Resolution Lieutenant, James King, described this northern tip of Oʻahu, writing:

> WOAʻHOO. . . We saw this Island the beginning of last year, but only just as a high lump, We this Time sailed along its NE & NW sides but say nothing of its Soern [Southern] part. What we did see of this Island was by far the most beautiful country of any in the Groupe; particularly the Neck that Stretches to the No ward [Northward] and its NW side. Nothing could exceed the verdure of the hills, nor the Variety which the face of the Country displayʻd. It /s north-eastern/ parts were cliffy, & rugg'd to the Sea side, but the Valley look'd exceedingly pleasant, near the
>
> N point we were charmed with the narrow border full of Villages, & and Moderate hills that rose behind them (Beaglehole 1967:I:610 in Silva 1984:C-10-11).

This is yet another testimony to the beauty and lushness North Shore during the early Contact period. In contrast, Captain George Vancouver visited the northern tip of Oʻahu later in 1794, discovering that the Kahuku coast had significantly changed in terms of cultivation and population, writing:

> …In every other respect our examination confirmed the remark of Capt. King excepting that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to be so numerously inhabited, as he represented it to have been at that time, occasioned most probably by the constant hostilities that had existed since that period (Vancouver 1798, Vol.3:71).

Wong-Smith (1989) suggests that regular hostilities and the scourge of Western diseases caused the severe decline of the Hawaiian population in Kahuku. It was likely Captain Cook's 1778 expedition that brought venereal disease to Hawaiʻi and spread rapidly between the initial and secondary contact events (Kuykendall 1938; Beaglehole 1967; Lind 1968; Schmitt 1968, 1971). By the time the first missionaries conducted a census of the islands in the early 1820s, they estimated that the entire population had been reduced by nearly a third (Schmitt 1968:10 in

Wong-Smith 1989:A-10). This population crash created a wasteland out of the once verdant fields and lively villages of Kahuku.

3.3 HISTORIC ERA

The focus of this section will remain on events that greatly shaped the modern character of Kahuku, Keana, and Mālaekahana Ahupuaʻa as well as any occurrences that help paint a picture of what Hawaiian cultural practices were like during this period.

3.3.1 Western Observations

Many accounts of the Kahuku, Keana, and Mālaekahana area's early historic era were provided by missionaries. According to missionary censuses from the 1830s suggests that the area had severe declines during this time (Schmitt 1968). Koʻolau Loa's population in 1831 was 2,891. with 452 living in Lāʻie. Wong-Smith (1989:A-10) notes that "a population loss of 210 for the entire district occurred between 1831 and 1835." This population decline affected the extent of traditional agriculture in the area. In the early 1830s, E.O. Hall, of the American Board of Missions, stated in regards to Koʻolau Loa, "Much taro land now lies waste, because the diminished population of the district does not require its cultivation" (as cited in McAllister 1933: 153). The greatest factor in the tragic population decline during this period was the introduction of Western diseases, followed by warfare (Kuykendal 1938; Nakamura 1981; Wong-Smith 1989).

The Superintendent of Secular Affaires for the Mission in Hawaiʻi, Levi Chamberlain, gave an 1828 account of Mālaekahana during his second circuit of Oʻahu, where he evaluated the effectiveness of the island's education system, provides insight on the fecundity of lands in this area. Chamberlain states:

> Tuesday Feb. 5th. After breakfast I examined two schools, belonging to Laie & Malaekahana, and was pleased with the appearance of the scholars. At a quarter before 11 A.M. we set out for Kahuku, and after travelling about two hours over a level sandy country, arrived at the school house, where we found 83 scholars assembled, waiting to be examined … A good hog had been cooked for us & when the examination closed, dinner was waiting … my attendants made a heartly meal; and the remainder of the food was placed in the calabashes of our natives, and carried along to furnish food for us when we should be again in need (Chaimberlain 1957:35-6).

Another account of Koʻolau Loa and the project area vicinity from the late 1800s was provided by John Effinger, in an article titled, "A Tramp Around Oahu," for *Paradise of the Pacific* magazine, where he states:

> The sun had scarcely got its eyes open when I had pushed on several miles further along the grassy plain and shore through Kualoa ranch, past the ruins of the old Wilder mill, looking like an antiquated English castle, and past the Punaluu rice patches. The chimney of Kahuku mill was my guiding star this morning, and the miles seem to fly along so green is the verdure around us and so fresh the strong salt air. Sentinel cliffs, sheltering pleasant valleys where are

> many of the summer residences of Honolulu's "400" shoot into the sky on the left. Chief Justice Judd Hon. P.C. Jones, and Cecil Brown, Esq. have country places along here, and when the Oahu Railway is completed, there will be an exodus from Honolulu every Saturday afternoon for a Sunday's vacation to this favored spot. The air is cool and bracing. Mosquitoes are hardly a nuisance. From Kualoa to Laie is the prettiest, healthiest part of the island of Oahu. About noon I reached Laie, a Mormon settlement, with a small cane plantation and mill. The plantation railway runs down into Laie from Kahuku plantation and all the cane is ground at the big Kahuku mill. Laie Point shoots out into the blue ocean here and the surf banging up against it throws spray high in the air. It was a few hours after noon when Kahuku mill was reached, and I took a few moments rest before pushing out for Waialua. The Kahuku stock ranch takes up all the land of this district not occupied by cane (Effinger 1895:88).

One account, which was recorded by King Kalākaua in the late 1800s, provides a very detailed description of a significant landmark of Mālaekahana, Waiʻāpuka (Site No. -275). He reiterated the experiences of a group of travelers touring the area in 1885, as follows:

> Entering the district of Koolouloa, and approaching the coast over a broad stretch of grassy meadow but slightly above the level of the ocean, our party was suddenly brought to a halt beside a pool of clear water, nearly round, and perhaps a hundred feet in diameter. The surface of the pool was ten or twelve feet below the level of the surrounding plain, and its even banks of solid rock dropped almost perpendicularly into water of unknown depth. The volume of the pool is affected neither by rain nor drought, and the native belief is that it is fed by springs at the bottom, and has a subterranean drainage to the ocean, some two or three miles distant.
>
> This, we learned, was the celebrated pond of Waiapuka, around which so many strange legends have been woven. All of them speak of a cavern somewhere beyond the walls of the pool, and to be reached only by diving into the water and finding the narrow passage leading up into it.
>
> While listening to fragments of the story of Laieikawai and of other legends connected with the mysterious cavern, and seriously doubting the existence of the secret chamber so prominently referred to in early folk-lore of Oahu, an old native, who had joined the party at Kaneohe, quietly and without a word, dismounted, divested himself of his upper garments and plunged into the pool. Swimming to the northern wall, he clung for a moment to a slight projection, and then disappeared. It was suggested for the first time that he was in search of the cavern of Laieikawai, and all eyes were turned toward the point where he was last seen above the water.
>
> Three or four minutes elapsed, and fears for his safety began to be exchanged, when the salutation of "*aloha*!" greeted us from the opposite wall, and the next moment a pair of black eyes were seen glistening through a small opening into the cavern, not before observed, about four feet above the surface of the water.
>
> The swimmer then returned to the pool by the passage through which he had left it, and we were compelled to admit that the cavern of Laieikawai was a reality, however wild and visionary may have been the stories connected with it. Not a single person present, including the governor, had ever before seen the passage

> to the cavern attempted, and the natives were overjoyed at what they had witnessed.
>
> To the many questions with which he was asked the old man returned but brief answers on his return, and when importuned to explain the method of his entrance to the cavern, that the secret might not be lost, he pointed significantly to the sea, and declared that there would be found thee bodies of those who sought to solve the mystery of the passage and failed (Kalākaua 1990:455-456).

This description suggests that Waiʻāpuka was not only massive, being approximately 100-feet in diameter, but also a classic sinkhole in an area known to be *karstic*, which is a geological term for limestone terrain that has been subjected to complex acidic weathering. Typically, *karstic* topography is prone to exhibiting a variety of subterranean and surficial features, including caves, tunnels, caverns, underground rivers and bodies of water, as well as sinkholes and cenotes. Unfortunately, by the time of McAllister's (1933) island-wide survey, the site of this culturally and topographically significant feature was destroyed by being filled with sediment. Whether man or natural forces are responsible for this act has not been ascertained.

Just after the turn-of-the-Century, Andrew Adams of the Territory's Forestry Division, reported on the agricultural and horticultural developments of Koʻolau Loa, stating:

> Mr. Andrew Adams, District Forester for the Koolauloa District, desired that no formal report for him be published but in correspondence he stated that "The Plantation is constantly planting Ironwood trees, which are thriving, but no systematic effort has been made toward forest planting, in fact the little planting that has been done could scarcely be dignified by the term 'forestation.' There are no forest nurseries, except several boxes on the premises of the head luna and my own where Iron wood trees are started from seeds.
>
> The native forest in the mountains is in good condition, and the Koa, of which there is a good belt between Malaekahana and Kaipapau valleys, is vigorous and thriving. The insect usually preying upon the Koa is not so much in evidence in this forest, it appears to me, as formerly, and there are many young Koas springing up; some of this is sizeable timber, but I doubt if it could ever be lumbered without great destruction to the surrounding forest, and especially the undergrowth, because of the almost inaccessible ridges on which the Koa stands (Adams 1905:90-91).

3.3.2 Cultural Practices

Although the spread of Western ideals and lifestyles was rampant at this time, there are several instances of Hawaiian traditional practices taking place in Kahuku. *Hula* and *mele* performances held in Kahuku in 1844 and 1849 were described by Emerson (1998). The first performance, a *hula*, called the Hula O-Niu, which took place in 1844 was described by Emerson (1998) as such:

> The so-called hula *o-niu* is not to be classed with the regular dances of the halau. It was rather a popular sport, in which men and women capered about in an informal dance while the players engaged in a competitive game of top-spinning. The instrument of sport was made from the lower pointed half of an oval coconut shell, or from the corresponding part of a small gourd. The sport was

> conducted in the presence of a mixed gathering of people amid the enthusiasm and boisterous effervescence which betting always greatly stimulated in Hawaii.
>
> The players were divided into two sides of equal number, and each player had before him a plank, slightly hollowed in the center—like the board on which the Hawaiians pounded their poi—to be used as the bed for spinning his top. The naked hand, unaided by whip or string, was used to impart to the rude top a spinning motion and at the same time the necessary projectile force—a balancing of forces that called for nice adjustment, lest the whirling thing reel too far to one side or run wild and fly its smooth bed. Victory was declared and the wager given to the player whose top spun the longest.
>
> The feature that most interests us is the singing, or cantillation, of the oli. In a dance and game of this sort, which the author's informant witnessed at Kahuku, Oahu, in 1844, one contestant on each side, in turn, cantillated an oli during the performance of the game and the dance (Emerson 1998:248).

The later performance, a *mele* about Kāne, recorded by Emerson (1998) took place in 1849 was viewed by King Kamehameha III's during his circuit around the island of Oʻahu. Emerson (1998) wrote:

> The author has already hinted at the form and character of the entertainments with which hula-folk sometimes beguiled their professional interludes. Fortunately the author is able to illustrate by means of song the very form of entertainment they provided for themselves on such an occasion. The following mele, cantillated with an accompaniment of expressive gesture, is one that was actually given at an awa-drinking bout indulged in by hula-folk. The author has an account of its recital at Kahuku, island of Oahu, so late as the year 1849, during a circuit of that island made by King Kamehameha III. This mele is reckoned as belonging to the ordinary repertory of the hula; but to which particular form of the dance it was devoted has not been learned…(Emerson 1998:129-130).

The fact that this performance was part of King Kamehameha III's circuit and recorded with such detail and contemplation by Emerson (1998), suggests that this unnamed *hula hālau* was no ordinary one. It is possible that this Kahuku *halau* has a long, but unrecorded history.

In terms of traditional agricultural practices, Handy (1940; as cited by Barrera 1981) maintain that Kahuku had a few areas that traditional Hawaiian farming methods may have taken place. They state the following about agriculture in Kahuku Ahupuaʻa:

> Inland from the Kahuku ranch house is Kaainapele Spring. Terrace symbols are shown south of the ranch house (U.S.G.S. topographic map, 1917), but Judge Rathburn says that these flats were built by Chinese before 1890 for rice paddies. They were irrigated with artesian water, but the water turned brackish and the paddies were abandoned. They were never used for taro. The 1917 map shows extensive terrace areas in the swampland seaward of the Oahu Railway, stretching l 5 miles south of Kukio Pond. These were originally terraces, were later planted to rice, and are now under sugar cane. According to John Kaleo, there is a small group of terraces, south of this swampland, named Kaukana. North of Kukio Pond was also a small area. It is reported that there were no

terraces up Kahuku Stream or Kaohiaae, its upland branch. Kaleo names 11 localities where terraces were formerly cultivated (as cited in Barrera 1981:13-14).

However, Handy and Handy (1940) stated that there were no terraces in Keana's stream or on the lowland plains. They also hold that, Kaleo, their informant for the area, knew of agricultural terraces in Kaukanalaau Stream.

3.3.3 Land Court Awards

Private land ownership was established in Hawai'i with the Māhele 'Āina, also known as the Great Māhele of 1848. Crown and *ali'i* lands were awarded in 1848 and *kuleana* titles were awarded to the general populace in 1850 (Chinen 1958). Awarded lands in this process are referred to as Land Commission Awards (LCAs). Over time, government lands were sold off to pay government expenses. The purchasers of these lands were awarded Grants or Royal Patent Grants (Chinen 1958). LCA's offer the native and foreign testimonies recorded during the claiming process, which shed light on what the land use of the area was in the early historic period. This information can be used to predict the types of resources may still be present in the project area.

In total, 86 LCAs and one Grant were identified within an approximate two kilometer radius around the Nā Pua Makani Project lands. A list of these properties by *ahupua'a* is provided in Table 1. Figure 4 and Figure 5 show the project area on TMK maps. The LCAs are described in Native Register (NR) comments and Foreign Testimonies (FT) submitted during the Māhele 'Āina and provide a narrative on traditional use of land within each *ahupua'a*.

Table 1. Land Court Awards (LCA) in or Near the Nā Pua Makani Wind Project Area

LCA	Ahupua`a	Claimant	Testimony	Book	TMK Map
2691:1 & 2	Kahuku	Laumea	8 *lo'i*, 2 watercourses (*'auwai*?), *kula* lands and shore area, *wauke* gardens, banana plantation (a mountain land), 3 *koa* trees, 2 *hala* trees, 1 *kukui* tree, houselot	NR v. 3, 592 FT v. 10, 169	5-6-004
2702:1	Kahuku	Waiaulaa	*Kula* lands planted with melons, spring, houselot with wooden fence	NR v.3, 598 FT v.10, 188	5-6-002
2704	Kahuku	Haui	1 *wiliwili* tree	-	-
2723:3	Kahuku	Puu	6 *lo'i*, *kula* land, houselot	NR v. 3, 607 FT v. 10, 166	5-6-002
2729:1	Kahuku	Polena	2 *'awa* gardens, 1 breadfruit garden, 1 *'ōhi'a* garden	-	5-6-004
2732	Kahuku	Pukawale	2 *wauke* gardens, 2 *koa* canoe trees	-	-
2785	Kahuku	Makakiekie	1 'awa, 5 *koa* canoe trees	-	-
2787	Kahuku	Makaokalai	1 *mala* of *'awa*	-	5-6-004
2880:1	Kahuku	Kupau	2 *mala noni*, 2 *mala* of *wauke*, 2 *koa* canoe trees	-	5-6-004
2872:1 & 2	Kahuku	Kaihikapu	18 *lo'i kalo*, *kula* lands, salt land, shore land, mountain land, *mala* of *wauke*, *mala* of sweet potato, houselot	NR v. 3, 672 FT v. 10, 154	5-6-004
2887:1 & 2	Kahuku	Keawe	3 *lo'i*, *kula* land, a *mala* of *'awa*, houselot	NR v. 3, 678 FT v. 10, 171	5-6-002 5-6-004
2916:1 & 2	Kahuku	Kaluau	5 *lo'i kalo*, watercourse (*'auwai*?), *mala* of *wauke*, *mala* of *'olena*, a *kuahiwi*, *kula* lands, houselot	NR v. 3, 692 FT v. 10, 168	5-6-004

LCA	Ahupua`a	Claimant	Testimony	Book	TMK Map
2918:1 & 2	Kahuku	Kawaa	1 *lo'i*, houselot	NR v. 3, 692 FT v.10, 182	5-6-002 5-6-004
3723:1	Kahuku	Male	9 *lo'i*, *kula* lands, houselot	NR v. 4, 156 FT v. 10, 171 NT v. 4, 368	5-6-002
4391:1 & 2	Kahuku and Keana	Kalawaiamanu	3 *'ili weuweu,* 1 *'ili* of sweet potato, 1 *'ili* of *wauke*, 1 *kula*, sugarcane and *wauke*, breadfruit, *noni*, *'awa* and banana, tobacco, houselot	NR v. 4, 292 FT v. 10, 184	5-6-006
4422:2	Kahuku	Kaumualii	10 *lo'i*, *kula* land with *wauke*, sweet potato, *hala*, salt land, a *mala* of *noni*, banana, watermelon, houselot	NR v. 4, 296 FT v. 10, 164	5-6-005
4458:1	Kahuku	Kaihupailani	5 *lo'i kalo*, *kula* lands, *kula* of *wauke*, wooded upland, *koa* tree, *kukui* tree, houselot	NR v. 4, 303 FT v. 10, 203	5-6-004
4558:1	Kahuku	-	Awarded on island of Kaua'i.	-	5-6-004
Grant 550	Kahuku and Keana	C. G. Hopkins	no specifics on land use	-	5-6-006
3712	Keana	Moku	1 houselot	NR v. 4,153 FT v. l0, 175 Not awarded to Moku, but awarded to Kinimaka	-
4392:1	Keana	Kalawaiamanu	no specifics on land use	-	5-5-002
7130	Keana	Kinimaka	As *Konohiki,* awarded entire *ahupua'a*; no specifics on land use	-	5-5-006
4631:3	Mālaekahana & Lā'iewai	Kii	2 *lo'i kalo*, 2 *lo'i*, 1 *kula*, 4 *'ili wauke*, 5 *'ili 'uala*, 1 *'ili* watermelon, 1 wooded upland, *pali 'uala* [sweet potato, cliff plantings], 1 *'apu'apu 'uala*, [sweet potato, pit plantings], 1 watercourse (*'auwai*?)	-	5-5-005
8452	Mālaekahana	A. Keohokalole	Entire *ahupua'a*	-	-

<u>LCA Awards in Kahuku Ahupua'a</u>

While King Kamehameha III, under the name of Victoria Kamamalu, retained the entire *ahupua'a* of Kahuku as part of Crown Lands, the land rights of its tenants amounted to 4,752 acres (Indices 1929:27-8 as cited by Wong-Smith 1989:A-11). According to Rechtman (2009:15), "…eighty-five claims for Land Commission Award (LCAw.) parcels were made within the *ahupua'a* of Kahuku, but only seventy-two *kuleana* lots were awarded to native tenants. Nearly all of awards were located makai of the present day highway…" A total of 18 LCA claims were located within two kilometers of the Nā Pua Makani Project lands.

The following are claims for lands either within or partially within Kahuku Ahupua'a. These claims provide a narrative on traditional use of *kula* and *wao* lands.

<u>No. 2887: Keawe (claimant), Kahuku, Oahu</u>
<u>January 5, 1848</u>

> To the Land Commissioners, Respectful Greetings: I, Keawe, hereby state my claim for land at Kahuku. The name of the *mo'o* is Luahime. There are three *lo'i*, bounded on the north by Kawaa's [land] on the east by Kaluau's [land], on the south by *lo'i ko 'ele*, on the west by Paukoa's [land]. A *mala* of sweet potato is at

Ahamau, and at Keana I have a *mala* of *ʻawa*. My houselot is Kahuku, and is surrounded by *kula*. My right of occupancy is from the time of Kamehameha I. KEAWE x his mark

No. 2729: Polena (claimant), Kahuku, Oahu
January 4, 1848

To the Land Commissioners, respectful greetings: I, Polena, hereby state my claim for land at Kahuku. The name of the *moʻo* is Luahine. There are seventeen *loʻi* bounded on the north by the *kula*, on the east by Kaihikapu's land, on the south by Kaluau's land, on the west by Maui's land. Three are cultivated *kulas* named Uwalapahupahu, Mamakaloa and Luahine. There is a sea shore land, named Puhikaawe. At Keana are two *ʻawa* gardens, and a garden of breadfruit and *ʻōhiʻa*. My houselot is at Kahuku and is bounded on the north east and west by a *kula*, on the south by a salt bed. My right of occupancy is from the time of Kamehameha I. POLENA X his mark

No. 2704: Haui (claimant), Kahuku, Oahu
January 4, 1848

To the Land Commissioners, respectful greeting: I, Haui, hereby state my claim for land at Kahuku. The name of the *moʻo* is Kuapuu; there are six *loʻi* and the watercourse, bounded on the north by a *kula*, on the east by Kekipi's, on the south by Makiloʻo, on the west by Kueulu's. There is a *kula* land, Ahamau, a fish pond named Kuhiwa, and a *loʻi* at Kii. At Keana I have a *wiliwili* tree. My right of occupancy was from the time of Kamehameha I. HAUI X his mark

No. 2732: Pukawale (claimant), Kahuku, Oahu
January 4, 1848

To the Land Commissioners, respectful Greetings: I, Pukawale, hereby state my claim for land at Kahuku, a *moʻo* named Kuha. There are five *loʻi,* bounded on the north by those of Makakiekie, on the east by a *kula*, on the south by Maui's [*loʻi*], on the west by Kupaikia's [*loʻi*]. There is a shore area-the name of the sea [fishery] is Keekee, [and] a mountain area. At Makapala are two *loʻi*, bounded on the north by Umeume's, on the east by Kupau's, on the south by a *kula*, on the west by a *koʻele loʻi*. There is a cultivated *kula* named Makapala, another *kula* is Mauiloa, and there is another valley or [gulch]. At Keana are two *wauke* gardens and two *koa* canoe trees. My houselot is at Kahuku and it is surrounded by *kula*. I have had the right of occupancy since the time of Kamehameha I. PUKAWAKE X his mark

No. 2785: Makakiekie (claimant), Kahuku, Oahu
January 1, 1848

To the Land Commissioners, Respectful Greetings: I, Makakiekie, herby state my claim for land at Kahuku. The name of the *moʻo* is Puulu. There are seven *loʻi*, bounded on the north by those of Keakaokawai, on the east by a *kula,* on the south by Pukawale's [land], on the west by Kupaihea's [land]. One *loʻi* and the watercourse adjoins those of Maui and Kuapuhi and *kula*. There is *kula* land at Kawelohale and Kii, two clusters of *hala* trees. At Ahamau are some gardens of sweet potato and gourd. There is a shore area called Kaohana. In the upland are

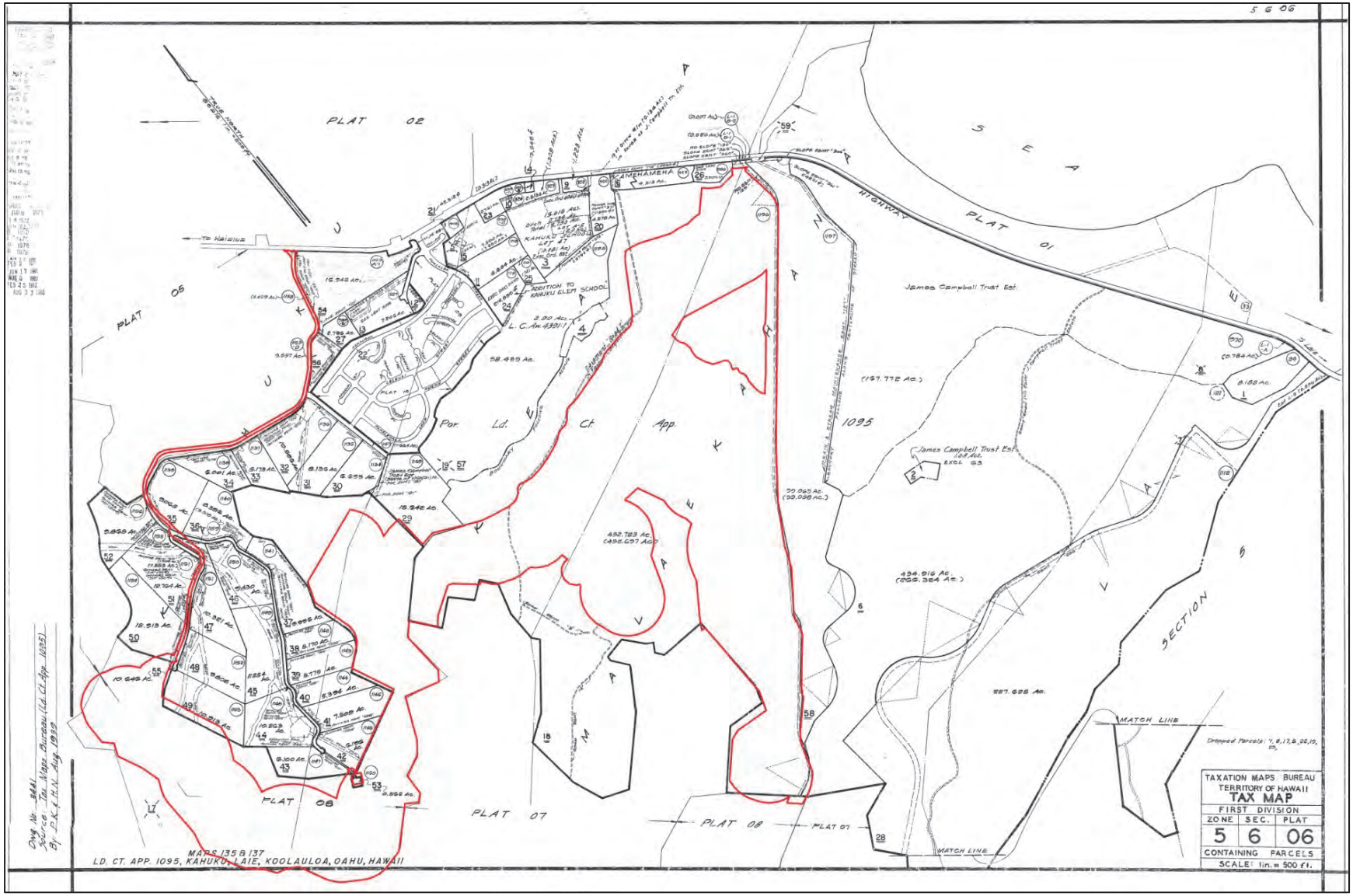

Figure 4. Project area depicted on TMK Map.

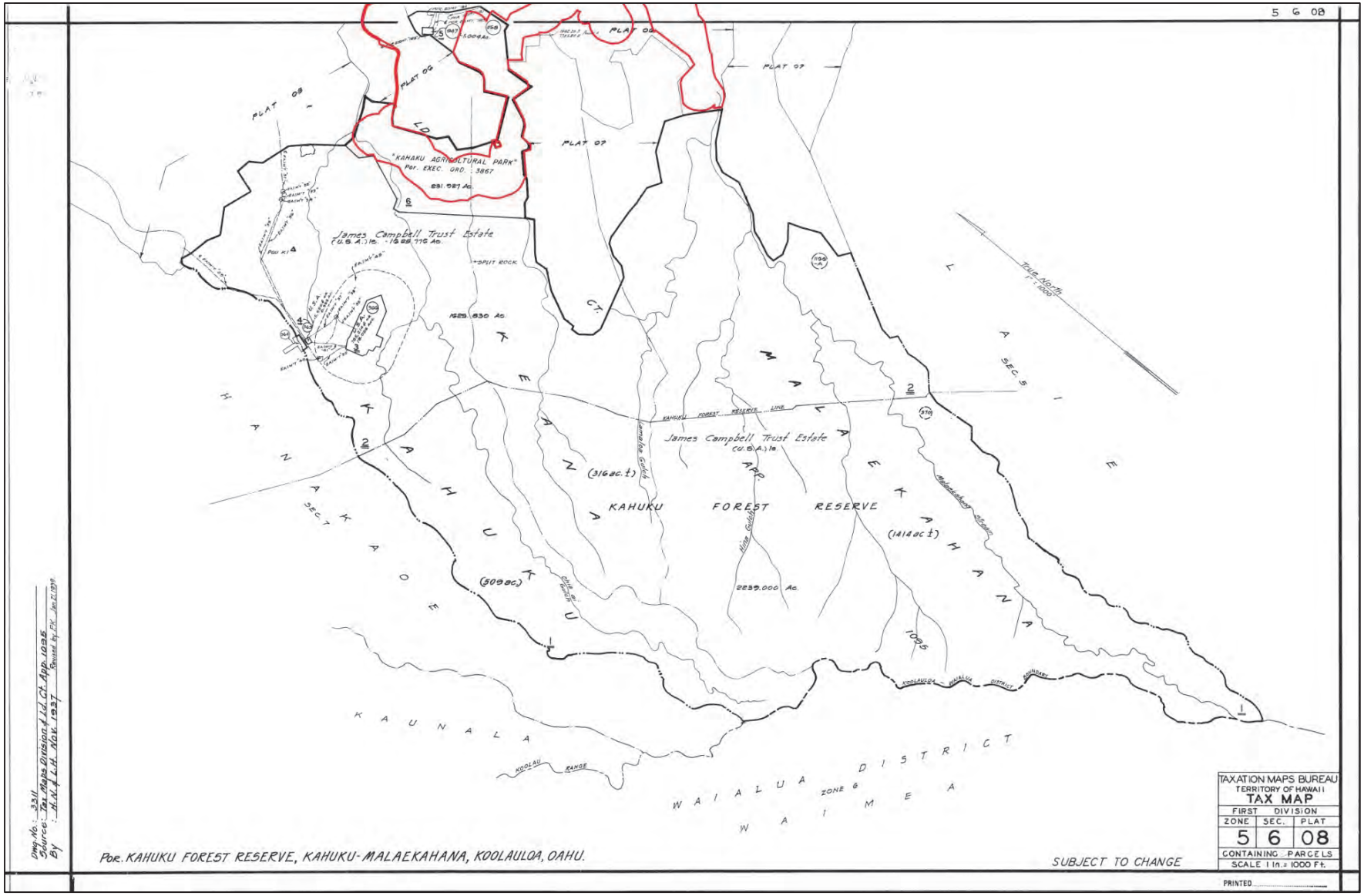

Figure 5. Project area depicted on TMK Map.

> some gardens of *wauke*, ʻ*awa* and *noni*, and seven *koa* canoe trees. In another place is a watercourse adjoining Maui's. At Keana are one ʻ*awa* garden, and five *koa* canoe trees. There is a mountain land, Kalapaweo. My house claim is at Kahuku, bounded on all sides by the *kula*. There is a fish pond for me, close to my house. My right of occupancy is from the time of Kamehameha I. MAKAKIEKIE X his mark

No. 2787: Makaokalai (claimant), Kahuku, Oahu
January 4, 1848

> To the Land Commissioners, Respectful Greetings: I, Makaokalai, hereby state my claim for land at Kahuku. At Luahine is one *loʻi* and two watercourses bounded on the north by Kawaa's [land], on the east by a *loʻi koʻele*, on the south by Keino's [land], on the west by Kawaa's (land]. There is also another *loʻi*, adjoining that at Akaihupiilani. There is a fishpond named Kumuhakane. There is also another area, Hanumoha. There are two gardens of sweet potato and *wauke*. There are two ʻ*awa* gardens. There are four *koa* canoe trees. At Keana are two ʻ*awa* garden and three *koa* trees. My houselot is at Kahuku bounded on all sides by the *kula*. My right of occupancy is from the time of Kamehameha. MAKAOKALAI X his mark

LCA Awards in Keana Ahupuaʻa

A total of ten LCA claims were recorded for Keana Ahupuaʻa, either totally within or partially within the *ahupuaʻa*. Of these claims, two LCA were awarded. The *ahupuaʻa konohiki* (overseer), Kinimaka was closely affiliated with Kamehameha III, which may have helped secure his claim to the entire *ahupuaʻa*. According to O'Hare et al. 2008, "He was a *makua hanai* (adopted parent) to David Kalākaua, sixth king of Hawaiʻi. Kinimaka retained one-half of the *ahupuaʻa*, giving back the other half to pay his commutation fees for the properties that he retained. This second half became part of the government lands" (O'Hare et al. 2008:19).

Environmental conditions would partly explain for the dearth of claims for this *ahupuaʻa*, as these lands were not suited for most traditional methods of farming. While the coastal areas of Keana appeared to be largely brackish water swamp and/or sand with outcrops of limestone, the uplands were relatively dry and rocky - not suitable for terrace farming. This was expressed by the sentiments of Kaleo, E. C. Handy's trusted informant, as they recorded traditional land use on Oʻahu in the 1940s. He maintained that he knew of no agricultural terraces up the stream, nor of any on the plains of Keana (Handy 1940). This was later upheld in Handy and Handy (1991:462), who stated the following about Mālaekahana and Keana:

> These two small ahupuaʻa intervening between Laʻie and Kahuku (the northernmost tip of Oahu) show much the same pattern, in miniature, of dune coasts, elevated coral, and broken level land seaward from the hills. Each has a small stream. There were formerly some irrigated terraces in Malaekahana (Wayclear-for-work), but not in Keana (The-cave) (as cited by O'Hare et al. 2008:19).

A total of four LCA claims were located within two kilometers of the Nā Pua Makani Project lands. The following are claims for lands either within or partially within Keana Ahupuaʻa. These claims provide a narrative on traditional use of Keana's *kula* and *wao* lands.

No. 4329B: Kuapuhi (claimant), Keana, Oʻahu
January 1, 1847
N.R. 277v4 [Listed as 4392]

To the Land Commissioners, Greetings: I, Kuapuhi, am a claimant at Konikaa, of three ʻ*ili* of sweet potatoes, bounded on the north and south by pali, on the east by Kahulihana; on the west by Maii; My house and the kula are in my *moʻo*. My right of occupancy is from the time of Kamehameha I.
KUAPUHI X, his mark

F.T. 185vl0
No. 4392: Kuapuhi [should be 4329B]

Kalawaiamanu, sworn says he knows the land of Kuapuhi in Keana. It consists of a piece of cultivated *kula* land, planted with potatoes. This piece may contain a quarter of an acre and is bounded:

On Hauula side by a *pali*
Mauka and Waialua side[s] by the *konohiki*
Makai by Kalawaiamanu's land.

Claimant's house lot is *makai* of his land and is enclosed with a stone wall. He has held the land for over 20 years. The konohiki consented to the claim for the piece of *kula* and house site.

[Award 4329B; R.P. 6247; Keana Koolauloa; 2 ap.; .71 Ac.; Award 4392 contains the documents for this award]

No. 4391: Kalawaiamanu (claimant), Keana, Oahu
January 3, 1848

To the Land Commissioners, Greetings: I, Kalawaiamanu, am a claimant in the ʻ*ili* in Louana. There are three ʻ*ili weuweu*, one ʻ*ili* of sweet potato, one ʻ*ili* of *wauke*, bounded on the north by the *kula*, on the east and west by sugarcane, on the south by the *pali*. Here are the jump lands: At Halulu is sugarcane, *wauke*. At Kahalau is breadfruit and *noni*. At Keaaulu is a breadfruit, and *noni*. At Kapuou is *noni*. At Kealahaka is ʻ*awa*, sugar cane, and banana. At Paos is ʻ*awa*. At Uumhalu is a *kula* planted in sweet potato and watermelon. My house is at Nonoula. My right of occupancy is from the time of Kameharneha II.
KALAWAIMANU

No. 3712: Moku (claimant), Keana, Oahu
January 10, 1848
N.R. 153v4

To the Land Commissioners, Greetings and Peace: I, Moku, hereby state my chum for land at Keana. One *mala* is at Paeloa. One *mala* is at Aahupalua. At Malekahana I have one *mala*. At Kawaiu is one *mala*. At Makanikeoloi, an upland, is a *mala* of ʻ*awa* and *wauke*. One *mala* is at Paaulani. One *mala* is at Aewai. At Laie I have a portion of a *loʻi* adjoining Kahalelaau's. At Kahuku I have one *loʻi* at Mookini, adjoining Kiha's *loʻis* [sic]. A watercourse is at Luahine. My house claim is at Keana, surrounded by my *kula*. My right of occupancy was from Kamehameha III. MOKU

F.T. 175vl0
Claim 3712: Moku

> Kiha, sworn, says Moku left this part of the country some 5 months ago and went to live on Hawaii. Witness knows the *kalo* patch claimed by Moku in Kahuku. It is not planted.
>
> (It was stated by several present that Moku had given up the pieces of land in this Claim, and no one appeared to represent him).
>
> The Konohiki claims this land.

[No. 3712 not awarded]

<u>LCA Awards in Mālaekahana Ahupuaʻa (in the Vicinity of Nā Pua Makani Project Area)</u>
A total of 21 land claims were made for the *ahupuaʻa* of Mālaekahana, yet only six were awarded with one award being the entire *ahupuaʻa*. The LCA claims suggest that traditional agricultural practices occurred in Mālaekahana, but was limited to dryland cultivation as well as gathering of plant resources, while wetland agricultures was practicing in adjacent Lāʻie (Hammatt 1996). Land use as indicated in Mālaekahana LCA claims is described by Hammatt (1996) as follows:

> In 1850 the *ahupuaʻa* of Mālaekahana (3280 Acres) is claimed by A. Keohokalole, mother of King Kalākaua, Queen Liliuʻokalani, Miriam Likelike Cleghorn and Wm. Pitt Leleiohoku (II) and is awarded to her in 1854. Of 21 claims for land parcels (*apana*) in Mālaekahana only four *kuleana* claims are awarded. There are no claims for *loʻi* in Mālaekahana. The claims often state that the area jumps around and goes from sea to mountain and therefore boundaries can't be given. The claims for Mālaekahana mention 15 *kula*, 6 *mala* ,and 1 *moʻo* with no crop given, 12 *wauke* patches, 7 house sites, 6 banana patches, 3 potato patches, 5 koa trees for canoe making, and 1 *mala* each for *hala, noni*, *ti*, *hau,* breadfruit and tobacco. Two mountain areas are also claimed. Two house sites, 1 banana and potato land, and 1 *wauke* land are awarded. However, no present maps show where these awards were located. The old Mālaekahana maps at the State Survey office are missing (as reported by the survey office to Dr. V. Creed on 2/2/96). Tax maps do not show the location of these few awards (Hammatt 1996:4-5).

After exhausting all available historic maps for Mālaekahana during this documentary research, no maps were found depicting the Mālaekahana LCA locations. Other than the entire *ahupuaʻa* (awarded to Ane Keohokalole), only one LCA claim, partially in both the Mālaekahana and Lāʻiewai Ahupuaʻa, was located within two kilometers of the Nā Pua Makani Project lands.

The succeeding sample of Mālaekahana and Lāʻiewai LCA claims provide insights on the area's traditional land use.

<u>No. 8537: Kahawaii (claimant deceased), Mālaekahana, Oahu</u>

> LCA 8537 AWARDEE Kahawaii (Deceased) – Kuhapa, sworn, says he knows the land claimed by Kahawaii in Malaekahana. Part of it is planted in wauke. This part is bounded on all sides by the Konohiki's lands. The house site of claimant is not enclosed. Claimant held land from his youth. He died last April (1840). His

wife is his heir. Paakahi, sworn, says he knows of 3 kalo patches claimed by Kahawaii in Laie. The Konohiki took this land away because claimant did not got he [sic] poalima. The konohiki of Malaekahana consented to this claim.

No. 7727: Paukoa (claimant deceased), Mālaekahana, Oahu

LCA 7727 AWARDEE Paukoa (Deceased) – Kuhapa, sworn, …in Malaekahana. Part of it has been given up to the Konohiki by claimant's widow. The portion retained by her is planted with wauke. It is bounded on the Hauula side by Kahoowaha's land, Mauka by Kuhapa's land, Waialua side by Kananui's land, makai by Nawai's land. Paukoa died in the present year.

No. 8355: Kakau (claimant), Mālaekahana, Oahu

LCA 8355 AWARDEE Kakau - …is not presently cultivated. Part of it was planted last year with bananas, wauke (about half an acre). Claimant occupied these lands since the time of Kamehameha I…

No. 3861: 2&3: Pulehu (claimant), Lāʻie, Oahu
January 5, 1848

To the Land Commissioners, Greetings: I hereby state the claim for my land. Kahikiea is the *moʻo*. There are five taro *loʻi* at Kahikiea. One *loʻi* is at Kaholo, one *loʻi* is at Paakea. One *ʻili weawea* [grass or herbage], one *moʻo* is at Malaekahana. One *ʻili* of sweet potatoes is at Omao. The right of my *makuas* was from Liholiho.

Foreign Testimony V. 11:263
No. 386l Pulehu

Kauaikaua, sworn says, he knows the land claimed by Pulehu in Laie. It consists of 6 *kalo* patches, a piece of *kula* land and a House site. The 6 patches are bounded on Hauula side by Kahalelaau's land, Mauka and Waialua side by the Konohiki, Makai by Kii's land. The *kula* land is planted with *wauke* - contains about half an acre - surrounded by the Konohiki. The house site is not enclosed, there is one house on it. Claimant has held the land for 30 years. The Konohiki''s agent consented to this claim.

No. 4003:3: Hano (claimant), Lāʻie, Oahu
January 5, 1848

Native Register V. 4:208
January 5, 1848

To the Land Commissioners, Greetings: I, Hano am a claimant of land at Laie. In the *ʻili* of Paoo are three *loʻi*, one *kula*, one *kai* /fishery/ one mountain area. The boundaries are: on the north, *muliwai* land of Poouahi, on the east, land of Kaaipuaa, on the south, land of Kauwaiawa, on the west, land of Palii. Here are the scattered claims: In the *ʻili* or the *ahupuaʻa*, six *loʻi*, ten *kula*. Seaward of the mountain, one house lot. In the *ʻili* of Kapuna, one *loʻi*, two *kula*. Because these claims are so very scattered, therefore it is noc practical to describe their boundaries lo you, the Land Commissioners. My right of occupancy at these places is from the time of Kamehameha 1 until the reign of Kamehameha III at this time.

Foreign Testimony V. 11:277
No. 4003 Hano

> Kauaiamanu, sworn says, he knows the land-claimed by Hano in Laie. It consists of 3 *kalo* patches, a piece of *kula* land, and a House lot. The 3 patches are bounded on Hauula side by Maii's land, Mauka by Hoanauli's land,- Waialua side by Kaluaiaawa's land. - Makai by Kauaiamanu's land. The *kula* land is planted with tobacco & bananas. It is bounded on Hauula side by Kauaiamanu's land, - Mauka by Napahu's land, -Waialua and Makai by the Konohiki. The houselot is in another place. It is not enclosed. Claimant has held the land for 9 years. The konohiki's agent had no other objection to the claim ....

No. 4343:2: Kauaiomono (claimant), Lāʻie, Oahu
January 3, 1848

Native Register V. 4:267
January 3, 1848

> To the Land Commissioners, Greetings: I, Kauaiomano, am a claimant at Laie for four *loʻi* and one *kula*. The boundaries are: north, the land of Pupukea, east, Kalakee's /land/, south, the land of Napaeko, west, the land of Hano. The scattered *loʻis* and *kulas* are as follows: Kalawa, one *loʻi*, no *kula*. Kapaakea, four *loʻi*, three *kula*. Kaholi, no *loʻi*, no *kula*. Kahikiea no *loʻi*, two *kula*. Kumupali, no *loʻi*, one *kula*. My right of occupancy is from my *kupunas* until the present.

Foreign Testimony V. 11:298
No. 4343 Kauaiomano

> Kauaikaua, sworn says, he knows-the land of claimant in Laie. It consists of 12 *kalo* patches, 7 of which are planted, a piece of *kula* land and a house site. 5 of the patches have not been planted for two years. The 7 *kalo* patches which are planted are bounded on Hauula side by Kaleoʻs land, -Mauka by Elemakule's land, ·Waialua side by the Konohiki, -Makai by Kamamai's land. The *kula* land is bounded on Hauula side by Pulehu's land, - Mauka by Kaleo's land, Waialua side by the land of Malaekahana, - Makai by Kamamai's land. It is planted with *wauke*. The house site is separate- not enclosed. Claimant derived the land from his ancestors. The Konohiki's agent had no other objection to this claim ...

No. 4361:3: Kii (claimant), Lāʻie, Oahu
January 3, 1848

Native Register V. 4:271 Laie wai, Oahu
January 3, 1848

> To the Land Commissioners, Greetings: I, Kii.am 1 claimant of land in the *ʻili* of Kahikea. There are two taro *loʻi*, a *kula* and a wooded upland named Omao. The boundaries are: north, Napilipili, east, Kaiwikkole, west, a stream, south, Kapaakea. Here are the scattered claims: At Puhahaka is one *ʻili* of *wauke*. At Namahana, is one *ʻili* of *wauke* and a *pali uala*; [steep planting of sweet potatoes]. At Keanahale is one *ʻili* of *wauke* and an *apuapuʻuala*. At Noholua are two *loʻi* and a watercourse. At Paakea is one *ʻili* of *wauke*, two *ʻili* of sweet potato, and, *ʻili* of watermelon. At Malaekahana is one *ʻili* of sweet potato. Malaekahana is a

> separate *ahupuaʻa*. Also, my house is at Paakea. My occupancy has been from the reign of Kamehameha 3 [sic]

Foreign Testimony V. 11:300
No. 4361 Kii

> Kupehia, sworn says, he knows the land claimed by Kii in Laie. It consists of 2 *kalo* patches, a piece of *kula* land and a house site. The 3 patches are bounded on Hauula side by Kahalelaau's land, - Maauka by Pulehua's, - Waialua side by the Konohiki, - Makai by Mahoe's land. The *kula* land is bounded on Hauula side by Kauaiomano's, - Mauka and Makai by the *konohiki*, - Waialua side by Kauikaua's land. The house site is distinct from the land – not enclosed. Claimant has held his land for over ten years. The land claimed in Malaekahana is *nahelehele*. The agent of the Konohiki of Laie had no objections to this claim.

3.3.4 Historic Agriculture, Religion, Developments, and Military Land Use

<u>The Kahuku Ranch</u>
According to Rechtman (2009), prior to Campbell's ownership, Charles Gordon Hopkins obtained the *ahupuaʻa* of Kahuku in 1851 the as part of Grant No. 550 and founded a ranch at Kahuku.

The result of these developments were not all positive, as suggested by Emerson (1928), where he writes that the tyranny of the new land owners had caused the Native population of Kahuku to suffer, on which he elaborates:

> Kahuku had passed from control of its chief to that of an Englishman. The pastures of his big ranch extended along the shore for 12 miles, reaching inland to the mountain chain, and he was so autocratic that the natives could not own a dog, or pasture a cow or horse, without his consent. The depredations of herds and flocks on their small homesteads became unbearable, but they appealed in vain for their beloved *hala* trees and patches of vegetables. . . There was no redress, however, and with the fading of the forests the people also disappeared and the once populous district of Kahuku became a lonely sheep and cattle ranch (Emerson 1928:135-136 as cited in Rechtman 2009).

The 25,000 acre property in Kahuku that would become Kahuku Ranch had passed through a series of hands before it was purchased by James Campbell for $63,500 cash in the mid-1870s. Campbell then stocked this ranch with 3,000 head of cattle as well as a number of sheep and horses he hoped would reach 30,000 (Silva 1984:C-16).

<u>The Kahuku Plantation</u>
By the late 1890s, Campbell had leased a large portion of his ranch lands to James B. Castle, which would become the Kahuku Plantation. The plantation proved to be innovative both socially and economically. In the early 1900s, the Hawaiian Sugar Planters' Association became a recognized organization that aimed to improve general working and living conditions of plantation workers. Kahuku Plantation became a pioneer in the movement, providing a day-care center for the working mothers beginning in 1905 (Thrum 1921:116). The plantation had also developed a new fuel-saving device that burnt waste molasses, creating an ash that was

then used as a high grade fertilizer (ibid.). By the mid-1930s, the plantation was cultivating nearly 4,500 acres and had 1,137 people under its employ (O'Hare and Hammatt 2006:21). With its heyday long over, the Kahuku Plantation shut its doors in 1971, causing the greater Kahuku area to experience economic instability for years.

During the plantation's operation, water was an extremely valued resource in the Kahuku and Keana area. Prior to the plantation, traditional agricultural methods relied on seasonal rains, the area's few springs, and intermittent streams. Thus, the plantation began pumping spring water, stream water, and rain to irrigate the sugarcane, but "…these sources were found to be insufficient. Thereafter, the company resorted to artesian wells, which came to be the main source of water" (Kuykendall 1967:69).

Religion and Religious Developments in Kahuku, Keana, and Mālaekahana Ahupuaʻa

Western religions in Kahuku during the late 1800s were jostling to gain the loyalty of the community. In the 1878 *Annual Report of the Hawaiian Evangelical Association*, Kahuku Church, which eventually merged with Hauʻula Church, was one of the last Hawaiian speaking Evangelical churches on the island (Hawaiian Evangelical Association 1878:2). This church is later described in this report as "one of the feeble churches," to the point that, "its pastor has been called to Waianae, and installed over that church…It would be well for this church to unite with some stronger one…" (Hawaiian Evangelical Association 1878:10).

The Church of Jesus Christ of Latter Day Saints gained the majority of Lāʻie and Mālaekahana's faith in as early as 1850, when Mormon missionaries initially settled in the area. According to Ahlo and Hommon (1981), the Mormon Church purchased approximately 6,000 acres in the area for farming. Of these lands, approximately 1,500 acres of which were ideal for agriculture. Crops that were initially cultivated on these lands, but by the end of the 19th century pineapple and sugar cane dominated. This is upheld in Vogeler et al. (2011), who largely cite Britsch (1989), holding that Brigham Young sent the first eight Mormon missionaries to the Hawaiian Islands in 1850. This initial mission yielded a significant religious, economic, and infrastructural foothold for the Mormon Church, as is evident in Voegler et al. (2011):

> They arrived on December 12 in Honolulu, and then split up, traveling in groups of two or three to the other islands. Their original mission to convert the mainly foreign-born (*haole*) population proved to be difficult. The missionaries were discouraged and discussed returning home, but they instead decided to stay, to learn the Hawaiian language, and to preach to the native Hawaiians...The number of Hawaiian converts quickly grew, and in 1853, they decided to buy land on Lānaʻi to start a colony, where all the brethren could live and work.
>
> The Lānaʻi colony was not a success, for a wide variety of reasons, and in 1864, the mission decided to found a new gathering place. In 1864, two Latter-day Saints Mission presidents, Francis A. Hammond and George Nebecker, traveled to Hawaiʻi to purchase land for a new Mormon settlement. Land was fairly cheap at this time in Hawaiʻi as the end of the Civil War in the U.S. had led to a depression in the sugar market, leading to an eagerness to sell land by sugar planters… In 1865, Hammond purchased a six-thousand acre plantation called "Lāʻie" from Thomas T. Dougherty. By 1865, the Church had 6,000 acres,

> probably all the land in Lāʻiemaloʻo and a portion of the land in Lāʻiewai (minus the 298.5 acres owned by the Kahuku Ranch and Kahuku Sugar Company).
>
> On this land was 600 head of cattle, 500 sheep, 250 goats, 20 horses, a large frame house, five native houses, and five acres of cotton…The first order of business for the new owners was to establish a cash crop that would sustain the settlement. Although corn and cotton were grown for the first two years, it soon became evident that sugar would be the salvation of the growing community. A mill was purchased and set up in Lāʻie in 1868...The problem of insufficient water in some years was solved in the early 1880s, when a flume was built to bring water down from the Koʻolau Mountains. A new, more efficient mill was built in 1879…
>
> By 1866, about two hundred Hawaiians, mostly members of the Church, were living at the Lāʻie mission settlement…Growth of the community was slow through the 1870s, due to most Hawaiians wishing to stay near their own homes. In 1874, only about 377 members lived near the mission... However, church membership as a whole did increase during this time; in 1865, the island-wide membership of the Hawaiian mission was recorded as 500; by 1906, it was 7,212 strong… (Voegler et al. 2011:41-42).

In 1920, the Mormon Temple was erected in Lāʻie, with a price tag of $250,000, which was intended to resemble a tabernacle in Salt Lake (Elder 1922:194).

<u>Transportation in Kahuku, Keana, and Mālaekahana Ahupuaʻa</u>

The entire northern portion of Oʻahu was greatly isolated from the Western urban sprawl of Honolulu until paved roadways and rail were implemented. While this area remained "country," the new transportation infrastructure forever changed the landscape Kahuku, Keana, and Mālaekahana Ahupuaʻa. According to Kuykendall (1953),

> On Oahu, what came to be called the "round-the-island road" --ancestor of Kamehameha Highway--extended from Honolulu to Ewa, thence across the central plateau to Waialua; from that place it ran along the coast past Kahuku and Kualoa to Kaneohe, where it joined the road which came over the Nuuanu pali from Honolulu. In 1856, for the first time, a four-wheeled carriage drawn by a pair of horses was driven over the portion of this road between Honolulu and Kahuku. Three years later, a Captain Coffin is reported to have driven with a carriage and span of horses from Honolulu to Kahuku one day in ten hours and to have returned the following day in eight hours (Kuykendall 1953:25).

In the late 1800s, the Oʻahu Railway and Land Co. ran a line up to Kahuku from Honolulu via the Pali – with the terminus of the line running from Waiʻanae (Honolulu Star-Bulletin 1941:155). This line was lauded for opening up new economic opportunities to windward districts of Oʻahu (ibid.:158). Wong-Smith (1989) summarizes this as follows:

> For its first nine years Kahuku Plantation Co. relied on little coastal vessels which anchored offshore from Kahuku Landing to bring supplies and return raw sugar to Honolulu. Five miles of 36-inch gauge railway, some of it portable, had been laid in 1890 to haul the cane through the plantation fields to the Kahuku mill and thence to the landing. The plantation track extended south opposite Laie and the Mormon settlement, which sent its cane to be ground at Kahuku… In 1899. the Oahu Railway finally laid track to a terminal at Kahuku. It hauled sugar and the

> agricultural freight products back and forth across the windward part of Oahu. The Koolau Railway Co. laid tracks from Kahana to Kahuku and served as a common carrier until 1931. From then until the 1950s, its sole function was to carry cane from the northeastern field of the island (Wong-Smith 1989:A-15-16).

Military Presence in Kahuku, Keana, and Mālaekahana Ahupuaʻa

Prior to the construction of any U.S. military bases in Hawaiʻi, the American Marconi Company set up a wireless operation in Hawaiʻi in 1902, building their transpacific receiving station at Kahuku in 1915. This site is located less than 3 kilometers north of the Nā Pua Makani Wind Project area.

According to O'Hare et al. (2008), Kahuku Golf Course, which is less than one kilometer east of the project area, also played a part in World War II, stating:

> It was during the attack on Pearl Harbor on December 7, 1941 that the Kahuku Golf Course was first used as an emergency landing field. On December 6, twelve B-17s had left California on route to the Philippines, with a stopover for refueling at Oʻahu. They flew into Oʻahu completely unaware of the Japanese attack and had to quickly dodge strafing by the Japanese Zeros. Amazingly, they all managed to make emergency landings, seven at Hickam Air Field, one at Wheeler Airfield, one at Bellows Airfield, one at the tiny Haleʻiwa Airport, and one on the grass and sand surface of the Kahuku Golf Course…The Army Air Force on Oʻahu had planned to build an emergency strip at the golf course, but it had not been completed by the time of Pearl Harbor attack (O'Hare 2008:28).

In 1942, the Kahuku Airfield was constructed as an auxiliary airfield, with several runways, ancillary bunkers, and emplacements (O'Hare and Hammatt 2006:21). Pilots from Wheeler Air Force Base were trained to fly a variety of aircraft on this airfield. By the late 1940s, Kahuku Field was abandoned and the lands once leased by the military were returned to the landowner. This former airfield was located near the present day Turtle Bay Resort.

According to Nakamura (1981), the *wao/mauka* areas of Kahuku and Keana Ahupuaʻa were also leased to the U. S. Military for training purposes in the mid-1950s. These lands, referred to as the Kahuku Training Area (KTA), have continuously been utilized by various branches of the United States Department of Defense and have not been easily accessible to the general public since. KTA makes up most of the western boundary of the Nā Pua Makani project area.

4.0 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

A total of 39 archaeological studies have been conducted in various locations within a 2.5 kilometer radius around the proposed Nā Pua Makani Wind Project lands. Presented in the following section is a summary of the findings for these reports. A list of the reports and their locations in chronological order is provided in Table 4 and map of the project area with all of the study areas and known archaeological sites is provided in Figure 6.

The earliest systematic archaeological study performed in the vicinity of the Nā Pua Makani Wind Project is the 1930 island-wide survey conducted by Gilbert McAllister (1933). In *Archaeology of Oahu*, McAllister identifies several historic sites near the project area, including McAllister's Site 269 (traditional platform) and Site 270 (Keana Cave), located less than 300 meters north of the project area. In addition, Kaaulelemoa Fishpond (Site 268) is located less than a kilometer north of the project area, a traditional fishing shrine on Makahoa Point (Site 272) is less than a kilometer to the east, and Pōlou Pool (Site 271) is located just over a kilometer to the north.

Nearly 50 years later, a state-wide survey of petroglyph sites was performed by J. Halley Cox and Edward Stasack (1970). In this study, Cox and Stasack (1970:97) recorded a human figure petroglyph on a boulder at Kalaeuila Point, which is ca. 4 kilometers south of the Kahuku/Keana boundary.

In 1977, Paul Rosendahl performed an archaeological inventory survey on 1,044 acres (non-contiguous) of the 9,646-acre Kahuku Training Area (KTA), the eastern sections of which abut and overlap portions of the west-southwest boundaries of the current Nā Pua Makani Wind Project lands. During this reconnaissance undertaking, Rosendahl (1977) identified nine archaeological sites, including four previously recorded sites that were destroyed (-259, -260, -1043, and -9517), one previously recorded site that was intact and on the State of Hawai'i Register of Historic Places (-2501), and four newly discovered sites (-9506 through -9509). All sites found by Rosendahl (1977) are located in the *ahupua'a* of Hanakaoe and nearly 2 kilometers to the northwest of the project area. Only site -9506, Kea'aulu Ditch, which is described as a historic stone-faced irrigation ditch, is located in close proximity to the project area (ca. 500 meters southwest).

In 1978, the Kualoa Archaeological Research Project (City and County of Honolulu) was tasked with a reconnaissance survey of the 49.9-acre Ko'olauloa Housing Project area and the 7.4-acre Kahuku District Park Expansion area (Clark 1979). These areas are located less than 500 meters north of the project area. During the survey, local informants led the archaeologists to a locale in the housing area that they referred to as a "sacred way," which was a cleared area with no visible man-made features, but held some spiritual significance to the community. Site -269 was relocated in the school expansion area and described as a stone platform containing a large coral slab that was interpreted as a possible *kū'ula* or god stone. Also revisited was Keana Cave (Site -270) where human skeletal remains were observed on the slope of the cave entrance. In

Table 2. Previous Archaeological Investigations in the Nā Pua Makani Wind Project Vicinity

Authors	Year	Report Title	Project Location	Findings
McAllister	1933	*Archaeology of Oahu.*	Island-wide survey.	Sites 50-80-02-0268 through -0272 near Nā Pua Makani Wind Project area.
Cox and Stasack	1970	Hawaiian Petroglyphs.	Island-wide survey.	Located a petroglyph on a beach boulder in either Keana or Kahuku Ahupuaʻa.
Rosendahl	1977	Archaeological Inventory and Evaluation Report for U.S. Army Support Command, Hawaiʻi (USASCH). Parts I Report Text and II Tables.	Kahuku Training Area, selected portions totaling 1,044 acres.	Relocation of three sites and discovery of six new sites (No. 50-80-02-9506 through -9509); Site -9506 (Historic stone faced irrigation ditch) is less than 0.5 km southwest of project area.
Barerra	1979	Kahuku Archaeological Survey.	Described in Barrera (1981) as located "…inland of the post office at Kahuku."	Discovery of five sites (No. 50-80-02-1425 through -1429), largely traditional.
Clark	1979	Preliminary Archaeological Reconnaissance Report for Koʻolau Loa Housing Project and Park Expansion, Kahuku, Island of Oʻahu. Kualoa Archaeological Research Project.	57.3-acres in the proposed Koʻolau Loa Housing Project area and Park Expansion Area, Kahuku.	Relocation of Site -0269, A "sacred way," (described as a Hawaiian sacred area having no structural features).
Schilt	1979	Archaeological Reconnaissance Survey of Proposed Extension, Kahuku Elementary School, Kahuku, Oʻahu.	4-acres in the Proposed Extension of Kahuku Elementary School.	Relocated a rock shelter and platform previously recorded by McAllister (1933). Two new sites (a mound and overhang shelter) were also found.
Yent and Estioko-Griffin	1980	Archaeological Investigations at Mālaekahana (50-80-02-2801), Windward Oʻahu.	Mālaekahana State Park, Phase I (south portion).	Site No. -2801; 3-year project; performed mapping, testing, excavation, and analysis; 3 major occupational layers found (ca. AD 1600-1780).
Barrera	1981	Cultural Resources Reconnaissance of the Kahuku Agricultural Park Project Area.	Four separate parcels totaling 3,000 acres in *mauka* Kahuku, Keana, and Mālaekahana Ahupuaʻa.	Three new sites: (1) a surface scatter of historic and traditional artifacts, (2) a single cowrie shell, and (3) a surface scatter of Historic artifacts. Sites 2 and 3 are located near a prominent limestone outcrop.
Davis	1981	Archaeological Reconnaissance Survey of Hawaiian Wind Farm Project area at Kahuku Oʻahu, Hawaiʻi.	Kahuku Training Area, selected portions (proposed windmill sites).	Discovery of four additional sites, including a Historic stone wall remnant, a habitation complex, agricultural terraces, and stone platform.
Sinoto	1981	Archaeological Reconnaissance Survey of Kiʻi and Punamanō Wetland Refuge Units, Kahuku, Oʻahu, TMK 5-6-02 & 3.	Kiʻi and Punamanō Wetland Refuge Units in Kahuku.	Relocation of two sites found by McAllister (1933): Punamanō Spring and Kiʻi Fishpond.
Yent & Ota	1982	Mālaekahana Phase II Initial Testing Results.	Mālaekahana State Park, Phase II (central portion).	22 cores; cultural materials encountered only in coastal cores; no new sites found.
Rogers-Jourdane	1982	Archaeological Reconnaissance Survey of Marine Culture Enterprises Lands in Kahuku, Oʻahu Island.	45 acres in Kahuku Golf Course area.	No sites found.

Authors	Year	Report Title	Project Location	Findings
Yent & Ota	1983	Eroding Archaeological Site at Mālaekahana Phase III, Mālaekahana Bay, Windward Oʻahu.	Mālaekahana State Park; Dune area of Phase III.	In eroding dune face, a human burial, imu, and two hearths were recorded (Site No. -1038).
Yent & Estioko-Griffin	1986	Results of Auger Coring Conducted at Mālaekahana State Recreation Area, Phase II, Koʻolau Loa, Oʻahu.	Mālaekahana State Park, Phase II (northern portion).	11 cores excavated; no sites found.
Sinoto	1986	Perimeter Flagging for Proposed Fencing Around Two Archaeological Site Areas, Kahuku Elementary School, Kahuku, Oʻahu. Letter Report.	Kahuku Elementary School, Keana Ahupuaʻa.	No new sites found; flagging of McAllister (1933) Sites -0269 and -0270.
Jensen	1989 a & b	Archaeological Inventory Survey Punamanō and Mālaekahana Golf Courses Lands of Ulupehupehu. Punaluʻu. Kahuku, Mālaekahana, and Lāʻie, Koʻolau Loa District, Island of Oʻahu.	Non-contiguous project area, totaling 866-acres of inland Kahuku. Punamanō Golf Courses is within Ulupehupehu, Punalau and Kahuku Ahupuaʻa. Mālaekahana Golf Course is in Lāʻie and Mālaekahana Ahupua`a.	Twenty-six sites containing 45 component features were identified. Traditional site types: caves, overhangs, walls, terraces, platforms, enclosures, isolated midden deposits. Historic site types: WWII II emplacements, dumps, roads, and agricultural ditches.
Kennedy	1989a	Archaeological Inventory Survey for the Proposed Mālaekahana Golf Course, A Portion of the Country Courses at Kahuku.	200 acres inland of Mālaekahana Bay and Kalanai Point, ca. 100 meters southeast of project area. Was location of Site -0275, Waiʻāpuka, a legendary sinkhole with spring.	Thirteen new sites found (11 Traditional habitation and agricultural sites and 2 Historic Plantation and Military sites). Also, 6 sand dunes recommended for testing. Letter report lists only temporary site numbers. Site -0275 not relocated.
Kennedy	1989b	Archaeological Assessment and Reevaluation Report Concerning the Recently surveyed, Proposed Punamanō Golf Course; A Portion of the Country Courses at Kahuku.	Inland Ulupehupehu, Punalau and Kahuku Ahupuaʻa.	Two new Historic sites to the Jensen's (1989 a&b) findings with a total of 14 additional features. Also recommends preservation of Site -4070 (possible burial).
Kennedy	1989c	Archaeological Reconnaissance Survey at TMK: 5-6-02:25, Located at Kahuku, Oʻahu.	Across Kamehameha Hwy. to the north of Hospital (Kahuku Medical Center).	No sites found.
Kennedy	1990	Kahuku Sand Mining Project: Archaeological Subsurface Testing Results.	Immediately southwest of Kahuku Golf Course.	No burials or cultural layers were found during testing.
Pfeffer & Hammatt	1992	Waialua to Kahuku Power Line.	Uplands of Ahupuaʻa spanning from Waialua to Kahuku.	
Hammatt & Pfeffer	1992	Archaeological Reconnaissance of Kahuku Agricultural Park.	Upland Keana Ahupuaʻa.	One day reconnaissance survey yielded no new sites.
Dagher	1993	Inadvertent Discovery of a Human Burial At Makahoa Point, Mālaekahana, Koʻolau Loa, Oʻahu.	Makahoa Point.	A single pre-Contact era human burial of Hawaiian ancestry was inadvertently discovered.
Jourdane	1994	Inadvertent Discovery of Human Remains near Kahuku Golf Course, Kahuku, Oʻahu.	Near Kahuku Golf Course.	A single pre-Contact era juvenile human burial was inadvertently discovered.
Hammatt	1996	Archaeological Reconnaissance for Proposed Mālaekahana Exploratory Wells, Mālaekahana, Oʻahu.	Just mauka of the southern mauka end of the NPM APE.	Archival research and archaeological background performed. No sites recorded.

Authors	Year	Report Title	Project Location	Findings
Hibbard	1997	Inadvertent Discovery of Human Remains, Japanese Cemetery, Kahuku Golf Course, TMK 5-6-002:010. Memo in Burial Files.	Japanese Cemetery near Kahuku Golf Course.	A single pre-Contact era human bone was inadvertently discovered.
Collins	1999	Recovery of Human Remains From Kahuku Golf Course.	Kahuku Golf Course (makai).	Pre-Contact era human remains were inadvertently discovered (site -5773).
Perzinski & Hammatt	2001	Archaeological Inventory Survey Report for Hospital Ditch and Kiʻi Bridge in the Ahupuaʻa of Kahuku, District of Koʻolau Loa, Island of Oʻahu (TMK: 5-6-02, 05 & 06).	Kamehameha Hwy., Kahuku near detour roads.	No sites recorded.
Calis & Tome	2002	An Archaeological Monitoring Report for the Force Main Sewer Replacement Project, Kahuku Ahupuaʻa, Koʻolauloa District, Oʻahu Island, Hawaiʻi.	Force Main Sewer, makai of Kamehameha Hwy., Kahuku.	No sites recorded.
Stride et al.	2003	Archaeological Inventory Survey of the Proposed 785-Acre Kahuku Agricultural Park.	The original 1993 project area was 1666 acres, later in 2003 reduced to 785 acres in upland Kahuku and Keana Ahupuaʻa (single report submitted in 2003).	In all, 21 sites were located in original project area. However, 7 sites were recorded (50-80-02-4510 through -4516) in the revised area. Site types: wall sections, overhang shelters, terraces, and enclosures. Most appear to function as habitation sites from pre-contact into Historic times.
O'Hare et al.	2004	Documentation of the Kahuku Sugar Mill, Kahuku Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu.	Kahuku Mill Complex.	Documentation report of remaining Plantation structures.
O'Hare et al.	2008	Archaeological Inventory Survey Plan for the Kahuku Subdivision Project, Kahuku, Keana, and Mālaekahana Ahupuaʻa, Koʻolau Loa District, Oʻahu Island TMK: (1) 5-6-002; 003, 010, 012, 016, and 027.	200 acres of makai Kahuku, Keana, & Mālaekahana Ahupuaʻa. Bound by the coast, Makahoa Point, Kaluahole, & Kamehameha Hwy.	No sites recorded. Extensive background research performed on area.
Morrison	2009	Archaeological Background Report for the Proposed Nā Pua Makani Wind Farm Project, Kahuku, Oʻahu (TMK 5-6-008:006).	231.9 acres of Kahuku and Keana Ahupuaʻa, mauka of Kahuku Hospital.	No sites recorded. Background research performed on area.
Rechtman	2009	A Comprehensive Archaeological Survey of the First Wind Kahuku Wind Power Project Area (TMKs: 1-5-6-05:007 & 014).	230 acres west of Kahuku Village and 2.5 kilometers inland of coast.	SIHP Site 4707, which was described as sugarcane field infrastructure.
Dagher & Spear	2010	Literature Search and Field Inspection of the Kahuku Storm Damage Reduction Project Kahuku Ahupuaʻa, Koʻolau Loa District, Oʻahu Island.	Kahuku Intermediate and High School grounds & park adjacent to the west.	No sites recorded. Background research performed on area.
Dagher & Spear	2014a	Archaeological Inventory Survey Report for the Kahuku Village Subdivision Project, Keana and Mālaekahana Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu, Hawaiʻi [TMK (1) 5-6-002:027].	Portion of 50 acres between Kahuku Golf Course and Kamehameha Hwy.	A single site was found (site No. -7508), consisting of ten features (9 plantation era & 1 pre-Contact to early Contact era).

Authors	Year	Report Title	Project Location	Findings
Dagher & Spear	2014b	An Archaeological Monitoring Report for the Kahuku Village Subdivision Project, Keana and Mālaekahana Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu, Hawaiʻi [TMK (1) 5-6-002:013, 014].	Portion of 50 acres between Kahuku Golf Course and Kamehameha Hwy.	Five archaeological sites found: site Nos. -7398 (historic cesspools); -7399 (Burial); -7400 (-7401 and -7511); -7398.
Lyman & Spear	2014	Archaeological Inventory Survey for the Kahuku Village Subdivision Project Keana Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu, Hawaiʻi [TMK: (1) 5-6-002:047 por].	Kahuku Village immediately makai of Kamehameha Hwy. and mauka of Kahuku Golf Course.	Site No. -7508, feature 8 (Historic existing Plantation era homes) relocated.

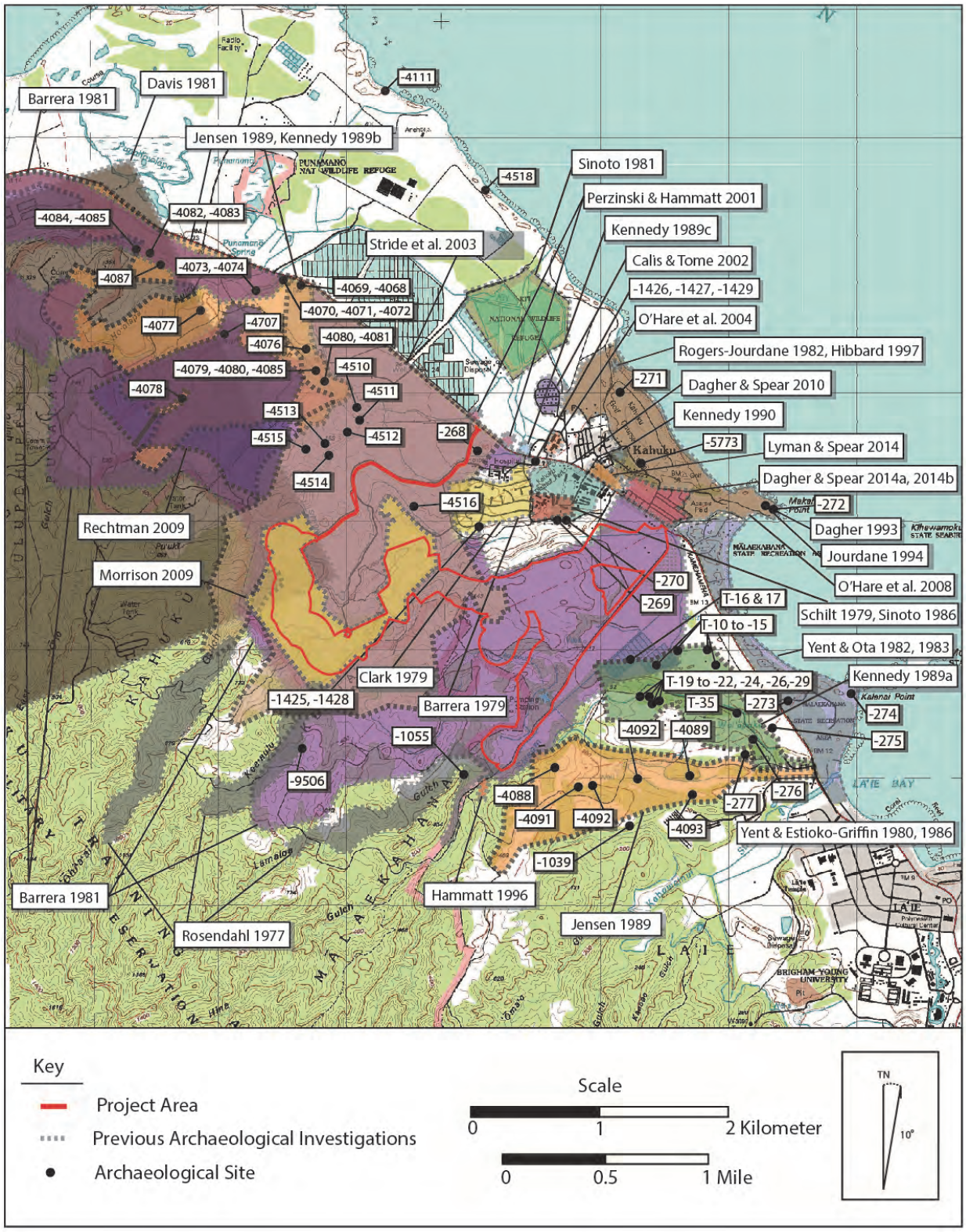

Figure 6. Previous archaeological studies and sites in vicinity of NPM project area (adapted from USGS Kahuku Quadrangle Map).

addition, Clark (1979) found a second rock shelter located along a coral outcrop that contained skeletal remains, possibly human, and wood. Clark (1979) noted several other small crevices in outcrops and rock shelters with crude walls in the project area, but did not investigate further. A single historic grave with a marker exhibiting a date of 1945 was also found during this investigation.

William Barrera (1979) revisited the Koʻolau Loa Housing project the following year, conducting a more thorough archaeological inventory survey and subsurface testing. Barrera (1979) suggested that two limestone knolls and the base of a limestone ledge had the potential to contain archaeological sites, and that the rest of the area had been impacted by sugarcane activities. These three areas were surveyed, yielding five archaeological sites. Site No. -1425 was comprised of two walls aligned at the base of the limestone cliff. Site No. -1426 was described as a rock-lined depression and a metal pipe located at the eastern knoll. Site No. -1427 consisted of a complex of three walls, three rock mounds, and one cave located on the eastern knoll. Site No. -1428 was described as a wall situated on top of a cliff. Site No. -1429 consisted of an earthen mound within an L-shaped wall. Although several of the features were tested, no cultural remains were observed. The conclusion was that most of these features, if not all, were historic and associated with sugar cane cultivation (Barrera 1979).

In 1979, a crew from the Bishop Museum recorded Sites No. -269 and -270 (Schilt 1979), during an archaeological reconnaissance survey for the 4-acre Kahuku School Expansion project. Although some collapse and disturbance was observed on the platform (Site No. -269), Schilt (1979) noted that one component of the platform was a large coral "block," which may indicate that the feature had a ceremonial component. Sketches were made of the platform as well as photographs to record the condition of the platform. Schilt (1979) also noted that the two stones at the entrance of Keana Cave (Site No. -270) were natural formations and that the cave floor was covered by scattered limestone fragments that were likely roof fall, but that midden could possibly lie below it. A roughly rectangular stone mound (Site No. -2478) and a small overhang located within a large outcrop (Site No. -2479) were also recorded (Schilt 1979).

A reconnaissance survey was performed in 1981 by Barrera for the 2,500-acre Kahuku Agricultural Park, which was separated into four parcels. This study area nearly encompasses the current Nā Pua Makani Wind Project area. Barrera (1981) brief survey was performed in three of these parcels and a more thorough survey was performed in one 500-acre parcel. The current project area lies largely in the 500-acre parcel intensively surveyed and the eastern most parcel Barrera (1981) surveyed. In his background research, Barrera (1981:19) listed sites on file at the SHPD office at that time, stating that Site -1055, described as a "Shelter Cave," was outside of his project area and mapped it approximately 200 meters west of the southernmost projection of the project area. However, no source was cited in Barrera's 1981 report. Three archaeological "locations" were identified in the westernmost parcels, which did not include any structural features, but consisted of solely of possibly pre-Contact and historic surficial remains. These three locations were all within Kahuku Ahupuaʻa, just under a kilometer north of the project area. Location 1 consisted of a marine shell, coral fragments, and basalt flakes. Location 2 was comprised of one cowry shell. Location 3 was a concentration of glass bottle fragments.

Subsequently, Bertel Davis (1981) performed a reconnaissance-level survey in selected areas of KTA for a proposed wind farm, which yielded four newly identified sites (Site No -2357 through -2360). Site No. -2357 consisted of a discontinuous segment of a stacked stone wall that supported a barbed-wire fence with milled wood posts. Sites No. -2358 through -2360, consisting of a house site, habitation terraces, and a terrace with ceremonial features (respectively), are suggested to be functionally and spatially related, being situated within a swale in upland ʻŌpana Ahupuaʻa (Davis 1981). These findings are located over 3 kilometers to the northeast of the project area.

The same year, Aki Sinoto of the Bishop Museum performed a brief reconnaissance survey of the Kiʻi and Punamanō Wetland Refuge areas (Sinoto 1981), finding that the land had been extensively modified. He noted a single historic site, which was an old OR&L railroad track. The entire wetland site was designated 50-0a-F4-10/11. While Sinoto (1981) referred to this area as Kahuku Fishpond, one of McAllister's (1933:154) informants maintains that this area was always a swamp - not a fishpond.

Between the years 1980 and 1986, several archaeological investigations were performed in Mālaekahana State park, which had been divided into three phases. In 1980, Yent and Estioko-Griffin performed mapping, testing, excavation, and analysis at Site No. 50-80-02-2801, which was in Phase I located in the southern portion of the park. The three-year project yielded three major occupational layers dating from ca. AD 1600 to 1780. (Yent and Estioko-Griffin 1980:xxi-xxiv). Yent and Ota (1982) performed auger testing at Phase II of the park, which is the northern portion of the park. Of the 22 cores, cultural materials were encountered only in coastal areas. No new sites were found. The next year, Yent and Ota (1983) recorded a human burial, *imu*, and two hearths in an eroding dune face in Phase III, which is in the center of the bay's coast (Site No. 50-80-02-1038). In 1986, Yent and Estioko-Griffin excavated 11 cores in the southern extent of Phase I, which yielded no new sites (Yent and Estioko-Griffin 1986).

Also in 1982, Rogers-Jourdane performed a reconnaissance survey of approximately 45 acres of the Kahuku Golf Course as well as a 2,000-foot long by 100-foot wide corridor for an associated pipeline. This survey yielded no archaeological sites (Rogers-Jourdane 1982). This project area was located over 200 meters to the northeast of the current project area.

Four years later, Sinoto revisited Sites No. -269 and -270 to flag the perimeter for protective fencing to be installed prevent damage during the proposed Kahuku Elementary School extension construction activities (Sinoto 1986).

In 1989, Jensen performed an archaeological inventory survey of two separate areas for the proposed development of Punamanō and Mālaekahana Golf Courses project, totaling 866 acres. Twenty-six sites containing 45 component features were identified between the two separate project areas. These reports were initially released as a single report by Jensen (1989a). Later that year, they were released as separate reports with a change in project area for the Mālaekahana Golf Course and, thus, new survey area, released by Kennedy (1989b). A reevaluation of Jensen's (1989) Punamanō Golf Course survey was also released by Kennedy (1989a). The proposed 638-acre Punamanō Golf Course was located less than one kilometer north of the current project area. Twenty-six archaeological sites were recorded by Jensen (1989)

in this portion of the project area (Sites No. -4076 through -4081, and -4085). Site No. -4076 is comprised of an overhang shelter complex of eight features (Features A-H) with visible midden and basalt flakes. Site No. -4077, also a complex (Features A-C), was described as a terrace with a wall and *ʻauwai* (modified crevasse). Site No. -4078 is a three feature complex (A-C) comprised of an overhang shelter with two stacked walls. Site No. -4079 consists of short wall segments. Site No. -4080 is described as a Historic trash dump and bottle scatter. Site No. -4085 is a complex of two features (A and B), Feature A being an enclosure and Feature B being a low wall. Kennedy (1989b) reviewed and reevaluated Jensen's (1989) findings and added two new Historic sites, including an enclosure complex and an irrigation ditch, as well as fourteen new features associated with sites previously identified by Jensen (1989). SIHP numbers for newly identified sites were not provided. Further, Kennedy (1989b) suggested that Jensen's (1989) Site No. -4076 be preserved, as Kennedy maintained that it could possibly be a burial. Kennedy's (1989a) survey of 200 acres at the site of the proposed Mālaekahana Golf course, which was not the same survey area as Jensen's (1989) Mālaekahana Golf Course project area, yielded 19 surface features. These sites included overhang shelters with evidence of previous human occupation, suspected agricultural terraces, low mounds, midden scatter areas, large, sandy dune formations with suspected cultural components, prehistoric surface artifacts, a historic gun emplacement, and a historic railroad bed. Kennedy (1989a) found thirteen new sites, consisting of 11 traditional habitation and agricultural sites and two Historic Plantation and Military sites. Also, six sand dunes recommended for testing. Sites in this report did not receive SIHP numbers, but were designated temporary site numbers. This portion of the project area is located less than 100 meters south of the current Nā Pua Makani Wind Project's southern boundary.

Later that year, Kennedy (1989c) performed a reconnaissance survey on a 14-acre parcel across Kamehameha Highway of Kahuku Hospital, which is roughly 1 kilometer north of the project area. While no archaeological sites were identified, Kennedy noted that Kiʻi Ditch ran through the parcel. There is no evidence that this plantation-era ditch followed an earlier *ʻauwai*, or traditional irrigation ditch.

In 1990, Kennedy performed archaeological subsurface testing in a parcel just northeast of the Kahuku Sugar Mill and approximately 500-meters north of the current project area. Although no archaeological materials were found in the 47 trenches, a single early modern trash pit and a few shallow irrigation channels associated with nearby small garden areas were observed. The stratigraphy of the trenches suggested that a sand deposit, which has been formed by gradual Aeolian processes over a lengthy time period, exists throughout the area. As such, human remains may potentially exist in the upper, penetrable sand deposit (Kennedy 1990).

Pfeffer and Hammatt (1992) of Cultural Surveys Hawaiʻi, performed an archaeological assessment of an area spanning from Waialua to Kahuku for a power line project. They noted that a multitude of archaeological sites may be present in the vicinity of the project area, with greater probability in coastal areas.

A one-day survey was performed by Hammatt and Pfeffer in 1992 on four parcels (lA, lB, 2, and 3) in *mauka* Keana Ahupuaʻa for the Kahuku Agricultural Park, limiting the survey to areas not under cultivation. No sites were recorded during the brief survey.

In 1992, Cultural Survey Hawai‘i (CSH) surveyed ca. 785 acres that included the western portion [TMK (1) 5-6-008:006] of the current project area (Figure 7; Stride et al. 2003). The original survey area was 1,600 acres, but then reduced to ca. 785 acres with no reason given. Figure 7 shows that most of the western portion of the current project area was surveyed by CSH. Approximately 53 acres of this western portion of the current project area was not previously surveyed. In addition, CSH was originally supposed to survey an additional ca. 900 acres to the east [TMK (1) 5-6-006:018] which would have included nearly all of the current Nā Pua Makani project area. However, CHS never completed the survey to the east or explained why the project area was reduced.

Stride et al. (2003) state that 21 sites were identified in the overall 1,600 acre survey area, but only seven sites were located in the reduced ca. 785-acre western portion. This indicates 14 sites were found in the eastern portion of the original CSH survey area, which includes the current Nā Pua Makani project area. These sites were not described, so it not known what types of sites were found or where they were located.

Stride et al. (2003) describe the seven sites which they recorded near the western side of the current project area. These seven sites are located to the north and outside of the current project area. These seven sites are composed of 16 features: overhang shelters (n=8) (one of which contained human remains), walls (n=3), terraces (n=3) an enclosure (n=1), and a U-shaped temporary shelter (n=1) and terraces.

The results of the CSH survey indicate that although the current project area and vicinity was severely impacted by large-scale commercial agriculture, the area still has the potential to contain significant cultural resources. These resources would be in areas not impacted by mechanized agricultural activities. There is also the possibility that subsurface deposits may be present, but this is somewhat unlikely.

In 1993, a single pre-Contact era human burial of Hawaiian ancestry was inadvertently discovered at Makahoa Point (Dagher 1993), which is approximately 800 meters east of the current project area. The following year, Jourdane (1994) wrote a letter report for a single pre-Contact era juvenile human burial that was inadvertently discovered near the Kahuku Golf Course, ca. 800 meters east of the project area. In 1997, a single human bone, assumed to be pre-Contact era, was inadvertently discovered near the Kahuku Golf Course, approximately one kilometer north of the current project area (Hibbard 1997). Several years later, another set of pre-Contact era human remains were inadvertently discovered at the golf course (Site -5773), less than 500 meters north of the project area (Collins 1999).

An archaeological inventory survey was performed in 2001 for the Hospital Ditch and Ki‘i Bridge/Drainage (Perzinski and Hammatt 2001), which is located just over 1 kilometer north of the project area. No archaeological sites were noted.

Archaeological monitoring was performed in 2002 during excavations related to the 670-meter long force main sewer replacement *makai* of Kamehameha Hwy, which is a little over one kilometer north of the current project area (Calis and Tome 2002). Although no archaeological sites were encountered during ground disturbing activities, Calis and Tome (2002) recorded the

stratigraphy of this area that appeared to be largely imported construction fills related to sugar cane cultivation and irrigation.

In 2004, O'Hare et al. conducted documentary research for the Kahuku Sugar Mill complex, following Historic American Engineering Records (HAER) recording format (O'Hare et al. 2004). The mill is roughly 900 meters north of the current project area.

O'Hare et al. (2008) performed extensive background research for the Kahuku Subdivision Project area, which is comprised of 200 acres that are located less than 300 meters northeast of the current project area. No sites recorded.

In 2009, International Archaeological Research Institute, Inc. (IARII) conducted archival research on the western portion of the Nā Pua Makani project area [TMK (1) 5-6-008:006] for West Wind Works, LLC (Morrison 2009). IARII reviewed early historic documents, historic maps, and previous archaeological investigations in the area.

IARII's research indicated that at the time of first European contact (1779) the general Kahuku area was densely settled and intensively cultivated. However, drastic population decline and reduction in agricultural practices were evident within 20 years (1794). In the mid 1800s, cattle and sheep ranching were being practiced in Kahuku, which led to dramatic vegetation change in the area. Sugar and pineapple cultivation began in the late 1800s resulting in extensive land modifications of the area. Figure 8, which shows that extent of historic commercial sugar cane and pineapple cultivation, is the result of IARII's research and the finding of a 1913 USGS map that shows the extent of these historic agricultural practices. Clearly, the majority of the Nā Pua Makani project area was extensively modified by these commercial agricultural activities.

IARII also reviewed the work done by CSH (Stride et al. 2003) and concluded that most of the Nā Pua Makani project area, as then defined (the western portion of the current project area [TMK (1) 5-6-008:006]), was surveyed by CSH. IRII noted that most of the area had been modified by historic agricultural activities and no archaeological sites were found.

IARII concluded that it is unlikely that any cultural remains would be found within the project area and that no further archaeological work was needed.

Rechtman (2009) conducted an archaeological inventory survey of the 230-acre First Wind Kahuku Wind Power project area located less than 300 meters northwest of the Nā Pua Makani Wind Project. A single archaeological site was recorded within the project area (Site -4707), which is an existing site recorded by Kennedy (1989) with related plantation infrastructure features that is located just outside of the project area.

Another background research report was prepared in 2010 by Dagher and Spear for the Kahuku Storm Damage Reduction Project, which is located approximately 500 meters north of the project area (Dagher and Spear 2010). No archaeological sites were recorded.

In 2014, Dagher and Spear performed an inventory survey on 50 acres between the Kahuku Golf Course and Kamehameha Highway for the Kahuku Village Subdivision Project, which is

directly across Kamehameha Highway of the current project area (Dagher and Spear 2014a). During this survey, a single site was found (Site -7508), consisting of ten features (nine plantation era and one pre-Contact to early-Contact era). Subsequently, Dagher and Spear conducted archaeological monitoring for the same project, where five additional archaeological sites were found, including Site -7398 through -7401, and -7511. Site types include human burials and historic cesspools (Dagher and Spear 2014b). Later the same year, Lyman and Spear (2014) conducted an inventory survey for the same project, but the area immediately northwest of Dagher and Spear's (2014a and 2014b) project area. No new archaeological sites were found.

Figure 7. Map showing areas archaeologically surveyed and not surveyed in the CSH study in relation to current APE.

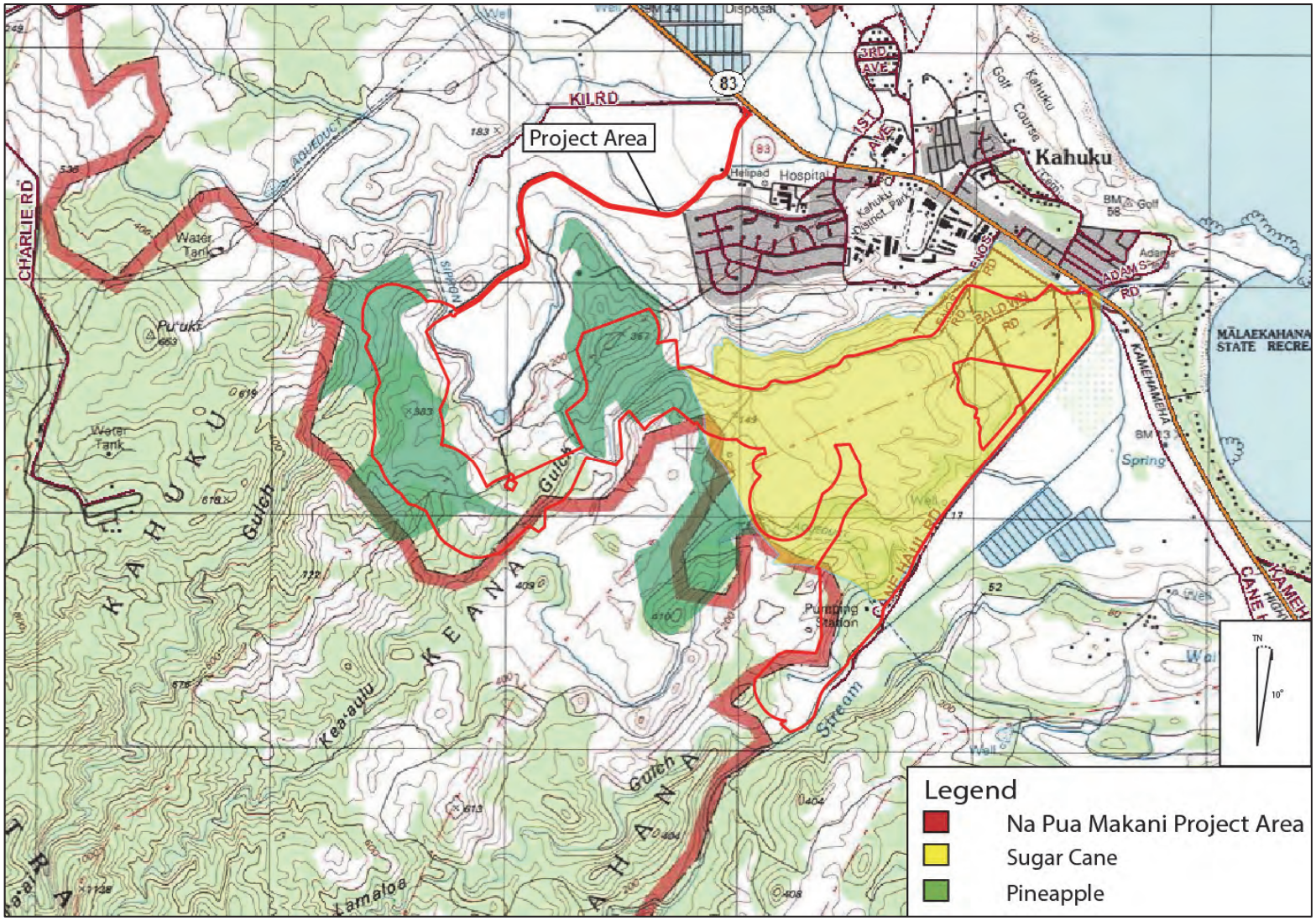

Figure 8. Location of former commercial agricultural lands (map source: National Geographic TOPO; data from Morrison 2009:Figures 4, 7, and 8).

5.0 METHODS

Under the overall direction of Paul L. Cleghorn, Ph.D., Pacific Legacy archaeologists, James McIntosh, B.A., Caleb Fechner, B.A., Jeff Putzi, B.A., Kimberly Mooney, B.A., Amara Kunishi, B.A., and Gina Farley, M.A. conducted multiple sessions of field investigations over an eight month period between April and December 2014.

The original APE began as approximately 450 acres but was subsequently altered to the current 464 acres due to changes in development plans. As a result, several sites (n=17) that were originally recorded during the survey are now outside of the APE and thus will not be affected by the project. However, Pacific Legacy is reporting the results of these sites here because they were formally documented prior to the change of APE.

5.1 PEDESTRIAN SURVEY

The team began the survey in April on the far western side of the project area on the lands owned by the State of Hawaiʻi. Team members were spaced between 10 to 20 meters apart depending on vegetation density and ground visibility. As close as possible to a 100% coverage survey was achieved. The team surveyed ridge tops, slopes and valleys throughout the APE. Slopes greater than 35 to 40 percent were not surveyed due to the low likelihood of containing cultural resources and safety issues. All drainages within the APE were surveyed. Special attention was paid to the sides and bases of the drainages where traditional Hawaiian features were predicted to be present.

When an archaeological feature was encountered, it was examined to determine whether it constituted an isolated element deserving its own site number or whether it formed part of a larger site complex. Each recognized archaeological site was then assigned a temporary field number to facilitate identification. This consisted of a T (for temporary) followed by a consecutively number (i.e., T-001). Individual structural features within a specific site were assigned consecutive letter designations to aid in recording and mapping.

Once identified, each site and its component features were fully documented. Vegetation clearance was undertaken as needed. The relative location of each site was mapped using a hand held Trimble GeoExplorer XT global positioning system (GPS) unit. Its coordinates were recorded in Universal Transverse Mercator, North American Datum of 1983, Zone 4 (UTM NAD 83 Z4) projection. An individual point was taken for each site (site datum) and most individual features (feature datum). In a few cases, dense vegetation and topography resulted in a lack of satellite signal and GPS coordinates were not recorded.

Detailed site and feature descriptions were recorded for all identified archaeological remains (Appendix B provides full descriptions for all recorded sites and features). Documentation also included digital photographs of each site. Plan view maps were prepared of the more complex sites using either a plane table or tape and compass. A metal site tag was filled out and left at

each site for relocation purposes. Since, at the time of the survey, SIHP numbers had not been assigned, the metal site tags left at each site were marked with the temporary field number and date.

5.2 TEST EXCAVATION

Subsurface backhoe testing was conducted at various locations throughout the project area. The focus of the testing was the areas where heavy ground disturbance would take place during the proposed construction of the wind farm. No subsurface testing was conducted within the active farm lots on the MHW lands to the east, however, one test trench was placed within one active farm lot along the roadway within the DOA controlled lands on the west side of the APE. An archaeologist stood-by and directed all backhoe excavations. Excavations were closely monitored, to ensure that no potentially significant finds were overlooked. Backhoe trenches ranged from 3 to 6 meters long and proceeded to 0.6 to 1.5 m below surface (2 – 4.9 feet). Once excavation of the trench was completed, a representative wall facing was cleaned and the stratigraphic profile was drawn and described; standard USDA descriptive terminology and Munsell Color references were used.

Two controlled, hand-excavated test units were excavated at two sites. They were excavated with trowel and dustpan and all soil was screened through nested 1/4 and 1/8 inch screens. Excavation preceded in arbitrary 10 cm levels within natural stratigraphic layers. Any cultural material identified was collected, bagged by provenience and transported back to the Pacific Legacy laboratory. The excavations were documented with notes on standard excavation forms. Profiles were drawn and the excavation recorded with digital images. Radiocarbon samples were submitted for identification and radiocarbon dating.

5.3 LABORATORY ANALYSES

All materials collected during the course of test excavations were transported to Pacific Legacy's Oʻahu laboratory for processing, identification, and detailed analysis. Analysis of recovered materials included sorting, identification, labeling, and curation. 100% of faunal material (shell fish, marine bone, avian bone, mammal bone) was sorted as to recognizable taxa, weighed and analyzed. All shell and bone midden material was identified and sorted by family, genus, or species when possible and was weighed separately before being entered onto a site midden table. The few artifacts recovered during test excavation were cleaned, identified, measured, weighed, described, photographed, cataloged and analyzed for function and chronological patterns.

During the course of excavation, samples for radiocarbon dating were recovered from secure proveniences. Two charcoal samples were selected for radiocarbon analyses from Site T-072. Prior to submission for radiometric analyses, the charcoal samples were submitted to the Wood Identification Laboratory at the International Archaeological Research Institute, Inc. for species identification. Each sample was examined and identified by academically trained wood analyst Gail Murakami. The purpose of this analysis was to determine the presence or absence of

historically introduced wood and to differentiate between short lived and long lived species (short lived species are better indicators of the true date at which a piece of wood was burned). The results of wood analyses are presented in Appendix D. The two charcoal samples were then sent to Beta Analytic Radiocarbon Dating Laboratory for dating. Both samples were relatively small so that accelerator mass spectrometry (AMS) radiocarbon dating was necessary.

5.4 CURATION

All field records (descriptions, notes, and photographs) resulting from the inventory survey, as well as all cultural materials (artifacts, midden, etc.) and samples (soil, charcoal, etc.) collected during test excavations, have been temporarily housed in the Pacific Legacy Kailua, Oʻahu office. The ultimate disposition of all materials generated by this project will be determined through consultation with the State Historic Preservation Division.

6.0 ARCHAEOLOGICAL SURVEY RESULTS

A total of 72 newly identified archaeological sites comprised of 113 distinct features were documented during the AIS survey (Figure 9 through Figure 12; Table 5) of a quite varied landscape (Figure 13 through Figure 18). Of the 72 sites documented, 22 sites are traditional Hawaiian pre-Contact sites, 40 sites are related to the sugar industry, 7 sites are historic sites not associated with sugar plantation activities, and 3 are military sites.

The original APE for the project began as approximately 450 acres, but was subsequently altered to the current 464 acres. This change in the size of the APE stems from design changes for the wind farm and the desire to avoid several pre-Contact archaeological sites identified on lands not strictly needed for the development of the wind farm. As a result of this APE alteration, seventeen (n=17) of the identified sites (T-039 through T-044, T-046 through T-052, T-060, and T-062 through T-064) are located outside of the revised APE and will not be impacted by the proposed Nā Pua Makani Wind Project. Of these, all except three sites (T-043 [stone lined drainage]; T-060 [concrete ditch], and T-064 Feature A [concrete ditch]) are traditional pre-Contact sites and relate to habitation, agricultural, and burial practices. Pacific Legacy is reporting on these sites in this AIS report because these sites were formally documented and recorded prior to the reduction of the APE. However, no test excavations were conducted in any of these sites, thus it is difficult to assess the significance of these resources. As a result, no recommendations for significance or preservation are made herein regarding the 17 sites outside of the APE. Specific descriptive information, including photographs and maps of each site is presented in Appendix B. A total of 55 archaeological sites are located within the amended APE.

The vast majority of recorded sites within the APE (N=37) were associated with the agricultural development and intensive use for the cultivation of sugar cane by the former Kahuku Plantation (Table 3). The overwhelming majority of sugar plantation related features functioned mainly to control and transport water. A total of 65 features in 36 sites are related to water control and transport (Figure 12). These features include a variety of ditches, metal pipelines, wells, reservoirs, pump houses, and concrete foundations. The ditches are present in several forms, from simple earthen ditches, to stone-lined ditches, to concreted ditches.

The next most common archaeological sites are pre-Contact Native Hawaiian sites (N=8). These consist of terraces, a stone mound, a stone platform, a modified outcrop, and a cave that functioned as habitation sites and areas for the cultivation of traditional crops.

Seven non-sugar plantation historic era sites were also recorded, as were three historic military sites consisting of two World War II defensive military bunkers and one military bivouac area.

The density of sites identified within the 464 acre APE is fairly low; 55 sites in the 464 acre APE computes to one site per 8.4 acres. The density of traditional pre-Contact sites (N=8) in the APE is even lower, with one site per 58.0 acres. The reason for this low density of archaeological sites is undoubtedly due to the massive earth moving operations associated with mechanical

cultivation of sugar cane for the Kahuku Plantation. A large number of surface pre-Contact archaeological sites were undoubtedly destroyed during mechanical clearance of the landscape for sugar cane cultivation.

Of the 55 sites located within the APE, 33 sites (T-007 through T-011, T-014, T-016, T-018, T-019, T-023 through T-027, T-029 through T-033, T-035, T-037, T-038, T-054, T-056, T-057, T-061, T-065 through T-067, T-070, T-071, T-077, and T-078) are recommended to have no further work conducted but are outside of the area of disturbance and will thus not be impacted by construction activities. Twelve sites (T-001, T-002, T-006, T-015, T-021, T-022, T-028, T-034, T-053, T-055, T-059, T-073) are recommended for no further work and are tentatively scheduled to be destroyed. Seven sites are recommended to be preserved (T-003 through T-005, T-017, T-020, T-036, and T-069) based upon their significance. Data recovery excavations are recommended for two sites (T-068 and T-072). Site T-068, a stone terrace, requires excavation to clarifiy the site function and antiquity. Site T-072, a shelter cave, cannot be avoided by construction activities and is tentatively scheduled to be destroyed. Data recovery excavations will add to our knowledge about traditional use of this portion of the North Shore of Oʻahu. Finally, one site (T-074) associated with the Kahuku Plantation contains two features that are recommended to be preserved (Features A and a portion of B) and two features (Features C and D) that require no further work. It is recommended that the entire water aqueduct (Feature A) and approximately half of the adjoining concrete ditch (Feature B) be preserved. The portion of Feature B is being preserved to provide a buffer for Feature A.

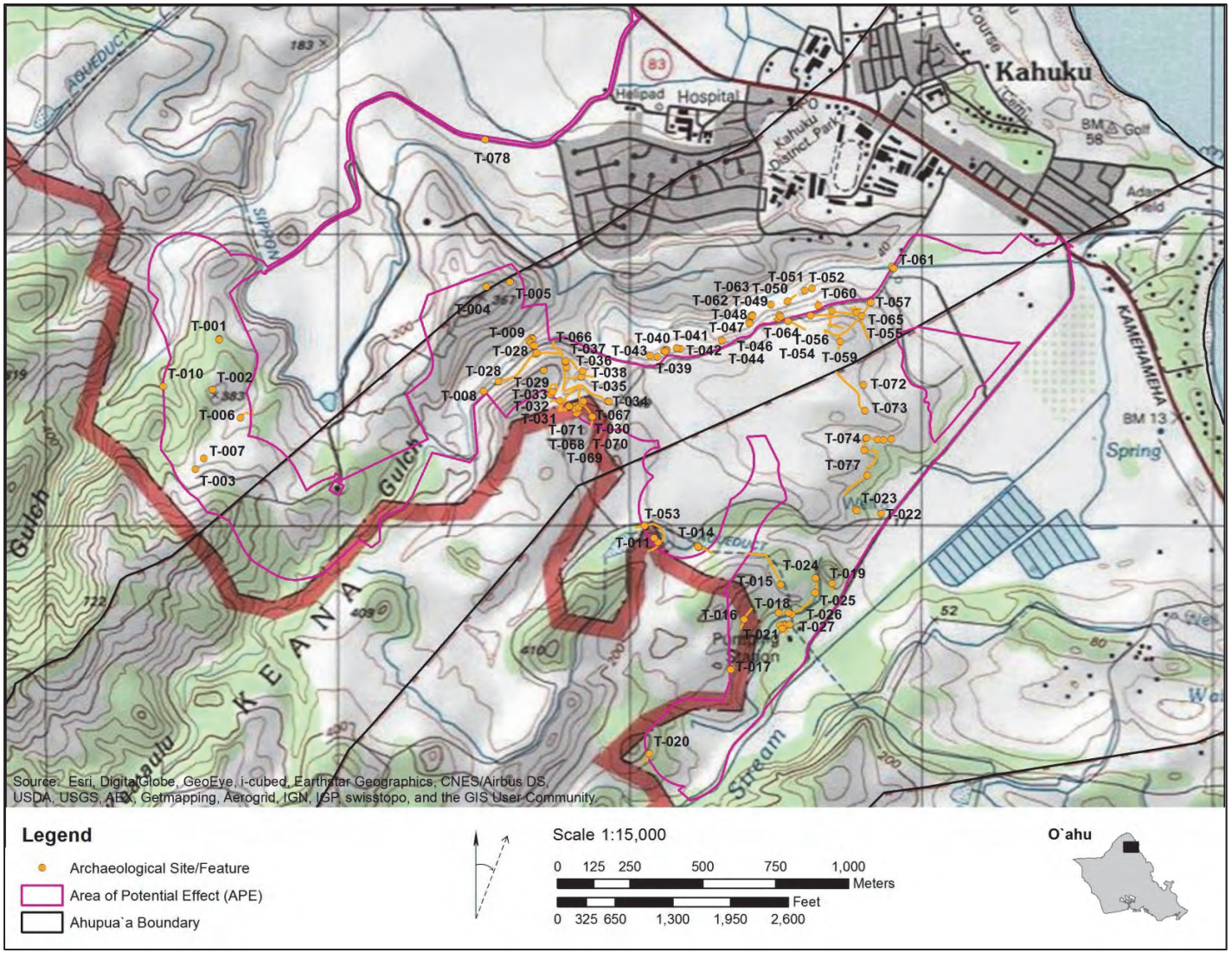

Figure 9. USGS map showing the locations of archaeological sites identified during the current project.

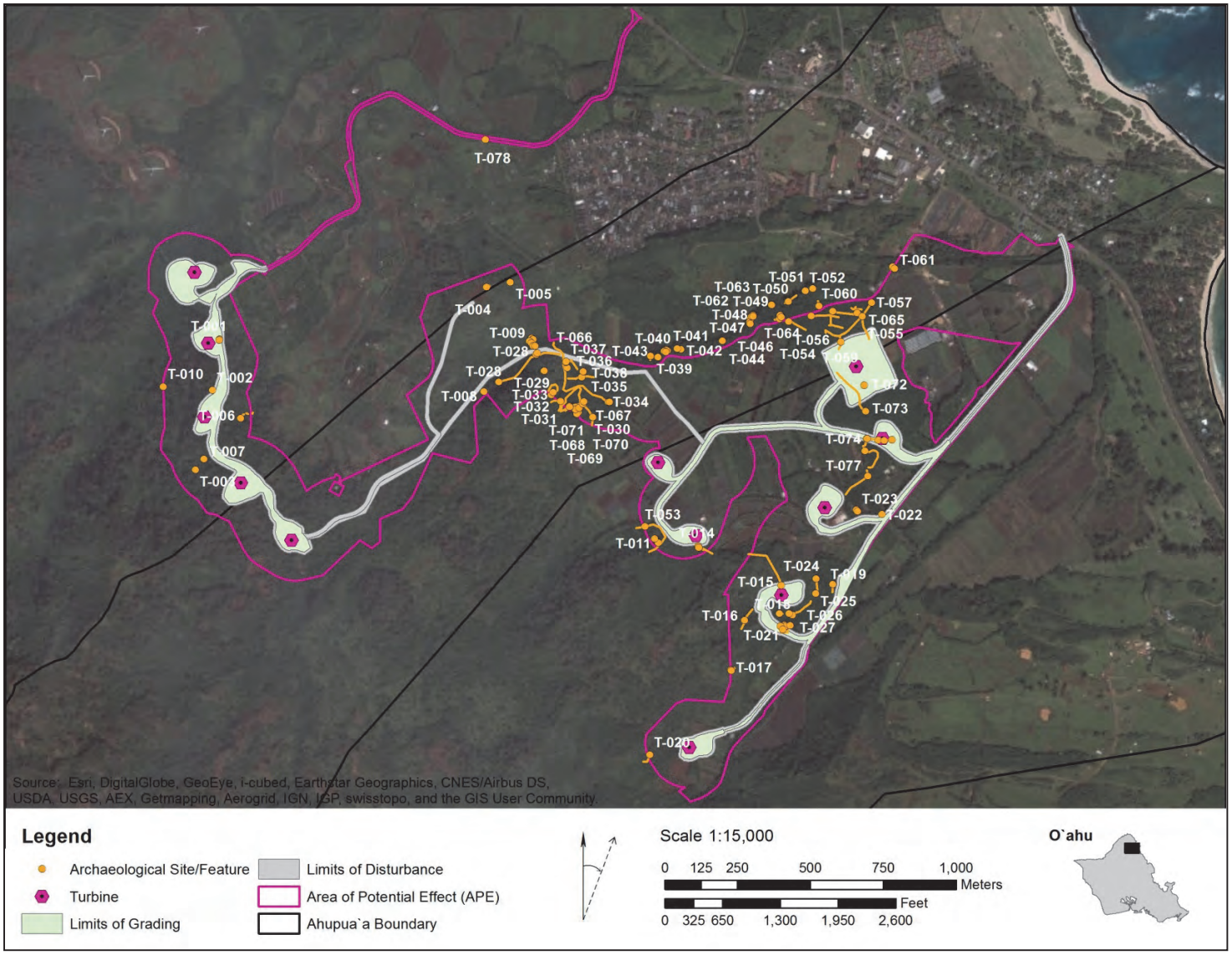

Figure 10. Aerial photograph showing the locations of archaeological sites identified during the current project.

Table 3. Archaeological Sites Recorded During the Current Project

SIHP No.	Temp. No.	Feature	Type	Function	Period	Outside of APE
	T-001	A	Alignment	Bivouac	Historic/Military	
		B	Hearth	Bivouac	Historic/Military	
	T-002	-	Stone Mound	Marker	Traditional	
	T-003	-	Platform	Habitation	Traditional	
	T-004	-	Bunker	Observation	Historic/Military	
	T-005	-	Bunker	Firing Position	Historic/Military	
	T-006	-	Ditch	Water Transport	Historic/Sugar	
	T-007	-	Terrace	Agriculture	Historic	
	T-008	-	Concrete Culvert	Water Control	Historic/Sugar	
	T-009	A	Concrete Foundation	Water Control	Historic/Sugar	
		B	Concrete Foundation	Water Control	Historic/Sugar	
		C	Concrete Foundation	Water Control	Historic/Sugar	
		D	Concrete Foundation	Water Control	Historic/Sugar	
		E	Retaining Wall	Water Control	Historic/Sugar	
	T-010	A	Ditch	Water Transport	Historic/Sugar	
		B	Ditch	Water Transport	Historic/Sugar	
		C	Ditch	Water Transport	Historic/Sugar	
		D	Ditch	Water Transport	Historic/Sugar	
	T-011	A	Valve	Water Control	Historic/Sugar	
		B	Well	Water Control	Historic/Sugar	
	T-014	A	Concrete Foundation	Water Control	Historic/Sugar	
		B	Concrete Ditch	Water Transport	Historic/Sugar	
		C	Iron Pipeline	Water Transport	Historic/Sugar	
	T-015	-	Pipeline	Water Transport	Historic/Sugar	
	T-016	-	Soil Ditch	Water Transport	Historic/Sugar	
	T-017	A	Stone Terrace	Agriculture	Traditional	
		B	Soil Terrace	Agriculture	Traditional	
	T-018	-	Stone/Concrete Ditch	Water Transport	Historic/Sugar	
	T-019	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-020	-	Terrace	Agriculture	Traditional	
	T-021	A	Storage Area	Water Control	Historic/Sugar	
		B	Concrete Well	Water Control	Historic/Sugar	
		C	Brick Well	Water Control	Historic/Sugar	
		D	Brick Well	Water Control	Historic/Sugar	
		E	Stone/Concrete Wall	Water Control	Historic/Sugar	
		F	Brick Well	Water Control	Historic/Sugar	
	T-022	-	Pump House	Water Control	Historic/Sugar	
	T-023	A	Shed	Storage	Historic	
		B	Concrete Slab	Storage	Historic	
	T-024	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-025	-	Stone Ditch	Water Transport	Historic/Sugar	
	T-026	-	Stone Retaining Wall	Roadway	Historic/Sugar	
	T-027	-	Stone/Concrete Ditch	Water Transport	Historic/Sugar	
	T-028	A	Soil Ditch	Water Transport	Historic/Sugar	
		B	Concrete Foundations	Water Transport	Historic/Sugar	
	T-029	A	Stone Lined Ditch	Water Transport	Historic/Sugar	
		B	Stone Lined Ditch	Water Transport	Historic/Sugar	
		C	Stone Lined Ditch	Water Transport	Historic/Sugar	

SIHP No.	Temp. No.	Feature	Type	Function	Period	Outside of APE
	T-030	A	Soil Ditch	Water Transport	Historic/Sugar	
		B	Retaining Wall	Water Transport	Historic/Sugar	
		C	Retaining Wall	Water Transport	Historic/Sugar	
		D	Concrete Ditch	Water Transport	Historic/Sugar	
	T-031	-	Terraced Soil Furrows	Agriculture	Historic	
	T-032	-	Terrace	Agriculture	Historic	
	T-033	-	Terraced Soil Furrows	Agriculture	Historic	
	T-034	A	Soil Ditch	Water Transport	Historic/Sugar	
		B	Concrete Footing	Water Control	Historic/Sugar	
	T-035	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-036	-	Stacked Stone Ditch	Water Transport	Historic/Sugar	
	T-037	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-038	-	Stone Alignment	Water Transport	Historic/Sugar	
	T-039	A	Overhang Shelter	Habitation	Traditional	X
		B	Terrace	Habitation	Traditional	X
	T-040	A	Terrace	Habitation	Traditional	X
		B	Terrace	Habitation	Traditional	X
		C	Terrace	Habitation	Traditional	X
		D	Terrace	Agriculture	Traditional	X
		E	Terrace	Agriculture	Traditional	X
	T-041	-	Filled Crevice	Poss. Burial	Traditional	X
	T-042	-	Terrace	Agriculture	Traditional	X
	T-043	-	Stone Lined Drainage	Water Control	Historic/Sugar	X
	T-044	-	Terrace	Uncertain	Traditional	X
	T-046	-	Terrace	Agriculture	Traditional	X
	T-047	-	Terrace	Agriculture	Traditional	X
	T-048	-	Wall	Uncertain	Traditional	X
	T-049	-	Wall	Habitation	Traditional	X
	T-050	-	Wall	Uncertain	Traditional	X
	T-051	-	Overhang Shelter	Habitation	Traditional	X
	T-052	-	Wall	Uncertain	Traditional	X
	T-053	-	Reservoir	Water Control	Historic/Sugar	
	T-054	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-055	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-056	-	Limestone Ditch	Water Transport	Historic/Sugar	
	T-057	-	Iron Pipeline	Water Transport	Historic/Sugar	
	T-059	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-060	-	Concrete Ditch	Water Transport	Historic/Sugar	X
	T-061	A	Pump House	Water Control	Historic/Sugar	
		B	Tank	Water Control	Historic/Sugar	
		C	Concrete Ditch	Water Transport	Historic/Sugar	
		D	Concrete Ditch	Water Transport	Historic/Sugar	
	T-062	A	Overhang Shelter	Habitation	Traditional	X
		B	Terrace (Internal)	Habitation	Traditional	X
		C	Terrace (External)	Habitation	Traditional	X
	T-063	A	Cave	Habitation	Traditional	X
		B	Terrace	Habitation	Traditional	X
	T-064	-	Concrete Ditch	Water Transport	Historic/Sugar	X
	T-065	-	Limestone Ditch	Water Transport	Historic/Sugar	
	T-066	-	Stacked Stone Ditch	Water Transport	Historic/Sugar	

SIHP No.	Temp. No.	Feature	Type	Function	Period	Outside of APE
	T-067	-	Modified Outcrop	Uncertain	Traditional	
	T-068	-	Stone Terrace	Uncertain	Traditional	
	T-069	A	Terrace	Habitation	Traditional	
		B	Terrace	Agriculture	Traditional	
	T-070	-	Artifact Scatter	Dump	Historic	
	T-071	-	Terraced Soil Furrows	Agriculture	Historic	
	T-072	-	Cave	Habitation	Traditional	
	T-073	-	Concrete Ditch	Water Transport	Historic/Sugar	
	T-074	A	Aqueduct	Water Transport	Historic/Sugar	
		B	Concrete Ditch	Water Transport	Historic/Sugar	
		C	Soil Ditch	Water Transport	Historic/Sugar	
		D	Limestone Retaining Wall	Water Transport	Historic/Sugar	
		E	Concrete Ditch	Water Transport	Historic/Sugar	
	T-077	-	Soil Ditch	Water Transport	Historic/Sugar	
	T-078	-	Concrete Ditch	Water Transport	Historic/Sugar	

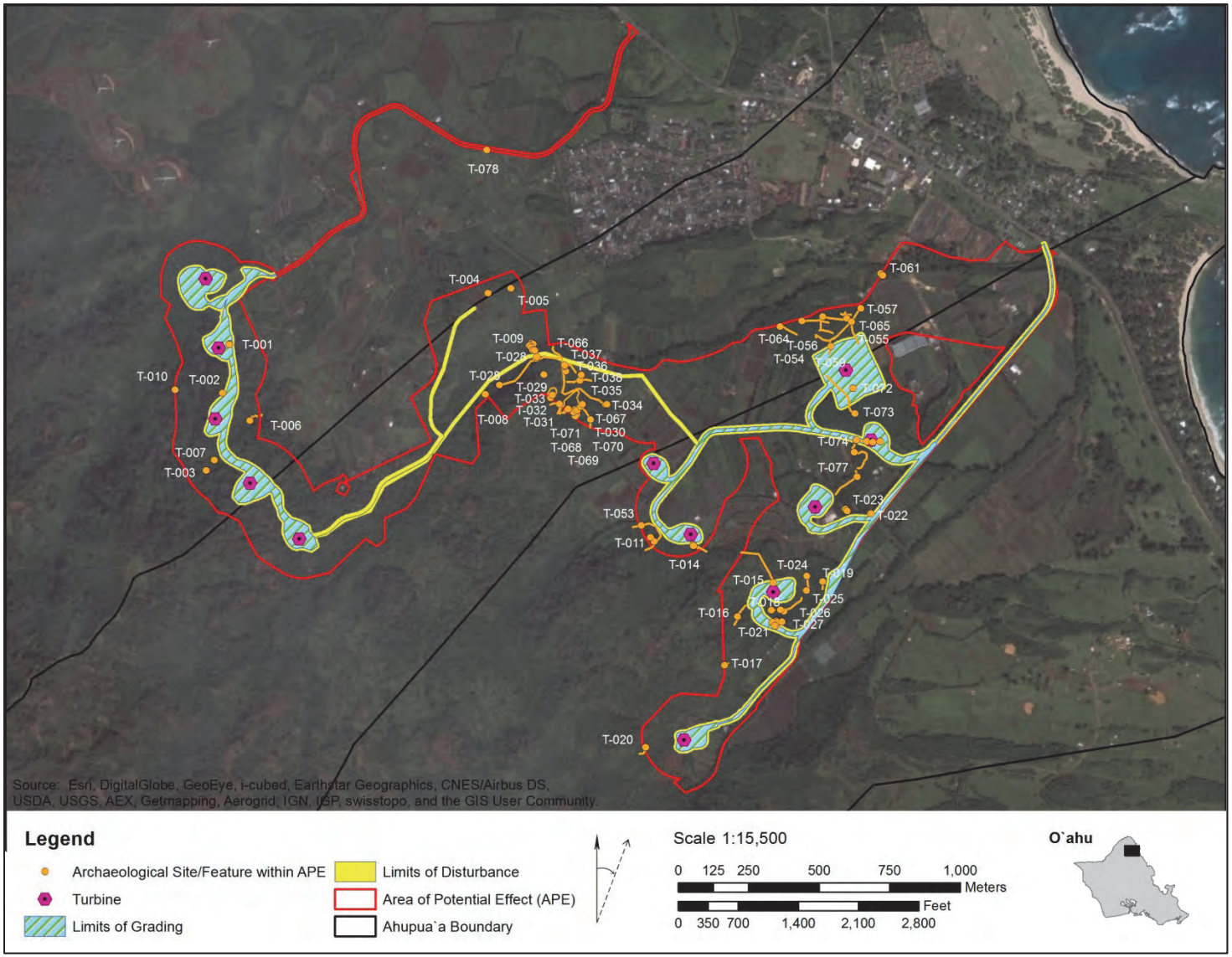

Figure 11. Aerial photograph showing the locations of archaeological sites within APE.

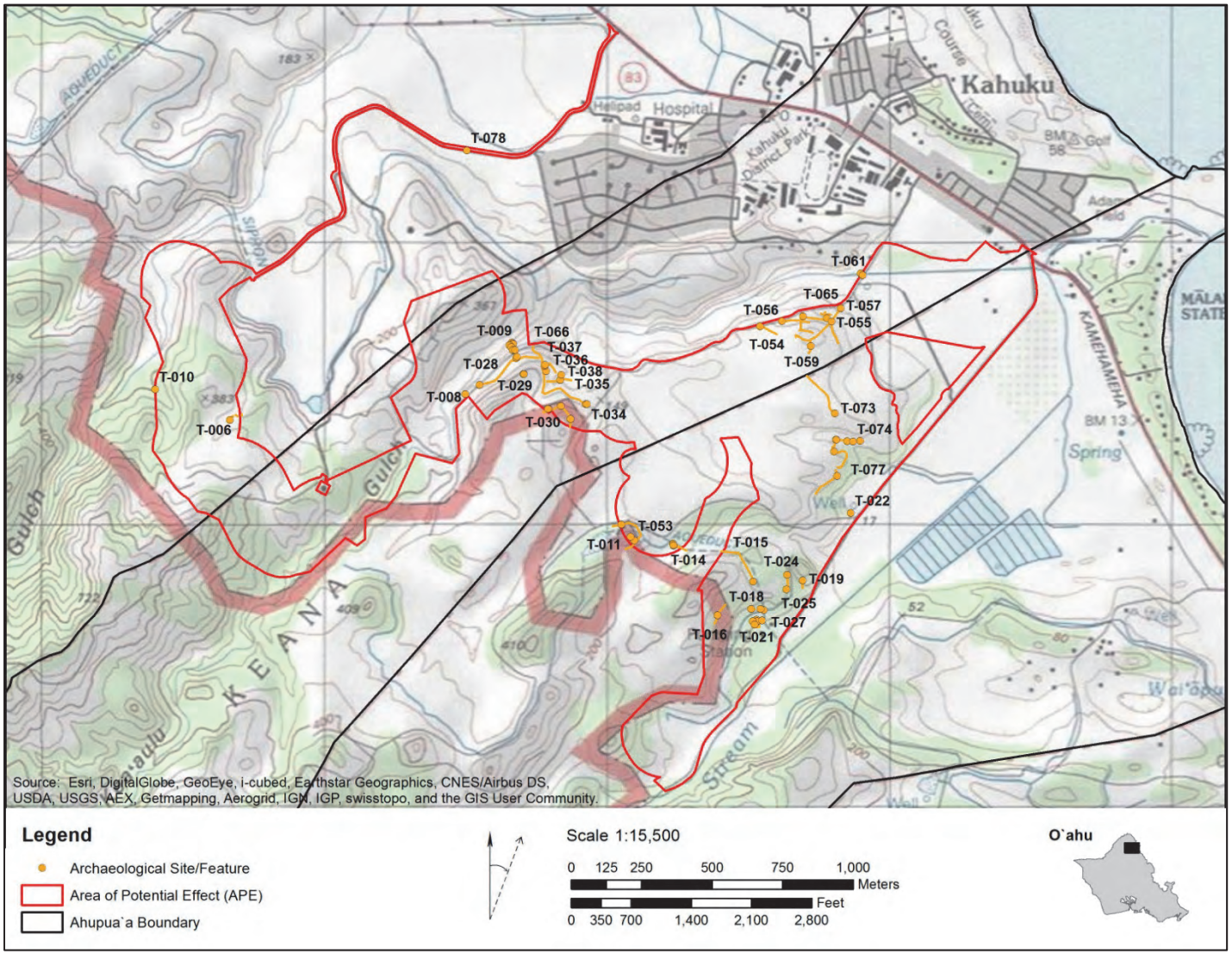

Figure 12. USGS map showing distribution of sugar plantation water transportation and control features.

Figure 13. Overview of central portion of project area.

Figure 14. Overview of project area and active agricultural lands.

Figure 15. Overview of eastern-most portion of the project area.

Figure 16. View of Ōhiʻaʻai Gulch.

Figure 17. Area of exposed sand in the northeastern portion of the project area.

Figure 18. Close-up of exposed sand.

7.0 SUBSURFACE TESTING RESULTS

Subsurface mechanical backhoe testing and hand excavated test units were placed at various locations throughout the project area (Figure 19). A total of 16 mechanically excavated trenches were placed throughout the project area with the focus of the testing being in those areas where heavy ground disturbance would take place during the proposed construction of the wind farm (Figure 20). None of the trenches excavated uncovered any cultural deposits or remains. Detailed information regarding each trench excavation is located in Appendix D. No subsurface testing was conducted within the active farm lots on the MHW lands to the east (so as to not disturb or excavate active farming), however, one test trench was placed within an active farm lot along the roadway within the DOA controlled lands on the west side of the APE. This trench (Trench 14) was placed in an area where the proposed road realignment may occur.

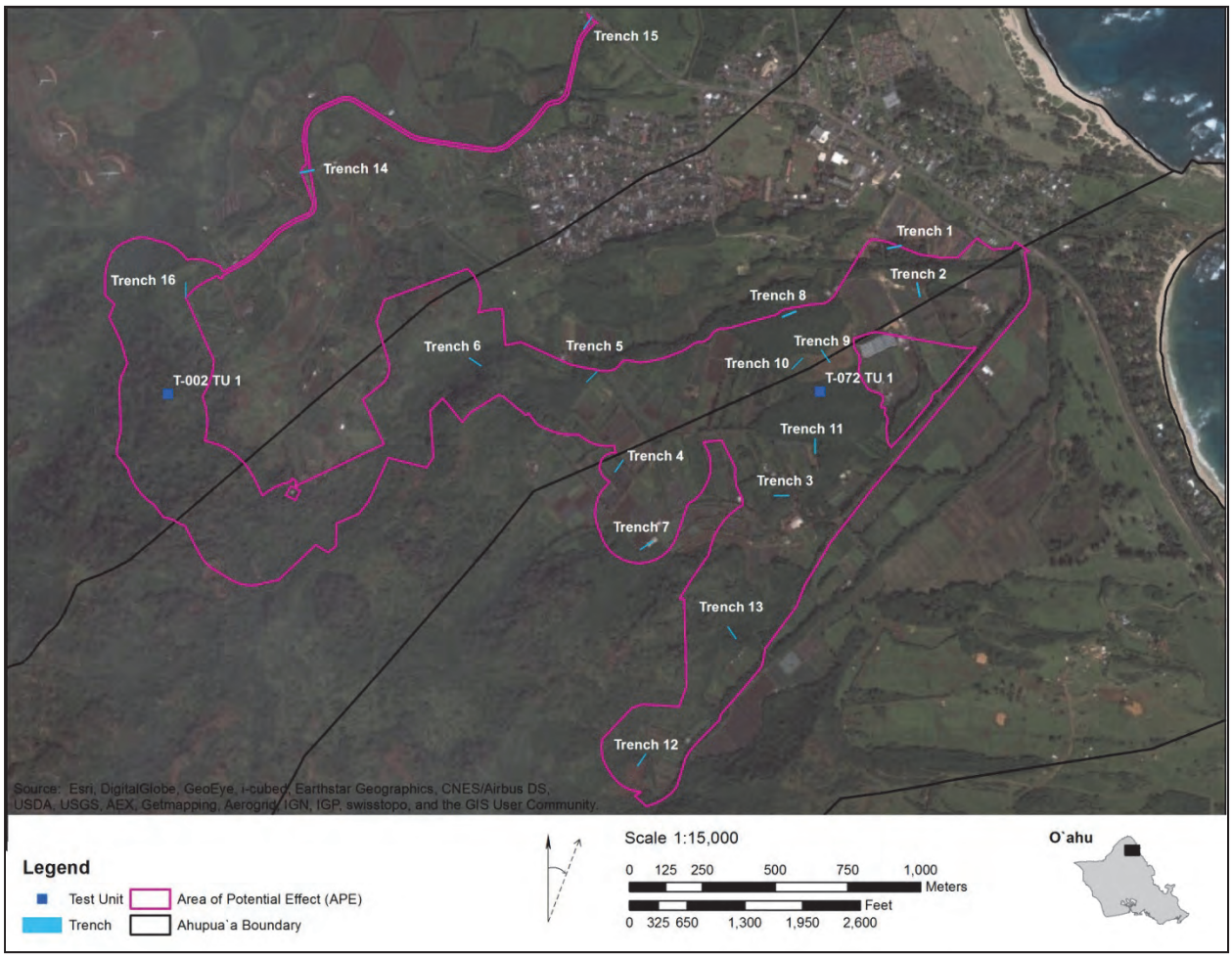

Figure 19. Locations of test trenches and test units within the APE.

Figure 20. Trench excavations were conducted throughout the project area.

Two controlled hand-excavated test units were excavated at two sites (T-002, mound and T-072, cave). They were excavated with trowel, brush, and dustpan and all soil was screened through nested 1/4 and 1/8 inch mesh screens. Any cultural material identified was collected, bagged by provenience, and transported back to the Pacific Legacy laboratory in Kailua for processing and further analysis. The excavations were documented with notes on standard excavation forms. Profiles were drawn and the excavation was recorded with digital images. Two collected charcoal samples were submitted for identification and radiocarbon dating.

7.1 Site T-002

The excavations conducted at Site T-002 (stone mound) were conducted because it was thought that the stone mound could potentially contain a human burial. The mound is located on top a ridgeline on the west side of the APE. The 1x1 meter test unit was placed on the west side of the mound in order to bisect the stone feature (Figure 21 and Figure 22). The excavation proceeded with the removal of surface rocks within the test unit. Excavation proceeded to a depth of 63 cm below surface. Three natural stratigraphic layers were revealed (Table 6; Figure 23). These natural layers consisted of two layers of silty clay overlaying a clay layer.

No cultural remains, artifacts, or human remains were encountered during the excavation at Site T-002.

Figure 21. Site T-002, Test Unit 1. Prior to excavation, view to east.

Figure 22. Site T-002, Test Unit 1, post excavation, view to east.

Table 4. Soils Descriptions for Site T-002, Test Unit 1

Layer	Depth (cm below surface)	Description
Layer I	0-6	Dark yellowish brown (5YR 2/2) silt loam; very fine grain, structureless; non-sticky, non-plastic; abrupt boundary. Contains leaf litter.
Layer II	3-26	Dark brown (7.5YR 3/3) silt loam; very fine grain, structureless; non-sticky, non-plastic; clear boundary.
Layer III	14-63	Yellowish red (5YR 4/6) clay; blocky, fine; non-sticky, non-plastic. Contains decaying rocks.

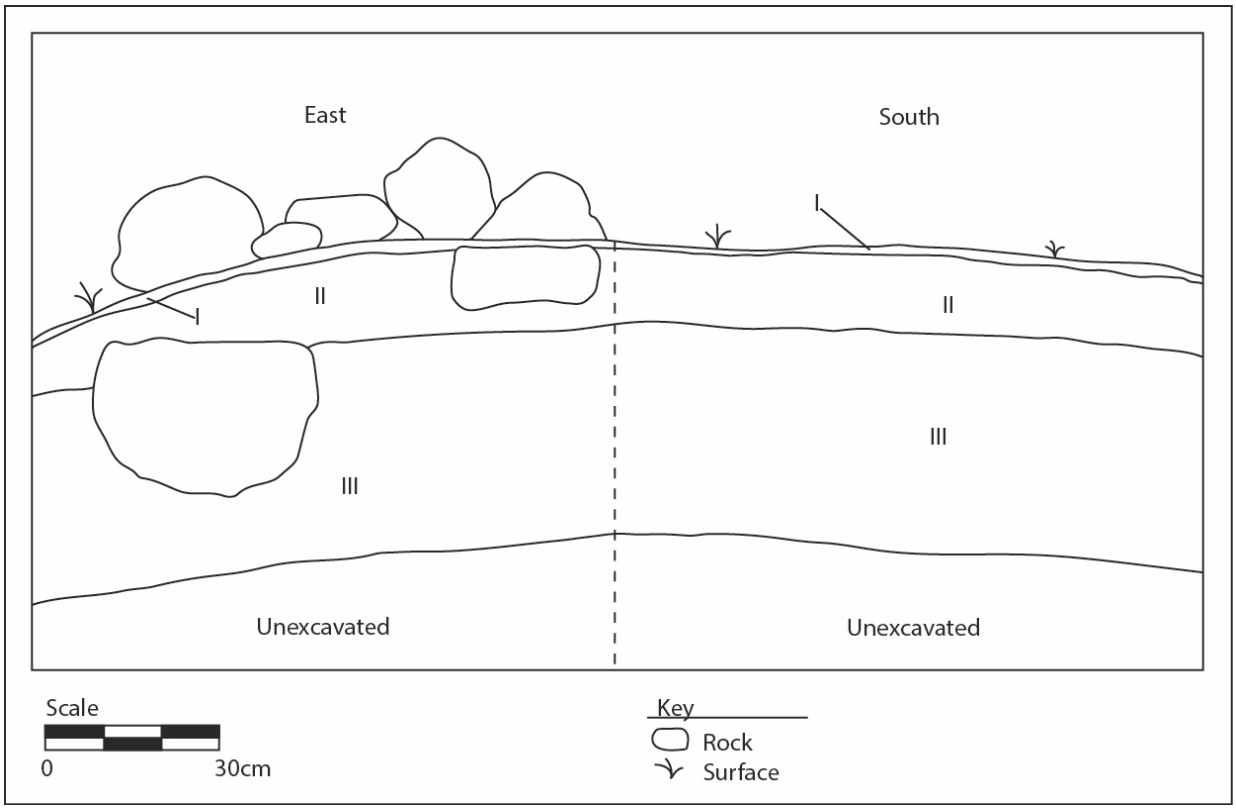

Figure 23. Soil profile of Test Unit 1 at Site T-002.

7.2 SITE T-072

A single 50x50 cm test unit was excavated at the rear of the cave at Site T-072 (Figure 24 and Figure 25). The test unit was placed at this site because marine shell midden and non-human animal bone were observed on the surface of the cave. Given the tight space and low ceiling within the cave along with the smaller entrance, it was thought that a smaller 50x50 cm unit would be best excavated at the site.

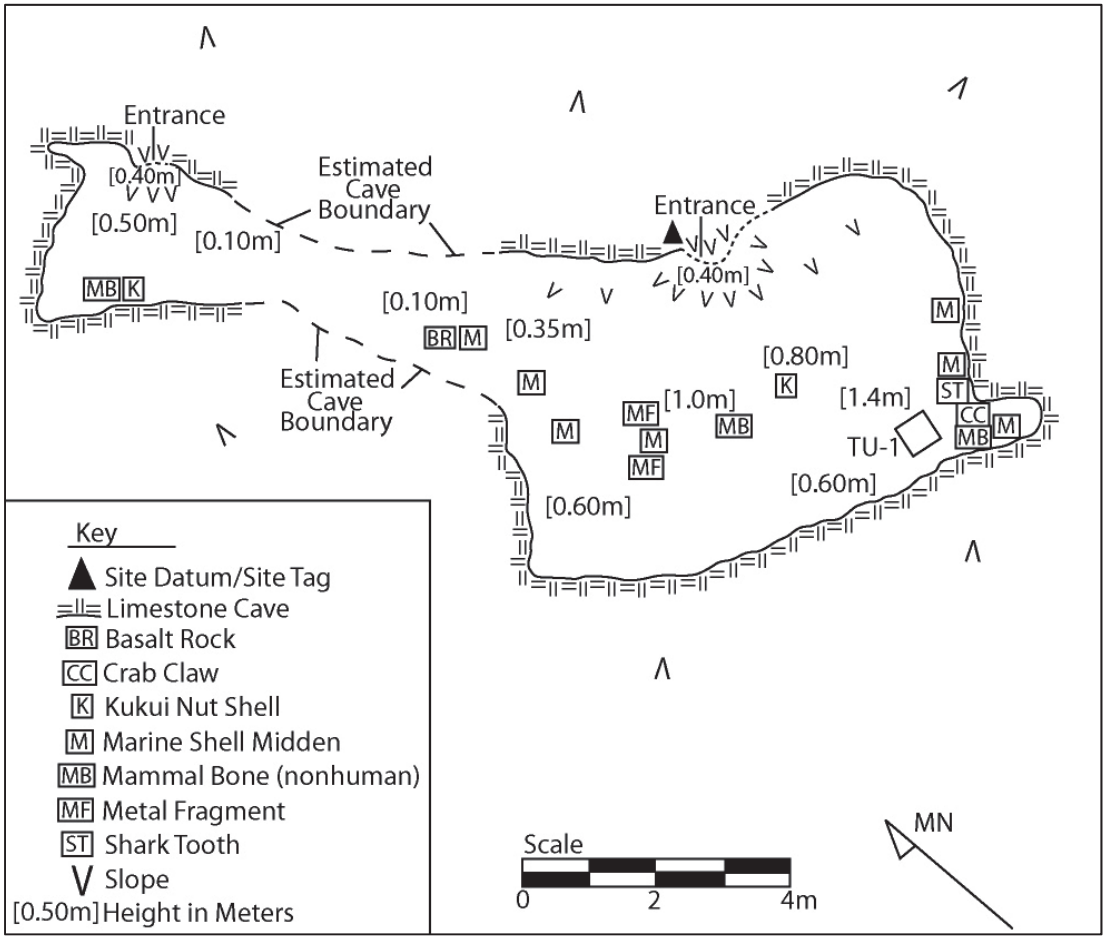

Figure 24. Plan view of Site T-072.

Excavations revealed a significant cultural deposit within the cave. Two silt layers were identified during the excavations (Table 7 and Figure 26). Two metal artifacts were recovered from Layer I, level 1 of the unit – a miniature metal picture frame and a metal button post.

Abundant marine shell midden was collected throughout the excavation. The majority of shell midden was recovered between Layer I, level 2 and Layer II, level 1. The midden was also associated with four basalt flakes recovered from Layer I, level 2. Two charcoal samples were collected in situ and submitted for dating. Both samples were recovered from Layer I, level 2 (ca. 22 cmbd and 37 cmbd). The radiocarbon dates spanned AD 1650 to Post 1950. However, given the lack of historic material in the lower level, we can conclude a date of AD 1650 to 1815 for this site.

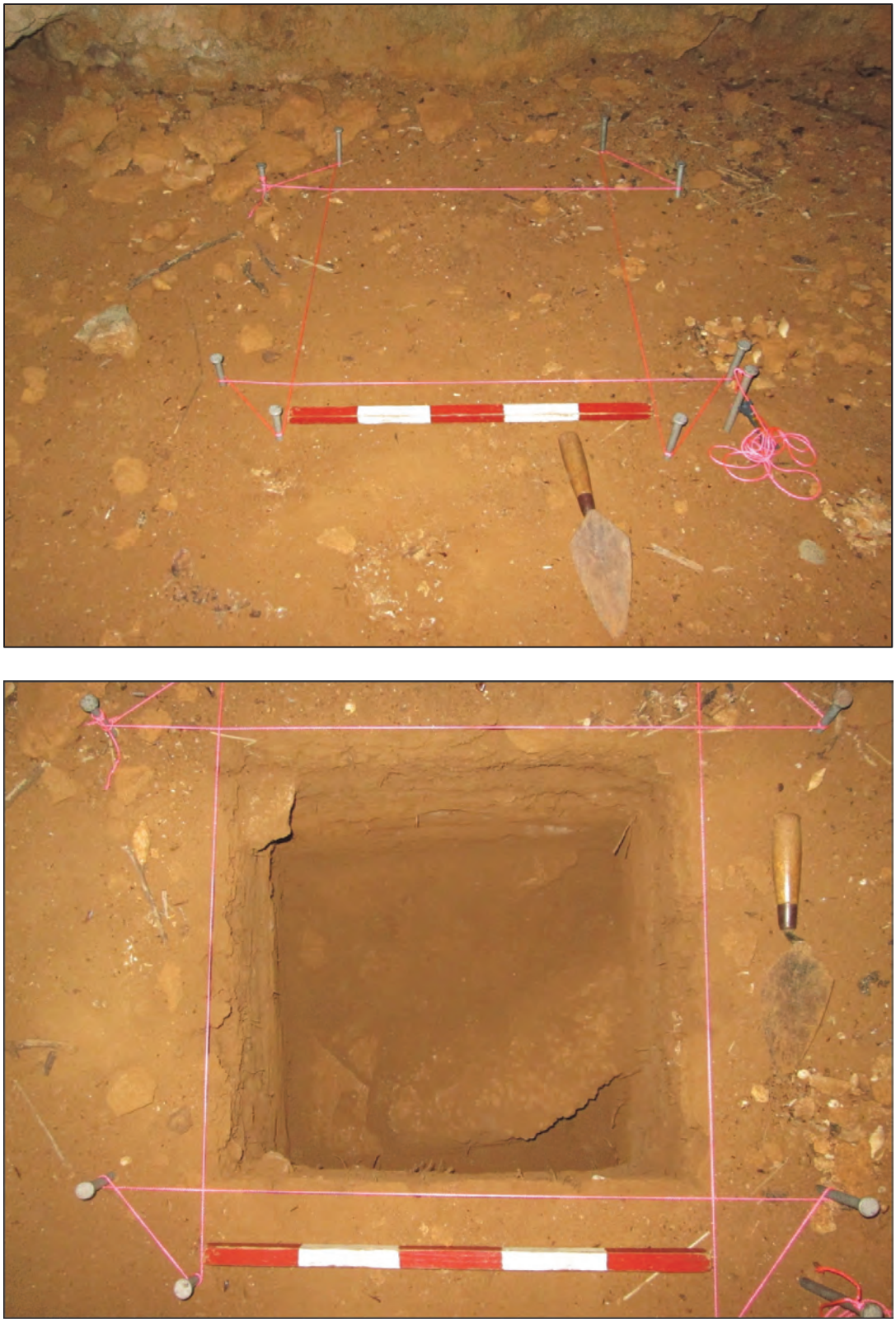

Figure 25. Site T-072, Test Unit 1, pre- and post-excavation photographs.

Table 5. Soil Descriptions for Site T-072, Test Unit 1

Layer	Depth (cm below datum)	Description
Layer I	10-40	Dark yellowish brown (10YR 3/6) silt. Moderate, fine grain; slightly sticky, plastic, weakly cemented; abrupt boundary. Contains cultural material: midden, non-human bone, basalt flakes, metal artifacts.
Layer II	30-70	Strong brown (7.5YR 4/6) silt. Moderate, fine blocky; slightly sticky, non-plastic, weakly cemented. Contains cultural material near the top of the layer.

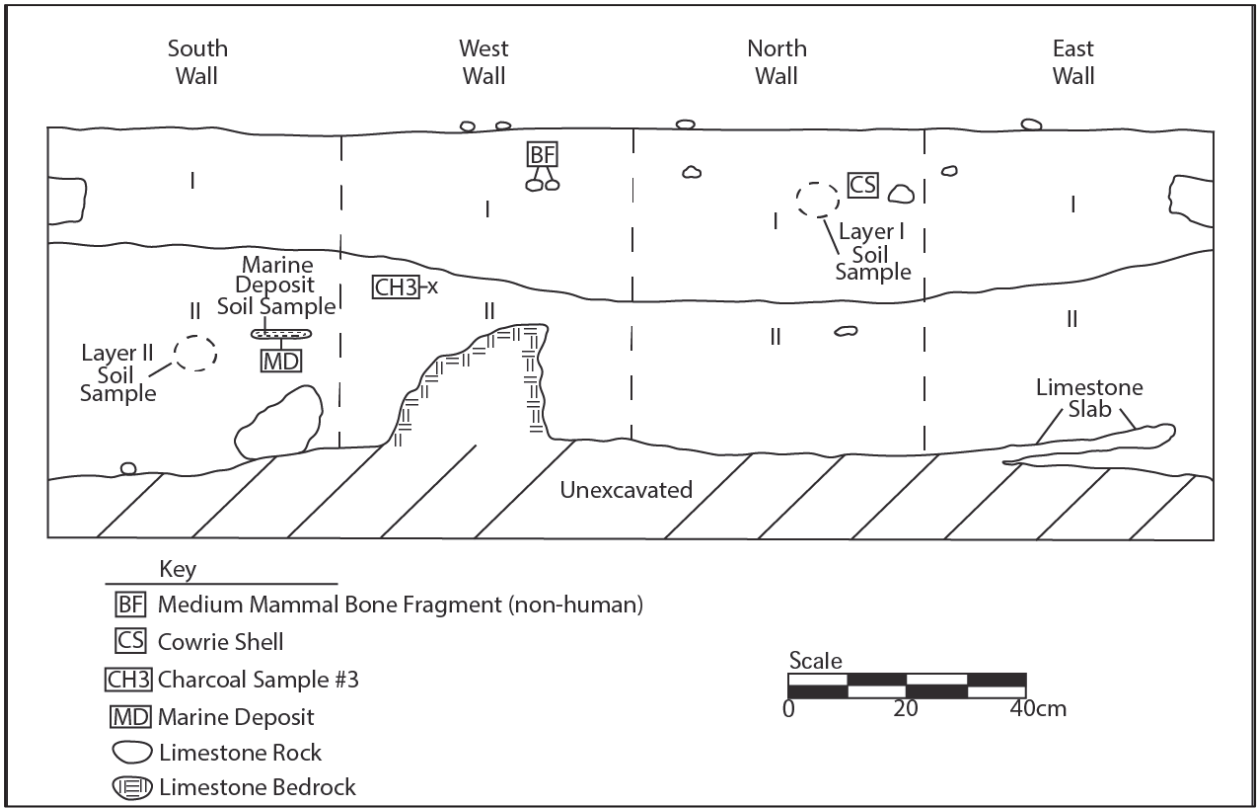

Figure 26. Profiles from Site T-072, Test Unit 1.

8.0 LABORATORY RESULTS

8.1 ARTIFACT ANALYSIS

Site T-063

Three traditional Hawaiian artifacts were recovered from Site T-063 (cave). Although no excavation was conducted at the site since it was located outside of the revised APE boundary, three artifacts were collected by the field crew for security reasons. The artifacts were very recognizable and visible in the cave and the archaeological crew worried that they might be looted, so were collected. The three traditional artifacts retrieved from the surface of the cave consisted of two basalt adzes and a limestone hammerstone and are described below, summarized in Table 8, and illustrated in Figure 27 through Figure 29).

Artifact 1. Basalt Adze (Figure 27). Consists of a large tanged quadrangular adze manufactured out of fine grain, dense, dark gray basalt. The front, sides, and back of the blade are ground and polished. The tang is partially ground and polished on the sides and back. The back of the poll is not ground or polished. The blade length relative to the length of the tang appears shorter than the typical adze of this size, which suggests that it may have originally been longer and possibly reworked after its original manufacture. It measures 197.5 mm in length, 45.2 mm in width, 40.5 mm in thickness, and weighs 329.5 grams. The cutting edge is 45.0 mm wide.

Artifact 2. Limestone Hammerstone (Figure 28). Consists of a discoidal hammerstone manufactured out of limestone. The edges are rounded and battered from hammering. The sides are slightly concave. It measures 75.9 mm in length, 75.6 mm in width, 39.0 mm in thickness, and weighs 270.6 grams.

Artifact 3. Basalt Adze (Figure 29). Consists of a small tanged quadrangular adze manufactured out of fine grain, dense, dark gray basalt. The front, sides, and back of the blade are ground and polished. The tang is partially ground and polished on the sides and back. The back of the poll is not ground or polished. It measures 88.3 mm in length, 26.7 mm in width, 18.1 mm in thickness, and weighs 82.6 grams. The cutting edge is 30.2 mm wide.

Figure 27. Large basalt quadrangular adze collected from Site T-063.

Figure 28. Limestone hammerstone recovered from Site T-063.

Figure 29. Small basalt quadrangular adze recovered from Site T-063.

Table 6. Artifacts Recovered from the Surface of Site T-063

Artifact No.	Site No.	Bag No.	Material	Description	Qty (MNI)	L (mm)	W/Diam (mm)	Th (mm)	Wt (g)	Age	Cond.	Comments
1	T-063	001	Lithic	Basalt Adze	1	197.5	45.2	40.5	329.5	Pre-Contact	good	Large tanged quadrangular adze manufactured out of fine grain, dense, dark gray basalt; front, sides, and back are ground and polished; tang is partially ground and polished on the sides and back; back face of poll is not ground or polished; the blade length relative to the length of the tang appears shorter than the typical adze of this size, which suggests that it may have originally been longer and possibly reworked after its original manufacture. The cutting edge is 45.0 mm wide.
2	T-063	002	Lithic	Limestone Hammerstone	1	75.9	75.6	39.0	270.6	Pre-Contact	good	Discoidal hammerstone manufactured out of limestone; the edges are rounded and battered from hammering; the sides are slightly concave
3	T-063	003	Lithic	Basalt Adze	1	88.3	26.7	18.1	82.6	Pre-Contact	good	Small tanged quadrangular adze manufactured out of fine grain, dense, dark gray basalt; front, sides, and back are ground and polished; tang is partially ground and polished on the sides and back; back face of poll is not ground or polished. The cutting edge is 30.2 mm wide.

Site T-072

A total of six artifacts were collected from Test Unit 1 (Table 9), consisting of a miniature metal picture frame, a copper button post, and four basalt flakes. The two historic metal artifacts were collected from Layer I, level 1, while the four traditional basalt flakes were collected from Layer I, level 2. General artifact descriptions for each of the artifacts are presented below.

Artifact 1. Miniature metal picture frame (Figure 30a and b). This two-piece oval miniature picture frame **m**easures overall 27.9 mm long by 22.2 mm wide by 3.3 mm thick, and weighs 2.9 grams. The opening for the picture measures 14.4 mm by 8.9 mm. The front and back of the frame are held together by four pinch clasps.

Artifact 2. Metal button post (Figure 31). This copper button post measures 9.5 mm in length and weighs 2.0 grams. The post has a diameter of 4.0 mm; the back disk has a diameter of 9.4 mm and the front disk has a diameter of 11.2 mm. The front disk is slightly concave and exhibits a metal protrusion that probably anchored a ceramic (or other decorative material) face.

Also collected during the excavation at Site T-072, Test Unit 1 were four basalt flakes all recovered from Layer I, level 2 (20-30 cmbd). Artifact 3 was recovered *in situ* from 21 cmbd. The remaining flakes were collected from the screen.

Artifact 3. Basalt Flake (Figure 32). Medium grain, medium gray basalt flake with some cortex present on dorsal surface**.** Measures 53.6 mm in length, 63.0 mm in width, 12.0 mm in thickness, and weighs 54.5 grams.

Artifact 4. Basalt Flake (Figure 32). Fine grain, dark red basalt flake with no cortex present. Measures 12.7 mm in length, 17.5 mm in width, 3.8 mm in thickness, and weighs 0.5 grams.

Artifact 5. Basalt Flake (Figure 32). Fine grain, dark red basalt flake with no cortex present. Measures 14.1 mm in length, 19.4 mm in width, 3.2 mm in thickness, and weighs 0.8 grams.

Artifact 6. Basalt Flake (Figure 32). Medium grain, medium gray basalt flake with no cortex present. Measures 16.7 mm in length, 19.5 mm in width, 3.2 mm in thickness, and weighs 1.3 grams.

Figure 30a and b. Artifact 1, miniature metal picture frame recovered from Site T-072, Test Unit 1.

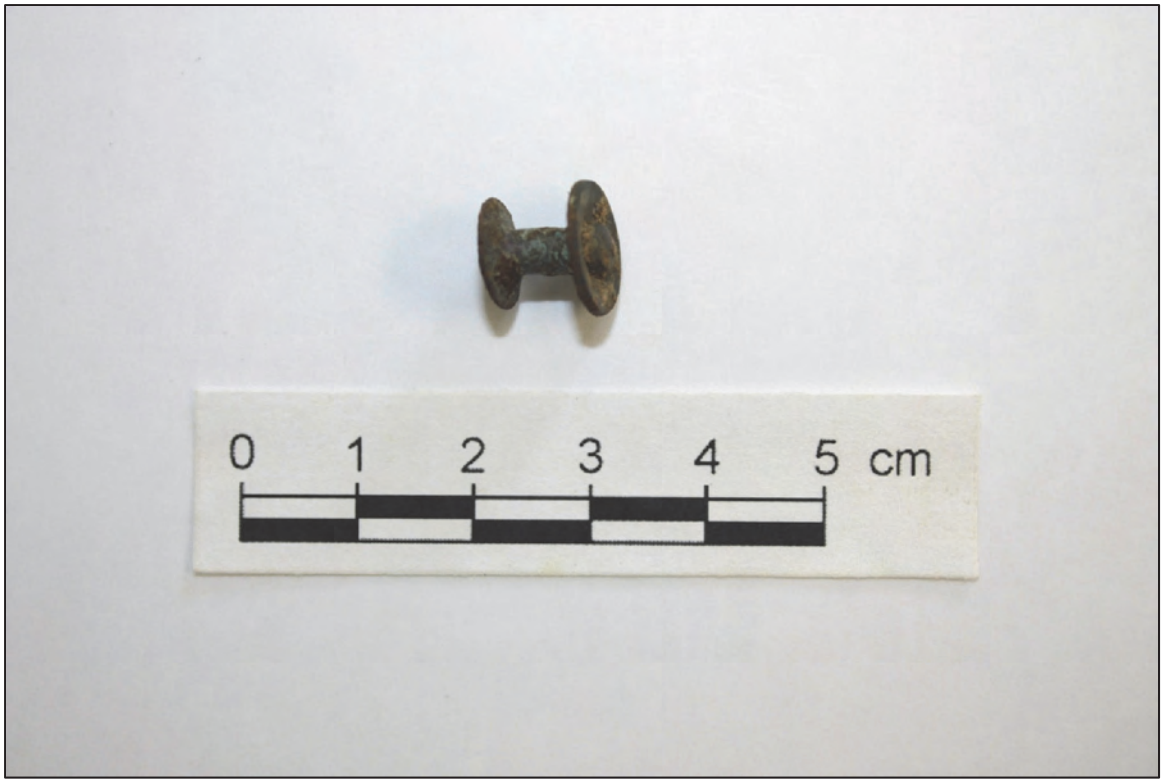

Figure 31. Artifact 2, metal button post recovered from Site T-072, Test Unit 1.

Figure 32. Basalt flakes recovered from Site T-072, Test Unit 1 (Artifacts Nos. 3-6 [left to right]).

Table 7. Artifacts Recovered from Site T-072, Test Unit 1

Artifact No.	Bag No.	Site No.	Unit	Layer/ level	CMBD	Material	Description	Qty (MNI)	L (mm)	W/ Diam. (mm)	Th. mm)	Wt (g)	Age	Cond.	Comments
1	5	T-072	TU-1	I / 1	16	Metal	Picture Frame	1	27.9	22.2	3.3	2.9	Historic	fair	Miniature metal picture frame
2	8	T-072	TU-1	I /1	10-21	Metal	Button Post	1	9.5			2.0	Historic	fair	Metal button post
3	10	T-072	TU-1	I /2	21	Lithic	Basalt Flake	1	53.6	63.0	12.0	54.5	Pre-Contact	good	Medium grain, medium gray basalt; some cortex on dorsal surface
4	15	T-072	TU-1	I /2	20-30	Lithic	Basalt Flake	1	12.7	17.5	3.8	0.5	Pre-Contact	good	Fine grain, dark red basalt; no cortex
5	15	T-072	TU-1	I /2	20-30	Lithic	Basalt Flake	1	14.1	19.4	3.2	0.8	Pre-Contact	good	Fine grain, dark red basalt; no cortex
6	15	T-072	TU-1	I	20-30	Lithic	Basalt Flake	1	16.7	19.5	3.2	1.3	Pre-Contact	good	Medium grain, medium gray basalt; no cortex

8.2 MIDDEN ANALYSIS

Midden is human food refuse comprised of marine shell, non-human bone generally consisting of remains from dog, pig, chicken, wild birds, and fish, as well as macrobotanical remains. Midden remains were a major component of cultural materials collected from the excavation of Test Unit 1 Site T-072. Overall, a total of 193.3 grams of midden was recovered from the test excavation unit. The most frequent midden type is marine shell, comprising 162.7 g (84.2%) of the total midden assemblage, followed by non-human bone (28.9 g; 15.0%), and flora (1.7 g; 0.9%) (Table 10).

Out of the total 193.3 grams that constitutes the midden assemblage, the marine shell is predominantly comprised of Gastropoda, or sea snail (71.8 g; 37.1%), followed by Malacostraca, or crustacean (45.4 g; 23.5%), Bivalvia, or bivalve (23.9 g; 12.4%), and Echinoidea, or sea urchin (21.6 g; 11.2%) (Table 11). The non-human bone is dominated by Mammalia, or mammal (25.3 g; 13.1%), followed by Osteichthyes, or bony fish (3.2 g; 1.7%), and Aves, or bird (0.4 g; 0.2%). The flora consists of Euphorbiaceae, or spurge (1.7 g; 0.9%).

Midden was collected from every level during the excavation of Site T-072, Test Unit 1 (Figure 33). The majority of midden was collected from Layer I, level 2 (70.4 g; 36.4%), followed by Layer I, level 3 (39.5 g; 20.4 %), Layer I, level 1 (25.6 g; 13.2 %), Layer II, level 3 (22.4 g; 11.6%), Layer II, level 2 (21.1 g; 10.9%), Layer II, level 1 (8.9 g; 4.6%), Layer II, level 4 (4.3 g; 2.2%), and the surface (1.1 g; 0.6%).

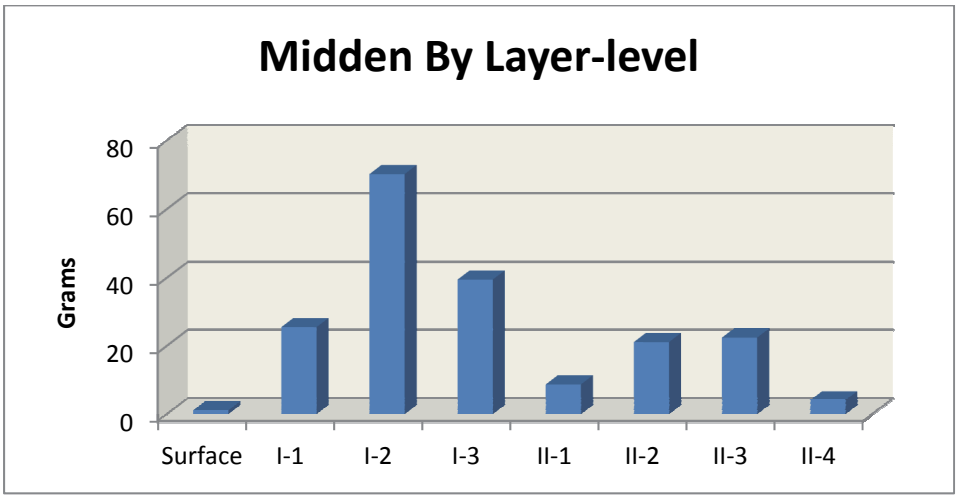

Figure 33. Distribution of total midden by layer and level.

Midden constituents from Layer I total 136.6 g, which are 70.7% of the total midden recovered. Marine and crab shell make up the majority of the midden recovered from Layer I (109.4 g; 80.1%). This is followed by non-human bone (25.5 g; 18.7%) and k*ukui* (*Aleurites*) endocarp (1.7 g; 1.2%. Gastopods make up the overall majority of marine shell midden recovered from Layer I. The crab shell only makes up 2.1 g of the 109.4 grams of crab and marine shell (1.9%).

Table 8. Midden Recovered from T-072, Test Unit 1

	Surface		Layer – level														Totals	
			I-1		I-2		I-3		II-1		II-2		II-3		II-4			
BONE	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**
Aves	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.4**	**0.2%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.4**	**0.2%**
Unid. Aves spp.	-	-	-	-	-	-	0.4	0.2%	-	-	-	-	-	-	-	-	0.4	0.2%
Mammalia	**1.1**	**0.6%**	**8.8**	**4.6%**	**12.4**	**6.4%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**1.8**	**0.9%**	**1.2**	**0.6%**	**0.0**	**0.0%**	**25.3**	**13.1%**
Rattus exulans	-	-	0.1	0.1%	0.1	0.1%	-	-	-	-	-	-	-	-	-	-	0.2	0.1%
Unid. Med. Mammal spp.	1.1	0.6%	8.5	4.4%	11.1	5.7%	-	-	-	-	1.8	0.9%	1.2	0.6%	-	-	23.7	12.3%
Unid. Med. Mammal spp., burnt	-	-	-	-	0.9	0.5%	-	-	-	-	-	-	-	-	-	-	0.9	0.5%
Unid. Small Mammal spp.	-	-	0.2	0.1%	0.3	0.2%	-	-	-	-	-	-	-	-	-	-	0.5	0.3%
Osteichthyes	**0.0**	**0.0%**	**0.7**	**0.4%**	**0.8**	**0.4%**	**1.3**	**0.7%**	**0.4**	**0.2%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**3.2**	**1.7%**
Unid. Osteichthyes spp.	-	-	0.7	0.4%	0.8	0.4%	1.3	0.7%	0.4	0.2%	-	-	-	-	-	-	3.2	1.7%
Bone Totals	**1.1**	**0.6%**	**9.5**	**4.9%**	**13.2**	**6.8%**	**1.7**	**0.9%**	**0.4**	**0.2%**	**1.8**	**0.9%**	**1.2**	**0.6%**	**0.0**	**0.0%**	**28.9**	**15.0%**
MARINE SHELL	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**
Bivalvia	**0.0**	**0.0%**	**9.1**	**4.7%**	**3.5**	**1.8%**	**8.1**	**4.2%**	**3.1**	**1.6%**	**0.1**	**0.1%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**23.9**	**12.4%**
Isognomonidae spp.	-	-	-	-	1.9	1.0%	5.0	2.6%	3.0	1.6%	-	-	-	-	-	-	9.9	5.1%
Mytilidae spp.	-	-	-	-	1.6	0.8%	3.1	1.6%	0.1	0.1%	0.1	0.1%	-	-	-	-	4.9	2.5%
Unid. Bivalvia spp.	-	-	9.1	4.7%	-	-	-	-	-	-	-	-	-	-	-	-	9.1	4.7%
Echinoidea	**0.0**	**0.0%**	**0.9**	**0.5%**	**11.4**	**5.9%**	**9.3**	**4.8%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**21.6**	**11.2%**
Unid. Echinoidea spp.	-	-	0.1	0.1%	7.6	3.9%	7.3	3.8%	-	-	-	-	-	-	-	-	15.0	7.8%
Unid. Echinoidea Radula	-	-	0.8	0.4%	3.8	2.0%	2.0	1.0%	-	-	-	-	-	-	-	=	6.6	3.4%
Gastropoda	**0.0**	**0.0%**	**5.2**	**2.7%**	**41.8**	**21.6%**	**18.0**	**9.3%**	**0.7**	**0.4%**	**0.5**	**0.3%**	**5.4**	**2.8%**	**0.2**	**0.1%**	**71.8**	**37.1%**
Conidae spp.	-	-	1.1	0.6%	3.1	1.6%	3.2	1.7%	-	-	-	-	-	-	-	-	7.4	3.8%
Cypraeidae spp.	-	-	0.2	0.1%	7.3	3.8%	3.3	1.7%	-	-	-	-	-	-	-	-	10.8	5.6%
Nerita picea	-	-	1.1	0.6%	9.2	4.8%	2.8	1.4%	0.1	0.1%	-	-	-	-	-	-	13.2	6.8%
Patellidae spp.	-	-	-	-	-	-	0.2	0.1%	-	-	-	-	-	-	-	-	0.2	0.1%
Strombidae spp.	-	-	-	-	11.6	6.0%	5.1	2.6%	0.1	0.1%	-	-	-	-	-	-	16.8	8.7%
Thaididae spp.	-	-	-	-	0.3	0.2%	0.5	0.3%	-	-	-	-	-	-	-	-	0.8	0.4%
Trochidae spp.	-	-	-	-	0.1	0.1%	0.3	0.2%	-	-	0.5	0.3%	5.4	2.8%	-	-	6.3	3.3%
Turbinidae spp.	-	-	-	-	8.9	4.6%	2.2	1.1%	0.5	0.3%	-	-	-	-	-	-	11.6	6.0%
Unid. Gastropoda spp.	-	-	0.3	0.2%	1.0	0.5%	-	-	-	-	-	-	-	-	0.2	0.1%	1.5	0.8%
Unid. Gastropoda, operculum	-	-	0.7	0.4%	0.3	0.2%	-	-	-	-	-	-	-	-	-	-	1.0	0.5%
Unid. Land Snail	-	-	1.8	0.9%	-	-	0.4	0.2%	-	-	-	-	-	-	-	-	2.2	1.1%
Malacostraca	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**2.1**	**1.1%**	**4.7**	**2.4%**	**18.7**	**9.7%**	**15.8**	**8.2%**	**4.1**	**2.1%**	**45.4**	**23.5%**
Carpiliidae spp.	-	-	-	-	-	-	2.1	1.1%	4.7	2.4%	18.7	9.7%	15.8	8.2%	4.1	2.1%	45.4	23.5%
Shell Totals	**0.0**	**0.0%**	**15.2**	**7.9%**	**56.7**	**29.3%**	**37.5**	**19.4%**	**8.5**	**4.4%**	**19.3**	**10.0%**	**21.2**	**11.0%**	**4.3**	**2.2%**	**162.7**	**84.2%**
FLORA	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**	**Wt. (g)**	**Unit %**
Euphorbiaceae	**0.0**	**0.0%**	**0.9**	**0.5%**	**0.5**	**0.3%**	**0.3**	**0.2%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**1.7**	**0.9%**
Aleurites moluccana	-	-	0.9	0.5%	-	-	-	-	-	-	-	-	-	-	-	-	0.9	0.5%
Aleurites moluccana, burnt	-	-	-	-	0.5	0.3%	0.3	0.2%	-	-	-	-	-	-	-	-	0.8	0.4%
Flora Totals	**0.0**	**0.0%**	**0.9**	**0.5%**	**0.5**	**0.3%**	**0.3**	**0.2%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**	**1.7**	**0.9%**
Totals	**1.1**	**0.6%**	**25.6**	**13.2%**	**70.4**	**36.4%**	**39.5**	**20.4%**	**8.9**	**4.6%**	**21.1**	**10.9%**	**22.4**	**11.6%**	**4.3**	**2.2%**	**193.3**	**100.0%**

The midden constituents from Layer II are much different. Total midden from Layer II is 56.7 g, or 29.3% of the total midden recovered from the test unit. The overwhelming majority of this midden is made up of crab claws and carapace. Crab remains from Layer II total 43.3 g or 76.4% of the total midden from Layer II. The remaining midden from Layer II is composed of a few gastropod and bivalve shells.

The remarkable aspect of the Layer II midden is the size and robust nature of the crab claws recovered. Figure 34 shows two of the better preserved and more complete claws recovered. These two claws are from Layer II, level 2. The significance of these claws is uncertain at this time, but their uniqueness needs recognition, because such findings are rare.

Table 9. Weight (g) of Midden Recovered from Test Unit 1, Site T-072, Sorted by Level

	Surface	I-1	I-2	I-3	II-1	II-2	II-3	II-4	Totals
Aves	0	0	0	0.4	0	0	0	0	0.4
Mammalia	1.1	8.8	12.4	0	0	1.8	1.2	0	25.3
Osteichthyes	0	0.7	0.8	1.3	0.4	0	0	0	3.2
Bivalvia	0	9.1	3.5	8.1	3.1	0.1	0	0	23.9
Echinoidea	0	0.9	11.4	9.3	0	0	0	0	21.6
Gastropoda	0	5.2	41.8	18	0.7	0.5	5.4	0.2	71.8
Malacostraca	0	0	0	2.1	4.7	18.7	15.8	4.1	45.4
Euphorbiaceae	0	0.9	0.5	0.3	0	0	0	0	1.7
	1.1	**25.6**	**70.4**	**39.5**	**8.9**	**21.1**	**22.4**	**4.3**	**193.3**

Figure 34. Photograph of crab claws recovered from Layer II, level 1.

8.3 WOOD IDENTIFICATION

Prior to submitting a charcoal sample for radiometric analyses, two wood charcoal samples were submitted to the Wood Identification Laboratory at the International Archaeological Research Institute, Inc. for species identification. Each sample was examined and identified by academically trained wood analyst Gail Murakami. The purpose of this analysis was to determine the presence or absence of historically introduced wood and to differentiate between short lived and long lived species. The intent was to be able to factor out possible long lived species, thus controlling for the "old wood effect" (Tuggle and Spriggs 2001:169).

Since radiocarbon analysis measures the radioactive decay of carbon 14 following the death of an organism, a primary assumption of radiometric dating is that the organism's time of death is also the time at which it ceased absorbing carbon 14 through exchange with the atmosphere. In dating a piece of wood or charcoal, however, the event dated is the growth of the individual tree ring, not necessarily the death of the tree. Trees grow by the addition of concentric rings, and each of these rings stops exchanging carbon with the biosphere once it is overlain by the next ring. As a result, if the tree is a long lived species, the radiocarbon age of the rings of its heartwood may differ significantly from the age of the rings of its sapwood. A date obtained from the heartwood of a long lived tree may be substantially earlier than the date at which the tree died and was used for firewood. In some long lived tree species this in-built age adjustment can be on the order of 100 years (Dye 2000). For this reason, short lived species are better age indicators. Wood analysis can assist in the identification and red flagging of longer lived plant species, therefore helping to adjust for possible old wood effect.

The results of wood identification on charcoal samples submitted for radiocarbon analysis are presented in Table 12. The full report from International Archaeological Research Inc. is presented in Appendix D.

One taxon was identified in each of the samples totaling two taxa for the assemblage. Neither of the charcoal samples submitted for wood analyses were found to consist of historically introduced species. Both samples were native, short lived species.

Table 10. Wood Identification Results

	WIDL No.	Taxa	Common / Hawaiian Name	Origin/Habit	Part	Count	Weight (g)
Bag 11, T-72, TU 1 Layer I/level 2, Sample #1	1426-1	*Chamaesyce* sp.	*'Akoko*	Native/Shrub	Wood	1	0.07
Bag 28, T-72, TU 1 37 cm bd, west wall post-ex, Sample #3	1426-2	*Hibiscus tiliaceus*	*Hau*	Native/Shrub-Tree	Wood	3	0.09

8.4 RADIOCARBON ANALYSIS

Once wood identification had been completed, two charcoal samples were submitted to Beta Analytic Radiocarbon Dating Laboratory for dating. Accelerator mass spectrometry (AMS) radiocarbon dating was used. AMS dating at Beta Analytic includes $^{13}C/^{12}C$ analysis, so the

samples were adjusted based on the ^{13}C /^{12}C ratio. The pretreatment for the AMS dating charred material samples consisted of acid/alkali/acid washes where the sample was first gently crushed and dispersed in deionized water. It was then given hot acid washes to eliminate carbonates, then alkali washes to remove secondary organic acids, then a final acid rinse to neutralize the solution prior to drying. During these serial rinses, mechanical contaminants such as associated sediments and rootlets were removed.

Two charcoal samples collected during the course of the test excavation were submitted for radiocarbon dating. The results of these analyses are summarized in Table 13 and discussed below. The full report from Beta Analytic is presented in Appendix E.

Beta Sample 402614 from 37 cmbd produced three age ranges at 2 sigma (95% probability): AD 1680 – 1765; AD 1800 – 1940; and post 1950. Although two metal artifacts were recovered from Layer I, level 1, no historic artifacts were recovered from the level of the collected sample; it seems reasonable that this sample dates from AD 1680 – 1765.

Beta Sample 402615 also taken from Layer I, level 2 produced five ranges at 2 sigma (95% probability): AD 1665 – 1695, AD 1725 – 1815, AD 1835 – 1840, AD 1855 – 1865, and AD 1920 – post 1950. Again, given that no historic artifacts were recovered from this level of the excavation it seems reasonable that this sample dates from the 100 year period between AD 1655- 1815.

These two radiocarbon dates provide sound information that this site was used during late pre-Contact period between AD 1655 – 1815.

Table 11. Radiocarbon Dating Results

Sample No.	SIHP No. (50-60-04-) & Provenience	Material	Measured Radiocarbon Age	$^{13}C/^{12}C$ Ratio	^{13}C Conventional Age B.P.	Calibrated Age[1] (one sigma)	Calibrated Age[2] (two sigma)
Beta 402614	T-072, Charcoal Sample #3, 37 cmbd	Charred Material (cf. *Hibiscus tiliaceus* ; *Hau)*	100+/-30 BP	-24.2 o/oo	110 +/-30 BP	Cal AD 1685 to 1730 (Cal BP 265 to 220) Cal AD 1810 to 1895 (Cal BP 140 to 55) Cal AD 1905 to 1925 (Cal BP 45 to 25) Post AD 1950 (Post BP 0)	Cal AD 1680 to 1765 (Cal BP 270 to 185) Cal AD 1800 to 1940 (Cal BP 150 to 10) Post AD 1950 (Post BP 0)
Beta 402615	T-072, Charcoal Sample #1, Layer I, level 2	Charred Material *Chamaesyce sp.; ʻAkoko)*	100.7+/-0.4 pMC	-1034 o/oo	180 +/- 30 BP	Cal AD 1665 to 1685 (Cal BP 285 to 265) Cal AD 1735 to 1785 (Cal BP 215 to 165) Cal AD 1795 to 1805 (Cal BP 155 to 145) Cal AD 1930 to Post 1950 (Cal BP 20 to Post 0)	Cal AD 1655 to 1695 (Cal BP 295 to 255) Cal AD 1725 to 1815 (Cal BP 225 to 135) Cal AD 1835 to 1840 (Cal BP 115 to 110) Cal AD 1855 to 1865 (Cal BP 95 to 85) Cal AD 1920 to Post 1950 (Cal BP 30 to Post 0)

9.0 SIGNIFICANCE ASSESSMENTS

The National Historic Preservation Act of 1966 (as amended) authorizes the Secretary of Interior to expand and maintain a National Register of Historic Places (NRHP) that contains a listing of districts, sites, buildings, structures and objects significant in American history, architecture, archaeology, engineering and culture. A property may be listed in the NRHP if it meets criteria for evaluation defined at 36 CFR §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.

The State of Hawai‘i recognizes the above criteria under HRS §13-275-6, and has also added a fifth 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.

The sites identified during the current AIS are assessed in Table 14 (below). Of the 55 archaeological sites recorded in the APE, 54 were assessed as significant under Criterion D. These sites are important for their information potential. Each of these sites has either yielded or has the potential to yield information important to state and national history. Forty-five sites have already yielded the information they contain. This information was collected during the current AIS investigations and no further work is being recommended. Thirty-three of these sites (T-007 through T-011, T-014, T-016, T-018, T-019, T-023 through T-027, T-029 through T-033, T-035, T-037, T-038, T-054, T-056, T-057, T-061, T-065 through T-067, T-070, T-071, T-077, and T-078) are recommended to have no further work conducted but are outside of the area of disturbance and will thus not be impacted by construction activities; twelve of these sites (T-001, T-002, T-006, T-015, T-021, T-022, T-028, T-034, T-053, T-055, T-059, and T-073) are

recommended to have no further work conducted and are tentatively scheduled to be destroyed. One site (T-074) contains two features that are recommended to be preserved (Features A and a portion of B) and two features (Features C and D) that require no further work. It is recommended that the entire water aqueduct (Feature A) and approximately half of the adjoining concrete ditch (Feature B) be preserved. The portion of Feature B is being preserved to provide a buffer for Feature A.

The forty-five sites that require no further work are not eligible for listing on either the Hawaiʻi Register of Historic Places (HRHP) or NRHP. Two additional sites (T-068, and T-072) still have the potential to yield important information of the history of the area and are located in areas of disturbance (see below for a description of each). Data recovery has been recommended for these sites prior to Project construction. Excavations in these sites will provide important information on traditional activities that took place in this area and the chronology of settlement. Once this information has been collected, no additional work will be necessary and these sites will not be eligible for listing. Seven sites (T-003 through T-005, T-017, T-020, T-036, and T-069) are recommended for preservation based on their significance (see below for a description of each). All these sites are outside of the area of disturbance and are eligible for listing on the HRHP.

Thirty-eight of the 55 archaeological sites within the APE have also been assessed as significant under Criterion A. Their significance is based on their association with the Kahuku Plantation (1890-1971), one of the early sugar plantations in Hawaiʻi and a dominant economic and social force on the North Shore of Oʻahu. However, these do not appear to be eligible for listing on either the HRHP or NRHP because there is a lack of integrity (i.e., not enough of the former plantation is present to convey the design, setting, feeling, or association with the former sugar plantation).

Only one site (T-074) appears to be eligible for listing on both HRHP and NRHP because it is assessed as significant under criteria A, C, and D. This site is a concrete aqueduct that spans a natural drainage channel. It is a unique water control feature within the wind farm site.

Table 12. Significance Assessments of Cultural Resources Within the APE

SIHP No.	Field No.	Feature	Type	Site Significance	Recommendation
	T-001	A	Alignment	Not significant	No Further Work
		B	Hearth	Not significant	No Further Work
	T-002	-	Stone Mound	D	No Further Work
	T-003	-	Platform	D	Preservation
	T-004	-	Bunker	A, D	Preservation
	T-005	-	Bunker	A, D	Preservation
	T-006	-	Ditch	A, D	No Further Work
	T-007	-	Terrace	D	No Further Work
	T-008	-	Concrete Culvert	A, D	No Further Work
	T-009	A	Concrete Foundation	A, D	No Further Work
		B	Concrete Foundation	A, D	No Further Work
		C	Concrete Foundation	A, D	No Further Work
		D	Concrete Foundation	A, D	No Further Work
		E	Retaining Wall	A, D	No Further Work

SIHP No.	Field No.	Feature	Type	Site Significance	Recommendation
	T-010	A	Ditch	A, D	No Further Work
		B	Ditch	A, D	No Further Work
		C	Ditch	A, D	No Further Work
		D	Ditch	A, D	No Further Work
	T-011	A	Valve	A, D	No Further Work
		B	Well	A, D	No Further Work
	T-014	A	Concrete Foundation	A, D	No Further Work
		B	Concrete Ditch	A, D	No Further Work
		C	Iron Pipeline	A, D	No Further Work
	T-015	-	Pipeline	A, D	No Further Work
	T-016	-	Soil Ditch	A, D	No Further Work
	T-017	A	Stone Terrace	D	Preservation
		B	Soil Terrace	D	Preservation
	T-018	-	Stone/Concrete Ditch	A, D	No Further Work
	T-019	-	Concrete Ditch	A, D	No Further Work
	T-020	-	Terrace	D	Preservation
	T-021	A	Storage Area	A, D	No Further Work
		B	Concrete Well	A, D	No Further Work
		C	Brick Well	A, D	No Further Work
		D	Brick Well	A, D	No Further Work
		E	Rock/Concrete Wall	A, D	No Further Work
		F	Brick Well	A, D	No Further Work
	T-022	-	Pump House	A, D	No Further Work
	T-023	A	Shed	D	No Further Work
		B	Concrete Slab	D	No Further Work
	T-024	-	Concrete Ditch	A, D	No Further Work
	T-025	-	Stone Ditch	A, D	No Further Work
	T-026	-	Stone Retaining Wall	D	No Further Work
	T-027	-	Soil/Concrete Ditch	A, D	No Further Work
	T-028	A	Soil Ditch	A, D	No Further Work
		B	Concrete Foundation	A, D	No Further Work
	T-029	A	Stone Lined Ditch	A, D	No Further Work
		B	Stone Lined Ditch	A, D	No Further Work
		C	Stone Lined Ditch	A, D	No Further Work
	T-030	A	Soil Ditch	A, D	No Further Work
		B	Retaining Wall	A, D	No Further Work
		C	Retaining Wall	A, D	No Further Work
		D	Concrete Ditch	A, D	No Further Work
	T-031	-	Terraced Soil Furrows	D	No Further Work
	T-032	-	Terrace	D	No Further Work
	T-033	-	Terraced Soil Furrows	D	No Further Work
	T-034	A	Soil Ditch	A, D	No Further Work
		B	Concrete Footing	A, D	No Further Work
	T-035	-	Concrete Ditch	A, D	No Further Work
	T-036	-	Stacked Stone Ditch	A, D	Preservation
	T-037	-	Concrete Ditch	A, D	No Further Work
	T-038	-	Stone Alignment	A, D	No Further Work
	T-053	-	Reservoir	A, D	No Further Work
	T-054	-	Concrete Ditch	A, D	No Further Work
	T-055	-	Concrete Ditch	A, D	No Further Work
	T-056	-	Limestone Ditch	A, D	No Further Work

SIHP No.	Field No.	Feature	Type	Site Significance	Recommendation
	T-057	-	Iron Pipeline	A, D	No Further Work
	T-059	-	Concrete Ditch	A, D	No Further Work
	T-061	A	Pump House	A, D	No Further Work
		B	Tank	A, D	No Further Work
		C	Concrete Ditch	A, D	No Further Work
		D	Concrete Ditch	A, D	No Further Work
	T-065	-	Limestone Ditch	A, D	No Further Work
	T-066	-	Stacked Stone Ditch	A, D	No Further Work
	T-067	-	Modified Outcrop	D	No Further Work
	T-068	-	Stone Terrace	D	Data Recovery
	T-069	A	Terrace	D	Preservation
		B	Terrace	D	Preservation
	T-070	-	Artifact Scatter	D	No Further Work
	T-071	-	Terraced Soil Furrows	D	No Further Work
	T-072	-	Cave	D	Data Recovery
	T-073	-	Concrete Ditch	A, D	No Further Work
	T-074	A	Aqueduct	A, C, D	Preservation
		B	Concrete Ditch	A, C, D	Preservation
		C	Soil Ditch	A, D	No Further Work
		D	Limestone Retaining Wall	A, D	No Further Work
		E	Concrete Ditch	A, D	No Further Work
	T-077	-	Soil Ditch	A, D	No Further Work
	T-078	-	Concrete Ditch	A, D	No Further Work

10.0 DISCUSSION AND RECOMMENDATIONS

Pacific Legacy, Inc., under contract to Nā Pua Makani Wind Partners LLC, conducted an AIS of approximately 464 acres of State and private lands in the *ahupuaʻa* of Kahuku, Keana, and Mālaekahana on the North Shore of the Island of Oʻahu for a proposed wind farm project. The purpose of the AIS is to identify and document archaeological properties and cultural sites within a delineated area, gathering sufficient information to evaluate the significance of identified properties and sites. If significant cultural resources are identified, effect determinations are made and mitigation measures are recommended.

Over the course of field investigations, 72 newly identified archaeological sites comprised of 113 distinct features were documented. Of the 72 sites documented, 22 sites are traditional Hawaiian pre-Contact sites, 40 sites are related to the sugar industry, 7 sites are historic sites not associated with sugar plantation activities, and 3 are military sites.

During the course of field investigations, the APE of the project was altered from ca. 450 acres to 464 acres. This change in size was due to design changes for the wind farm and the desire to avoid several pre-Contact archaeological sites that were identified in lands not strictly needed for development of the wind farm. The intent was to modify the APE so as to protect these sites from project impacts. Seventeen of the 72 identified sites (T-039 to T-044, T-046 to T-052, T-060 and T-062 to T-064) are now located outside of the revised APE and will not be impacted by the proposed Nā Pua Makani Wind Project. Fourteen of the sites outside of the APE, with the exceptions of Sites T-043, T-060, and T-064, appear to be pre-Contact traditional Hawaiian sites. The pre-Contact sites appear to be related to traditional agricultural pursuits (terraces), habitation (cave shelter, overhang shelters, terraces, and walls) and a possible burial (filled crevice). Two of the historic sites outside of the APE (T-060 and T-064) are concrete ditches, while the third site (T-043) is a stone lined drainage, all of which were probably associated with the Kahuku Sugar Plantation. The 17 sites located outside of the current APE had been mapped and described prior to the change in the APE and are thus included in the current AIS report. However, no test excavations were conducted in any of these sites, thus it is difficult to assess the significance of these resources. As a result, no recommendations for significance or preservation have been made. However, if in the future, the current project area expands, or a new project is proposed in the area of these sites, additional archaeological work will need to be conducted on these sites including testing and providing significance and recommendations.

Of the 55 sites located within the APE, eight traditional, likely pre-Contact archaeological sites (T-002, T-003, T-017, T-020, T-067, T-068, T-069, and T-072) were identified. These traditional sites included terraces, a mound, a platform, a shelter cave, and a modified outcrop. These sites should be viewed as vestiges of a traditional landscape that once existed here. It seems rather obvious that the paucity of pre-Contact sites in this area is due to the intensive land altering activities that were conducted by the Kahuku Plantation. These traditional sites provide a glimpse of the very intensive use of the area by Native Hawaiians during the pre-Contact period. The intensive traditional use of the area probably had both permanent habitation sites and temporary shelters, with activities centered on intensive agricultural practices and

exploitation of the adjacent marine resources. Agricultural practices probably revolved around dryland cultivation of traditional crops such as sweet potato, taro, sugar cane, gourd, etc. Marine exploitation included shell fish and seaweed gathering, as well as near-shore and off-shore fishing. The intensive use of the area is supported by early historic explorer accounts describing this portion of Oʻahu.

Four of the traditional sites (T-003, a possible habitation platform; T-017, two probable agricultural terraces; T-020, an agricultural terrace; and T-069, a habitation terrace and an agricultural terrace) inside the APE have been recommended for preservation. One traditional site (T-072, a shelter cave) cannot be avoided by construction activities. Site T-072 is recommended for data recovery excavations, as well as for Site T-068 (a terrace), where the function and age are still in question. Data recovery excavations will add to our knowledge about traditional use of this portion of the North Shore of Oʻahu. No further work is recommended for two of the traditional sites (T-002, a stone mound that was test excavated during the current AIS investigations; and T-067, a modified outcrop that has a low potential to yield any further information).

Thirty-seven of the 55 recorded sites within the APE are associated with the agricultural development and intensive use by the former Kahuku Plantation. The Kahuku Plantation was formed in 1890 and was in operation until 1971. By the mid-1930s, the plantation was cultivating nearly 4,500 acres and employed 1,137 people. The overwhelming majority of sugar plantation related features functioned mainly to control and transport water. A total of 65 features in 36 sites are related to water control and transport. These features include a variety of ditches, metal pipelines, wells, reservoirs, pump houses, and concrete foundations. The ditches are present in several forms, from simple earthen ditches, to stone-lined ditches, to concreted ditches.

The two military defensive bunkers identified on the west side of the APE (Site T-004 and T-005) were associated with World War II and are part of the Coastal Defense System. These sites highlight the limited use of the area by the U.S. Military during the 1940s. Other than the temporary bivouac site (T-001) found on the west side of the APE, no other evidence of military use was found in the APE.

Of the 55 sites located within the APE, 33 sites (T-007 through T-011, T-014, T-016, T-018, T-019, T-023 through T-027, T-029 through T-033, T-035, T-037, T-038, T-054, T-056, T-057, T-061, T-065 through T-067, T-070, T-071, T-077, and T-078) are recommended to have no further work conducted but are outside of the area of disturbance and will thus not be impacted by construction activities. Twelve sites (T-001, T-002, T-006, T-015, T-021, T-022, T-028, T-034, T-053, T-055, T-059, T-073) are recommended for no further work and are tentatively scheduled to be destroyed. Seven sites are recommended to be preserved (T-003 through T-005, T-017, T-020, T-036, and T-069) based upon their significance. Data recovery excavations are recommended on the two sites discussed above (T-068 and T-072). Finally, one site (T-074) associated with the Kahuku Plantation contains two features that are recommended to be preserved (Features A and a portion of B), and two features (Features C and D) that require no further work and may be destroyed. It is recommended that the entire water aqueduct (Feature A) and approximately

half of the adjoining concrete ditch (Feature B) be preserved. The portion of Feature B is being preserved to provide a buffer for Feature A.

It is recommended that data recovery occur at Site T-072, a habitation cave. The site is located within the vicinity of the proposed Turbine 10 and the laydown/building area and cannot be avoided. Marine shell midden is present throughout the surface of the cave floor and a shark tooth was also found on the floor of the cave. A test excavation placed within the cave identified additional abundant marine shell and non-human bone midden along with four basalt flakes and two historic household artifacts. The radiocarbon dates from the site indicate an occupation of between ca. AD 1650-1815 for the site. The presence of the marine midden and traditional artifacts supports this date range while the miniature picture frame and metal button post suggests use of the site into the early post-Contact period.

Given the number of resources identified during the AIS and the potential to uncover additional subsurface sites during construction, archaeological monitoring is recommended during all ground disturbing activities within the project area.

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Map

United States Department of Interior (USDI)
1938 Transportation on Oahu.

APPENDIX A

SHPD AISP Acceptance Letter

Neil Abercrombie
GOVERNOR OF HAWAII

WILLIAM AILA JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JESSE K. SOUKI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCE ENFORCEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCE MANAGEMENT
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

August 4, 2014

Paul Cleghorn, Ph.D.
Pacific Legacy
30 Aulike Street, Suite 301
Kailua, Hawaii 96734

LOG NO: 2014.02981
DOC NO: 1408NN02

Dear Dr. Cleghorn:

Subject: **Chapter 6E-42 Historic Preservation Review-**
Archaeological Inventory Survey Plan for the Proposed Nā Pua Makani Wind Farm
Kahuku Ahupua'a, Ko'olaupoko District, Island of O'ahu
TMK: (1) 5-6-006:018 and 5-6-008:006

Thank you for the opportunity to review the draft plan titled *Archaeological Inventory Survey Plan for the Proposed Nā Pua Makani Wind Farm in the Lands of Kahuku, Island of O'ahu [TMK (1): 5-6-006:018, 5-6-008:006]* by Cleghorn (June 2014), which was received by our office on June 24, 2014. This AISP was prepared in compliance with state historic preservation review legislation, Hawaii Revised Statutes (HRS) 6E-42 and Hawaii Administrative Rules (HAR) §13-284-5. The plan was prepared for Champlin/GEI Wind Holdings, LLC in support of the proposed development of a wind farm on approximately 450 acres of public (TMK: (1) 5-6-008:006) and private (TMK: (1) 5-6-006:018) lands in the ahupua'a of Kahuku. The project will involve the construction of thirteen wind turbines, associated laydown areas, access roads, a collector substation, underground collector lines, and transmission lines.

In 1992, Cultural Surveys Hawai'i, Inc. (CSH) surveyed ca. 785 acres that included the western portion of TMK: (1) 5-6-008:006, including the current project area. The original area comprising 1,600 acres was reduced without explanation, and findings were not presented for about 900 acres. The CSH report (Stride et al. 2003) states that twenty-one sites were identified in the overall 1,600 acre survey but only seven sites were located in the 785 acre portion. The seven sites include the following sixteen features: 8 overhang shelters (1 includes human remains), 3 walls, 3 terraces, 1 enclosure, and 1 U-shaped temporary shelter. Stride et al. (2003) also indicate that although large scale commercial agriculture severely impacted the current project area and vicinity, potential still exists for significant cultural resources to be present, but not subsurface resources. International Archaeological Research Institute, Inc. (IARII) conducted archival research on the western portion of the Na Pua Makani project area (TMK: (1) 5-6-008:006) for West Wind Works, LLC (Morrison 2009). Like Stride et al. (2003), Morrison (2009) concluded that the project area had been extensively modified by commercial agricultural activities. However, Morrison (2009) concluded that little potential existed for encountering any cultural remains.

The AISP explains the intent to identify and record any remaining historic sites and cultural deposits located within the project area. Pedestrian sweeps of the entire project area will be conducted with archaeological field crew spaced from 10-15 meters apart. The location of each site will be mapped using a hand held Trimble GeoExplorer X global positioning system. Because of the extensive development on this property, it is highly likely that any potential historic properties that still exist will be subsurface archaeological deposits, including human skeletal remains. Therefore, Pacific Legacy has outlined a program of subsurface testing involving 13 backhoe trenches in areas where wind turbines and other facilities are planned, and in areas that have been in-filled and potential exists for encountering buried cultural deposits. If site areas are identified, test excavations will be conducted to better assess the possible age and function of the sites.

The trench excavation methods will involve, where possible, identification and mapping in plan view and hand excavation of cultural layers, midden remains, artifacts, and pit features. Artifact assemblages present in fill deposits and large historic trash-filled pits will be subjected to field documentation (photographs of representative samples and qualitative and quantitative analysis) with collection of only a representative sample of artifacts for more detailed analysis in the laboratory. Traditional Hawaiian artifacts, faunal shell and bone, and charcoal and other botanical remains will be collected (or sampled, as appropriate) for analysis in the laboratory. Should samples of charcoal be recovered from secure proveniences at tested sites, the samples will be first submitted to International Archaeological Research Institute, Inc. for wood identified analysis, including determining the presence/absence of historically-introduced wood and differentiating between short lived and long lived species. Selected samples will be then sent for radiocarbon analysis.

The archaeological inventory survey plan is accepted, pursuant to Hawai'i Administrative Rule 13§13-284-5(c). Please send one hardcopy of the document, clearly marked FINAL, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

Please call Deona Naboa at (808) 692-8015 if you have any questions or concerns regarding this letter.

Aloha.

Susan A. Lebo

Susan A. Lebo, PhD
Oahu Lead Archaeologist

APPENDIX B

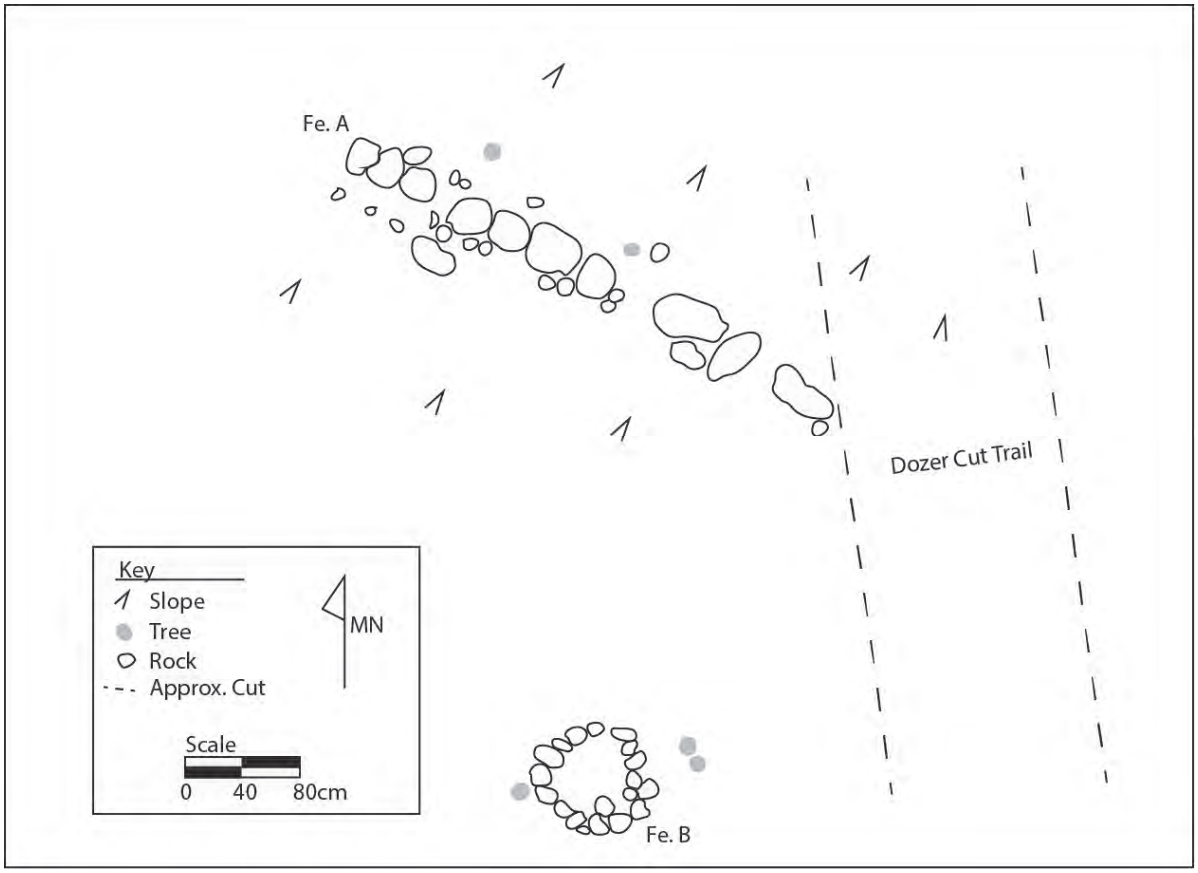
Site Descriptions

SIHP No.:
Field No.: T-001
Site Type: Complex
Site Function: Bivouac
Site Condition: Good
Description: Site T-001 is situated within a small saddle on the north slope of an unnamed ridge. The edges of the saddle to the east and west are slightly higher than the saddle itself. The east slope descends into an unnamed gulch and the west slope descends into ʻOhiaʻai Gulch. A recent bull dozer cut trail is located immediately to the east of the site and appears to have possibly impacted the east edge of Feature A.

Feature A consists of a stone alignment constructed of small to large basalt cobbles. The alignment is oriented northwest to southeast (299˚-119˚) and measures approximately 3.8 meters in length by 0.5 meters in width. Several of the cobbles are slightly embedded into the ground.

Feature B consists of a circular stone hearth located ca. 3.5 meters up slope to the south of Feature A. The hearth is constructed of small to medium basalt cobbles and measures ca. 0.9 meter in length (east-west) by 0.8 meter in width (north-south).

Site T-001 appears to have functioned as a historic military era training campsite or bivouac.

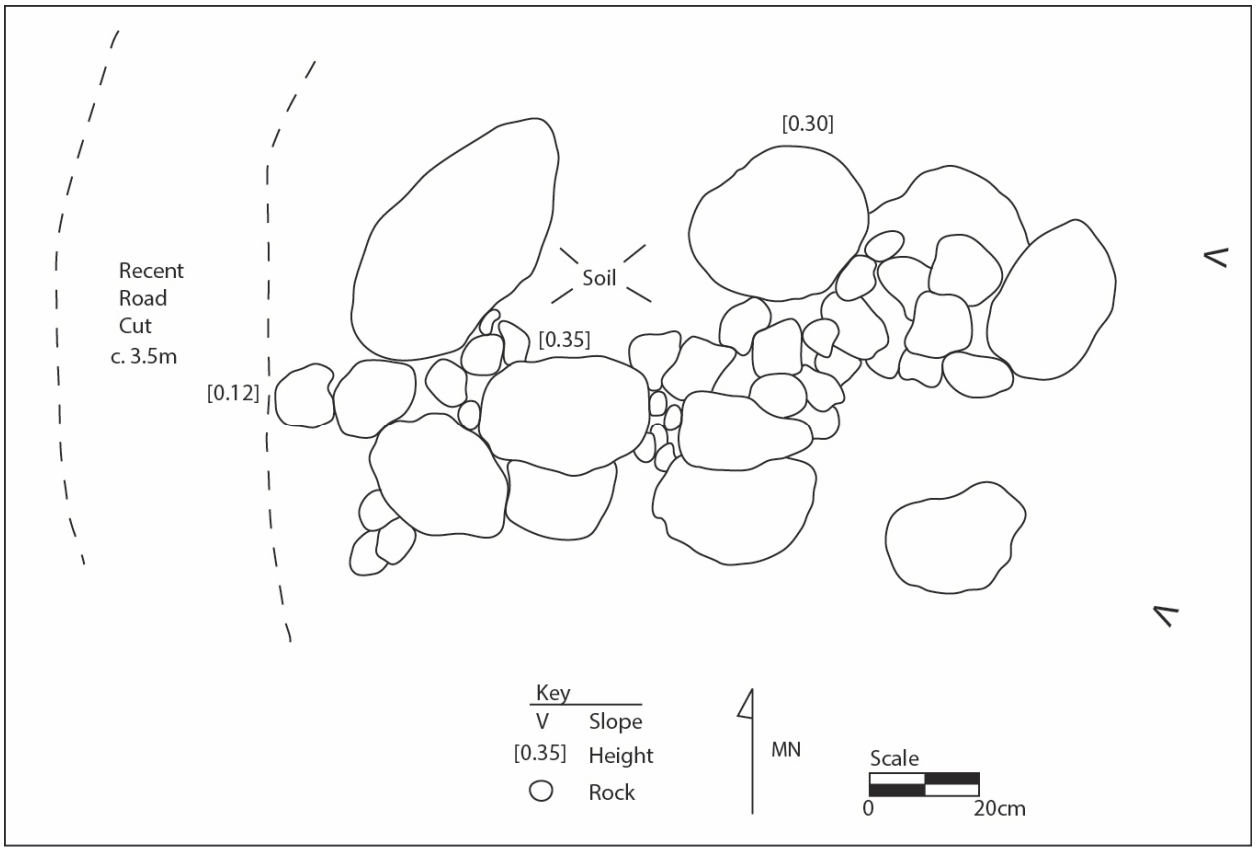


Planview map of Site T-001.

Site T-001, Fe. A, stone alignment, view to southwest.

Site T-001, Fe. B, stone hearth, view to southeast.

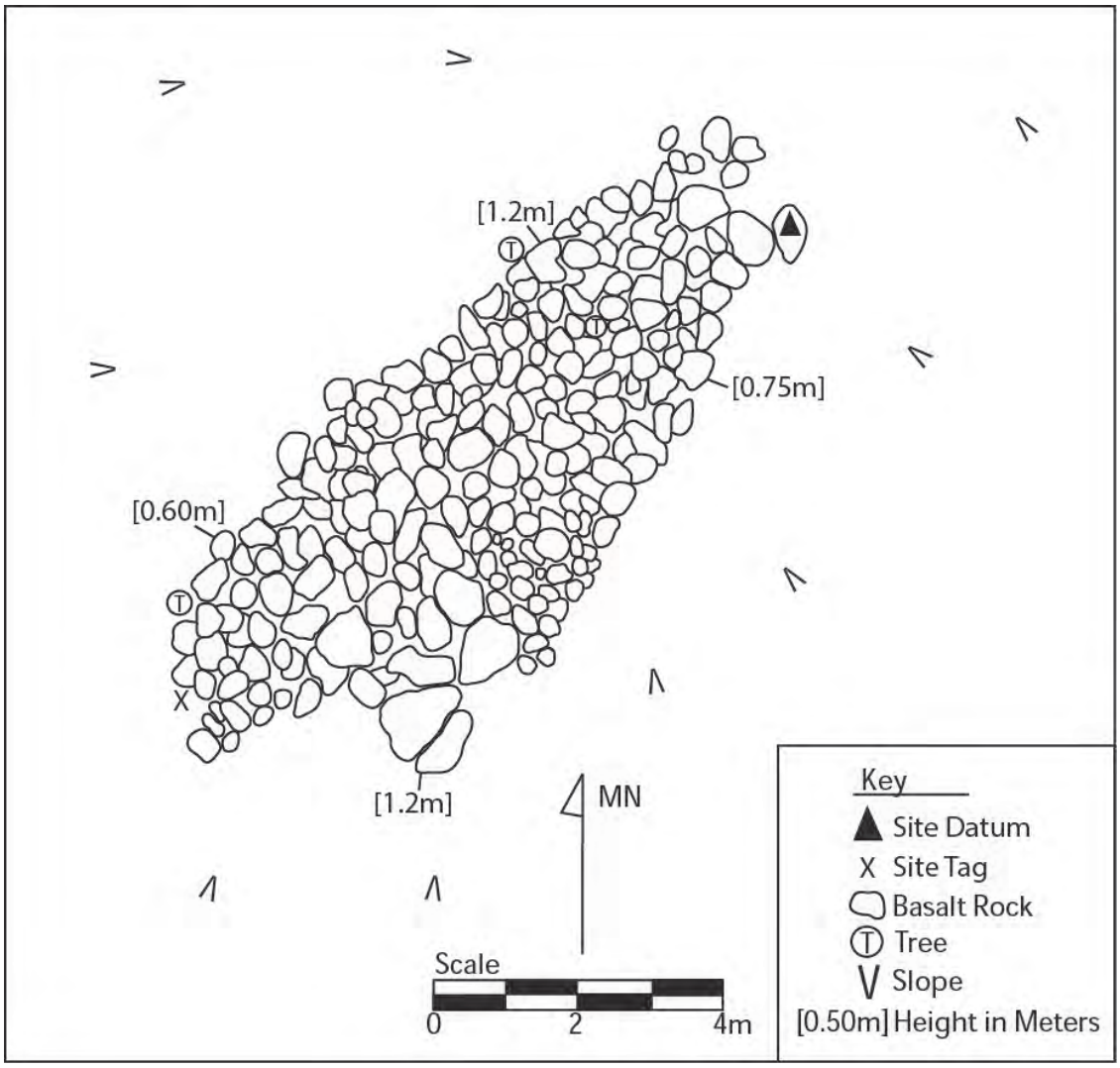
SIHP No.:
Field No.: T-002
Site Type: Stone Mound
Site Function: Marker
Site Condition: Good
Description: Site T-002 is situated on the crest of a ridge located approximately 177 meters south (188°) of Site T-001. Site T-002 consists of a roughly rectangular stone mound constructed of small basalt boulders and large basalt cobbles. The mound measures ca. 1.7 meters in length (east-west) by 0.9 meters in width (north-south) by 0.35 meter in height above the surrounding ground surface. Originally, the stone mound was thought to possibly represent a human burial mound. In order to verify this assumption, a 1.0 meter by 1.0 meter test unit was excavated at this feature. Excavation of Test Unit 1 did not encounter any cultural material or human skeletal remains. Therefore, the function of the stone mound was revised to a traditional marker. The results of the excavation are presented in Section 7.0 of this report.



Planview map of Site T-002.

Site T-002, stone mound, view to southeast.

SIHP No.:
Field No.: T-003
Site Type: Platform
Site Function: Habitation
Site Condition: Excellent
Description: Site T-003 consists of a stone platform located approximately 231 meters northeast from Site T-006. It is situated near the beginning of a drainage that descends to the northeast. Vegetation in the area consists of Christmasberry, strawberry guava, and a variety of ground cover. A small cluster of *ti* plants is located immediately upslope of the platform. The platform is roughly rectangular in shape and is constructed of medium to large basalt boulders which have been loosely stacked and piled between two to three courses of stone in height. The surface of the platform is relatively level, but not paved. The platform measures ca. 11.5 meters in length by 5.4 meters in width at the southwest end and 2.8 meters in width at the northeast end. The platform ranges between ca. 0.6 to1.5 meters in height above the surrounding ground surface. The platform appears to have functioned as a traditional habitation site.



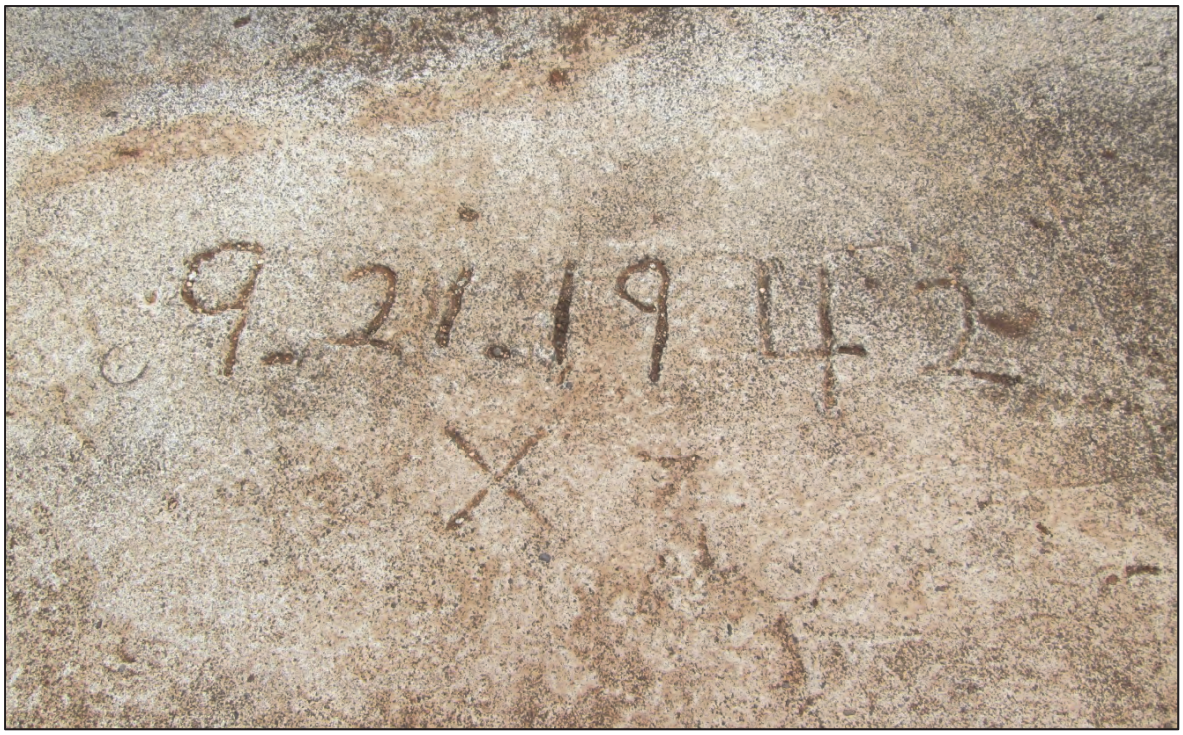
Planview map of Site T-003.

Site T-003, platform, view to southwest.

SIHP No.:
Field No.: T-004
Site Type: Concrete Bunker
Site Function: Observation
Site Condition: Good
Description: Site T-004 consists of a concrete bunker located on top of a relatively flat ridge near the permanent project related MET-Tower. The bunker is square in shape and is oriented roughly north to south (5˚-185˚). It has a flat roof, and there is an opening located on the southeast side with a staircase that descends into the structure. The large interior room measures ca. 6.1 meters in length (north-south) by 6.1 meters in width (east-west) by 2.1 meters in height. There are three large openings to the north, east, and west that provide ample views of the coastline. These windows measure ca. 0.4 meter in height. In the center of the main room is a raised concrete foundation with three metal bolts. A smaller room is located to the southwest of the main room and measures ca. 2.60 meters in length (north-south) by 2.10 meters in width (east-west). The exterior of the bunker only measures ca. 1.4 meters in height above the surrounding ground surface due to the partial subsurface nature of the structure. A wooden pole measuring ca. 4.5 meters in height is located at the northeast corner of the structure and was likely used to run telephone and electric wires to the bunker. There are metal frames on the exterior of the viewing windows which likely held some sort of covering. A "9.21.1942" construction date is inscribed on the exterior of the roof. Overall, the site is in good condition. Modern spray paint graffiti is visible on the exterior and interior of the bunker. The bunker appears to have functioned as part of the WWII coastal defense system.

Site T-004, exterior of bunker with MET-Tower in background, view to southwest.

Site T-004, interior, view to northeast.



Site T-004, inscribed date (9.21.1942) on exterior roof, view to southeast.

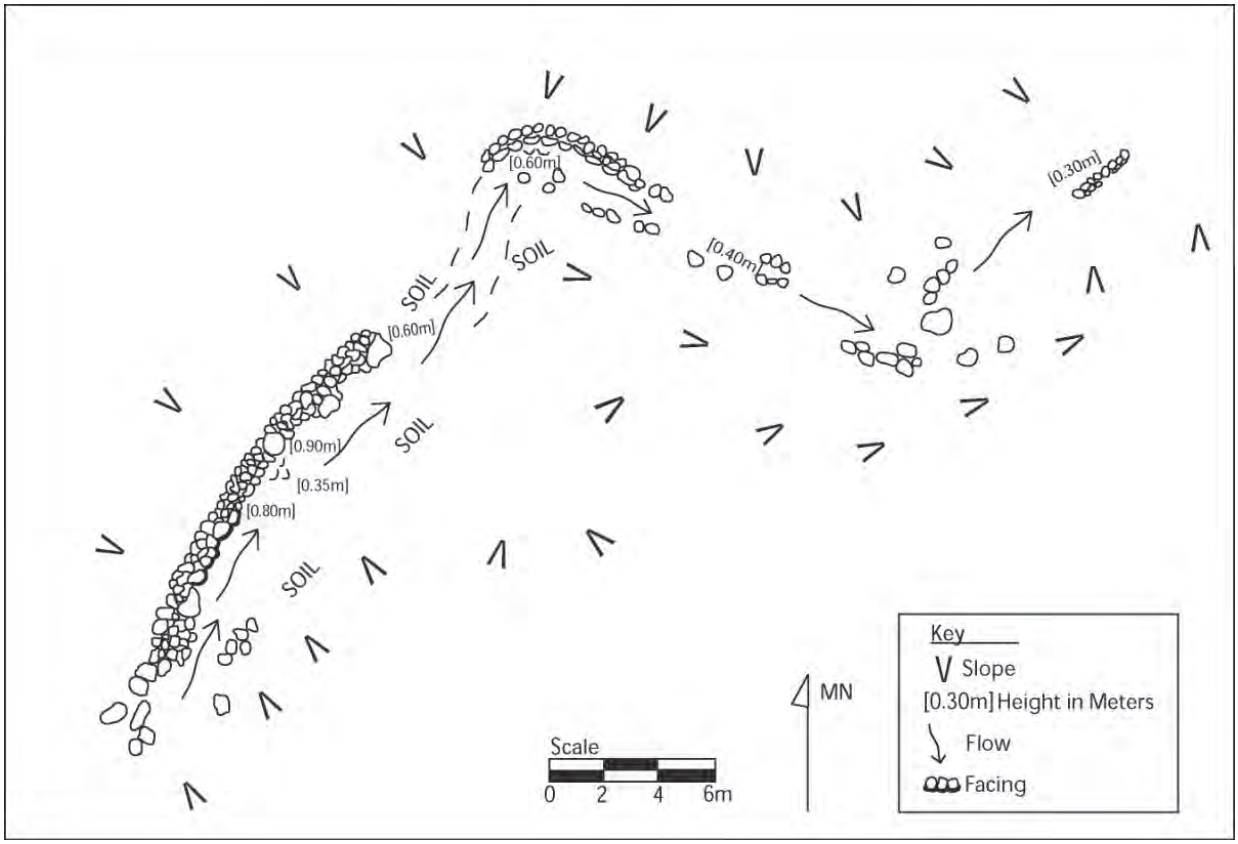
SIHP No.:
Field No.: T-005
Site Type: Concrete Bunker
Site Function: Firing Position
Site Condition: Fair
Description: Site T-005 consists of a concrete bunker located on the edge of a ridge overlooking Kahuku, situated ca. 75.0 meters east of Site T-004. The bunker is partially embedded into the hillside, with the exposed exterior portion measuring ca. 4.4 meters in length (northwest-southeast) by 4.4 in width (northeast-southwest) by 0.75 meters in maximum height above the surrounding ground surface. An entrance to the bunker is located on the south side and consists of a soil ramp with three to four courses of stacked stone with mortar. The entrance is partially filled with soil, but measures ca. 1.2 meters in height by 0.8 meters in width. The interior of the bunker consists of a small room that measures ca. 3.0 meters in length (east-west) by 2.6 meters in width (north-south) by 1.75 meters in height. The interior floor is covered in soil and trash. The northeastern side of the interior room has a rounded extension with a small opening. The extension measures ca 1.7 meters in length by 1.5 meters in width. The viewing window measures ca. 0.4 meters in height. There are three ventilation holes visible on the roof. Overall, the site is in fair condition. Modern spray paint graffiti is visible on the exterior and interior of the bunker. The bunker appears to have functioned as part of the WWII coastal defense system.

Site T-005, exterior of bunker, view to west.

Site T-005, interior, view to northeast.

Site T-005, interior, view to south.

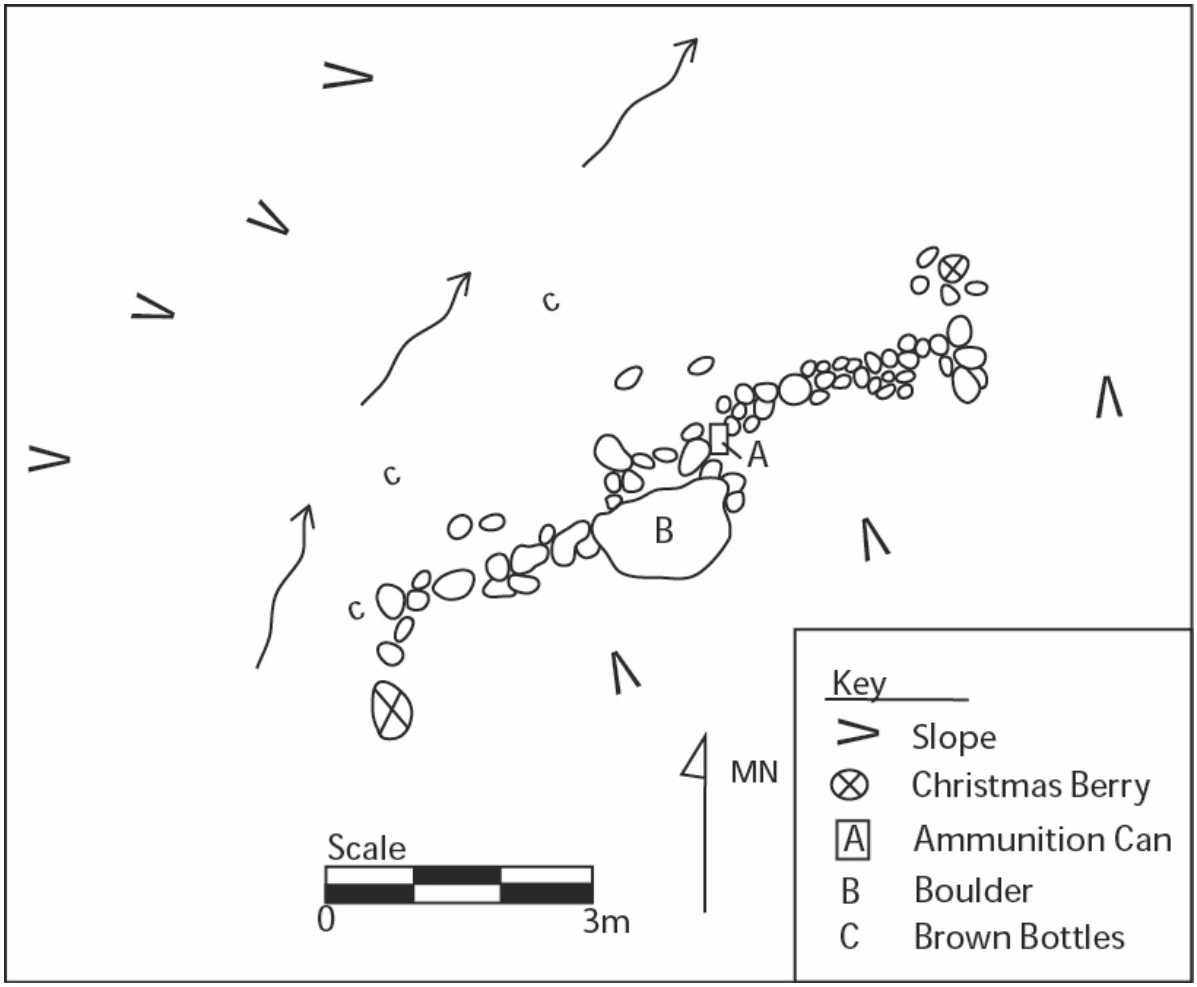
SIHP No.:
Field No.: T-006
Site Type: Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-006 consists of a stone and soil ditch located approximately 300 meters down slope to the northeast of Site T-003. The site is situated along the northwest edge of a northeast running drainage. The ditch is constructed of loosely stacked and partially faced small to large basalt cobbles and boulders along the northwest side and a soil ditch and berm along the southeast side. The ditch runs approximately 16.8 meters down slope to the northeast (60˚), then bends and runs 10.0 meters to the southeast (120˚), then bends again and runs 12.0 meters to the northeast (50˚). The stone portion of the ditch measures between 0.7-1.1 meters in height along the southeast side and up to 0.4 meter in height along the northwest side. In places, one boulder is used, in other places cobbles are stacked four to five courses in height. The ditch measures ca. 2.0 meters in width and up to 0.5 meter in depth. Overall, the ditch is in fair condition. Site T-006 appears to have functioned as a ditch constructed in order to transport water for the former commercial sugar plantation.



Planview map of Site T-006.

Site T-006, stacked stone portion of ditch, view to north.

SIHP No.:
Field No.: T-007
Site Type: Terrace
Site Function: Agriculture
Site Condition: Fair
Description: Site T-007 consists of a terrace located within the same drainage as Site T-003 and T-006. It is approximately 150.0 meters northeast of Site T-003 and 150.0 meters southwest of Site T-006. The terrace is situated along the southeast side of the northeast running drainage and consists of a roughly L-shaped stone retaining wall constructed of piled small basalt boulders and small to large cobbles along the west and north edges of the feature. The surface of the terrace is roughly paved with basalt cobbles except for a large basalt boulder located in the center. The terrace measures ca. 7.0 meters in length by 1.5 meters in width by 0.35 meters in height above the surrounding ground surface. Several historic artifacts were observed at Site T-007 including three glass beer bottles and one metal ammunition can. Overall, Site T-007 is in fair condition, although the terrace does appear to have been impacted by water flow within the drainage and vegetation growth. Site T-007 appears to have functioned as an agricultural terrace constructed and utilized during the historic period.



Planview map of Site T-007.

Site T-007, terrace, view to southeast.

SIHP No.:
Field No.: T-008
Site Type: Concrete Culvert
Site Function: Water Control
Site Condition: Fair
Description: Site T-008 is of a concrete culvert consisting of a corrugated metal pipe, concrete wall, and basalt cobble retaining wall. The concrete wall measures ca. 2.44 meters in length by 0.3 meter in thickness by 1.6 meters in height above the surrounding ground surface. A corrugated metal pipe measuring ca. 3.0 meters in length by 0.9 meter in diameter extends through the lower portion of the concrete wall. The pipe extends ca. 0.9 meters from the edge of the concrete wall. Loosely stacked large basalt cobbles form a retaining wall that supports the concrete wall and holds the corrugated pipe in place. There is an orange plastic survey marker with "1061" written on it in Sharpie located next to the culvert. Site T-008 appears to have functioned as a culvert constructed and utilized during the former commercial sugar plantation in order to divert water into a natural drainage.

Site T-008, concrete culvert, view to north.

SIHP No.:
Field No.: T-009
Site Type: Complex
Site Function: Water Control
Site Condition: Poor
Description: Site T-009 is complex consisting of a series of four concrete block foundations and a short section of a concrete retaining wall situated along a small dry streambed. The site is located on DLNR land, approximately 60.0 meters northeast from the property boundary.

Feature A consists of an irregularly shaped concrete block foundation measuring 1.50 meters in length by 1.0 meter in width by 1.3 meters in height above ground surface. There is a thin layer of black tar on a portion of the foundation. This feature is situated less than 1.0 meter north of the streambed.

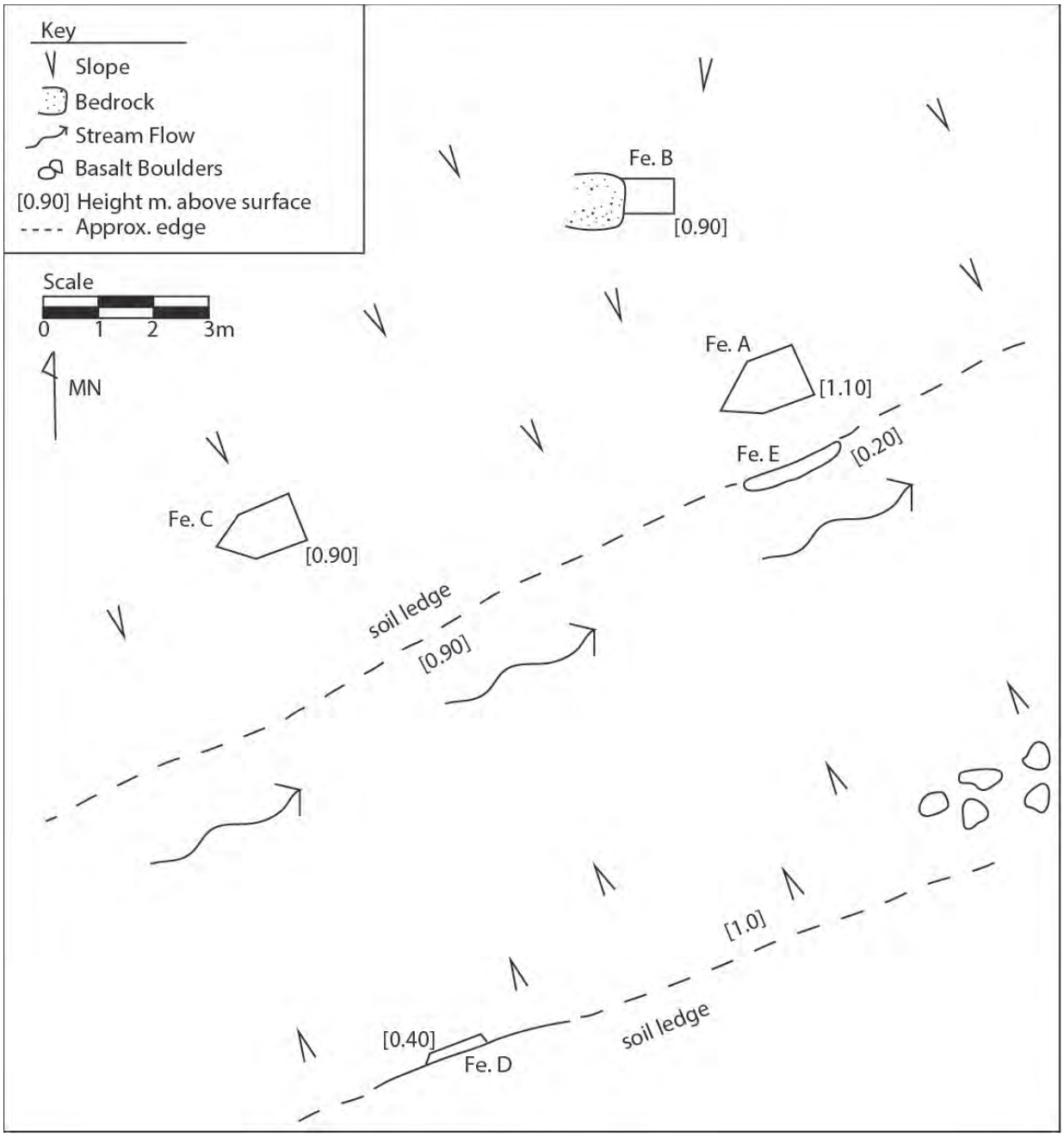
Feature B is another irregularly shaped concrete foundation located ca. 3.0 meters upslope to the northeast of Feature A. Feature B measures 0.95 meter in length by 0.76 meter in width by 1.06 meters in height. Basalt cobbles have been mortared together to form a concrete foundation that is connected to a basalt outcrop.

Feature C is an irregularly shaped concrete foundation located ca. 7.0 meters southwest of Feature A. It measures 1.5 meters in length by 1.15 meters in width by 0.9 meter in height. Like Feature A and Feature B, it is located on the north side of the streambed. It also has black tar staining on the top.

Feature D consists of a partially buried concrete foundation located ca. 6.0 meters southeast of Feature C, on the south side of the streambed. It measures ca. 1.4 meters in length by 0.35 meter in width by 0.4 meter in height above the ground surface. The exposed portion of the foundation is similar in size and construction to the other features. The soil burying Feature D was presumably pushed over from the dirt road-cut above Feature D to the south.

Feature E consists of a partially buried concrete retaining wall located ca. 0.9 meter south of Feature A. The wall is constructed of basalt cobbles and concrete, and measures 1.8 meters in length by 0.2 meter in width by 0.2 meter in height above the ground surface. It is situated within the streambed and was likely used to protect Feature A from flowing stream water.

Given its location in a narrow gulch, off a dirt road, and situated on both sides of a dry streambed, Site T-009 appears to be associated with water control related to the former commercial sugar plantation.



Planview map of Site T-009.

Site T-009, Fe. A, concrete foundation, view to northeast.

Site T-009, Fe. C, concrete foundation, view to northeast.

SIHP No.:
Field No.: T-010
Site Type: Complex
Site Function: Water Transport
Site Condition: Good
Description: Site T-010 is a complex consisting of four connecting ditches situated along the edge of a drainage.

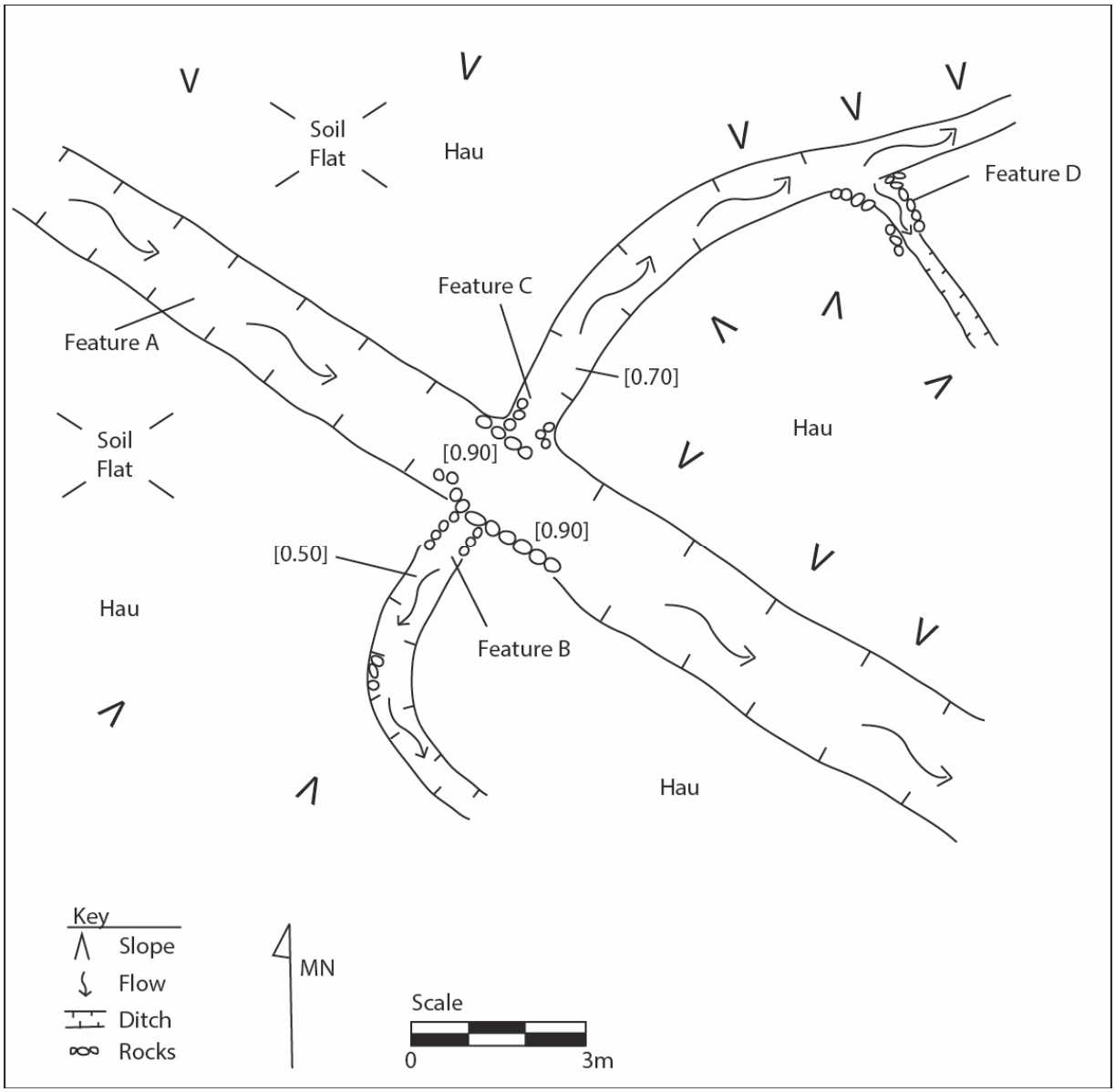
Feature A is a large ditch which runs northwest to southeast down the center of the site. The majority of the ditch consists of soil with portions of stacked basalt boulder and cobble retaining walls located at the intersections with Feature B and Feature C. The ditch measures ca. 40.0 meters in length by 3.3 meters in width with a maximum depth of 2.2 meters. The bottom of the ditch is relatively flat and the sides are relatively steep. The stone retaining wall located at the intersection with Feature B measures ca. 2.3 meters in length by 0.9 meter in height. The stone retaining wall located at the intersection with Feature C measures ca. 1.2 meters in length by 0.9 meter in height.

Feature B is a smaller, shallower ditch extending off from Feature A, located directly across from Feature C. It runs southwest from the intersection with Feature A for ca. 3.0 meters before turning to the southeast. The majority of the ditch consists of soil with short segments partially lined with basalt cobbles. The ditch measures ca. 20.0 meters in length by 0.7 meter in width by 0.5 meters in depth.

Feature C is also a smaller, shallower ditch extending off from Feature A, located directly across from Feature B. It runs northeast from the intersection with Feature A for ca. 5.0 meters before turning to the east. The majority of the ditch consists of soil with short segments partially lined with basalt cobbles. It measures ca. 20.0 meters in length by 1.0 meter in width by 0.7 meter in depth.

Feature D is a small ditch extending off from Feature C, located ca. 7.6 meters northeast of the intersection with Feature A. It runs southeast from the intersection with Feature C and measures ca. 3.5 meters in length by 0.3 meter in width by 0.3 meter in depth. The majority of the ditch consists of soil with a short segment located at the intersection with Feature C lined with basalt boulders and cobbles and a short piece of a preformed concrete ditch. The concrete ditch measures ca. 0.7 meter in length by 0.3 meter in width by 0.3 meter in depth.

Site T-010 is in good condition. The site appears to be associated with water transport related to the former commercial sugar plantation.



Planview map of Site T-010.

Site T-010, Fe. D, view to southeast.

Site T-010, Fe. A, view to northeast.

SIHP No.:
Field No.: T-011
Site Type: Complex
Site Function: Water Control
Site Condition: Poor
Description: Site T-011 is a complex comprised of a valve (Feature A) and a well (Feature B). The site is situated on a gradual northwest facing slope that forms a reservoir that appears to be manmade. The site measures 14.2 meters in length (northwest-southeast) by 0.75 meter in width (northeast-southwest) by 0.3 meter in depth and 0.3 meter in height above ground surface. Feature A is located ca. 13.0 meters upslope of Feature B. Feature A consists of a valve constructed of iron and steel with an iron wheel at the top of the feature that turns an inner cog and controls the opening of the well (Feature B). Feature B is a subsurface well measuring ca. 0.6 meter in width by 0.3 meter in depth. The well is filled in with soil and debris, but still contains water. A metal cover partially blocks the well and resembles a man-hole cover. The features are adjoined by pipes and function as a pulley system to expose and/or cover the opening of the well. The pipes are set on concrete footings with straps. Site T-011 appears to be associated with water control related to the former commercial sugar plantation.

Site T-011, Fe. A, valve, view to northwest.

Site T-011, Fe. B, well, view to southeast.

SIHP No.:
Field No.: T-014
Site Type: Complex
Site Function: Water Transport
Site Condition: Poor
Description: Site T-014 is a complex consisting of three associated features located on the north side of a natural drainage.

Feature A is a concrete foundation located ca. 2.0 meters to the west of Feature B. The foundation measures ca. 3.3 meters in length (east-west) by 3.2 meters in width (north-south) by at least 0.68 meter in depth. Rusted metal is visible along the interior of the foundation which is covered with soil and vegetation. Therefore, no interior depth could be obtained. The rusted metal may indicate there was a cover for the foundation. The concrete foundation may have been used for water control considering its proximity to the other features.

Feature B is a concrete ditch located ca. 2.0 meters to the east of Feature A. The ditch is oriented roughly northwest-southeast extending down slope, and is made up of preformed concrete sections that are broken into various segments. Overall, it measures ca. 15.8 meters in length by 0.28 meter in width by 0.17 meter in depth. The ditch appears to have transport water down slope.

Feature C is a large iron pipeline located ca. 2.4 meters north of Feature B and oriented roughly northwest-southeast. Overall, it measures ca. 53.0 meters in length, but only 30.0 meters is within the current APE. The remaining 23.0 meters is located outside the APE. The pipeline measures ca. 0.61 meter in diameter (2 feet), and appears to have transported water down slope.

Site T-014 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-014, Fe. A, concrete foundation, view to west.

Site T-014, Fe. A concrete foundation (on left) and Fe. C. pipeline (on right), view to northwest.

Site T-014, Fe. C, pipeline, view to northeast.

Site T-014, Fe. B, concrete ditch, view to southeast.

SIHP No.:
Field No.: T-015
Site Type: Pipeline
Site Function: Water Transport
Site Condition: Fair
Description: Site T-015 consists of a steel pipeline oriented roughly northwest-southeast along the toe of a slope. The pipeline measures approximately 174.3 meters in length by 0.61 meters (24 inches) in diameter. The south end of the pipeline terminates into the ground, while the north end simply ends. The pipeline segments appear to be riveted together, and a concrete or asbestos like white lining is visible on the interior of the pipe. The south end of the pipeline that terminates into the ground contains a wheel valve with a concrete and stone ditch extending down slope to the east for ca. 10.0 meters. The concrete and stone ditch measures ca. 1.0 meter in width by 0.2 to 0.3 meter in depth. Additional concrete ditch segments are loosely scattered on the surface near the north end of the pipeline. Site T-015 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-015, pipeline, view to southwest.

SIHP No.:
Field No.: T-016
Site Type: Soil Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-016 consists of a soil ditch located approximately 187.0 meters southwest of Site T-015. The ditch is situated on a gradual east facing slope, and is oriented roughly north to south. It measures ca. 68.0 meters in total length and ranges from 1.1 to 1.75 meters in width by 0.5 to 0.75 meter in depth. A filled-in area measuring ca. 9.0 meters in length is located ca. 23.0 meters north of the southern end of the ditch. Site T-016 appears to be associated with water transport related to the former commercial sugar plantation.

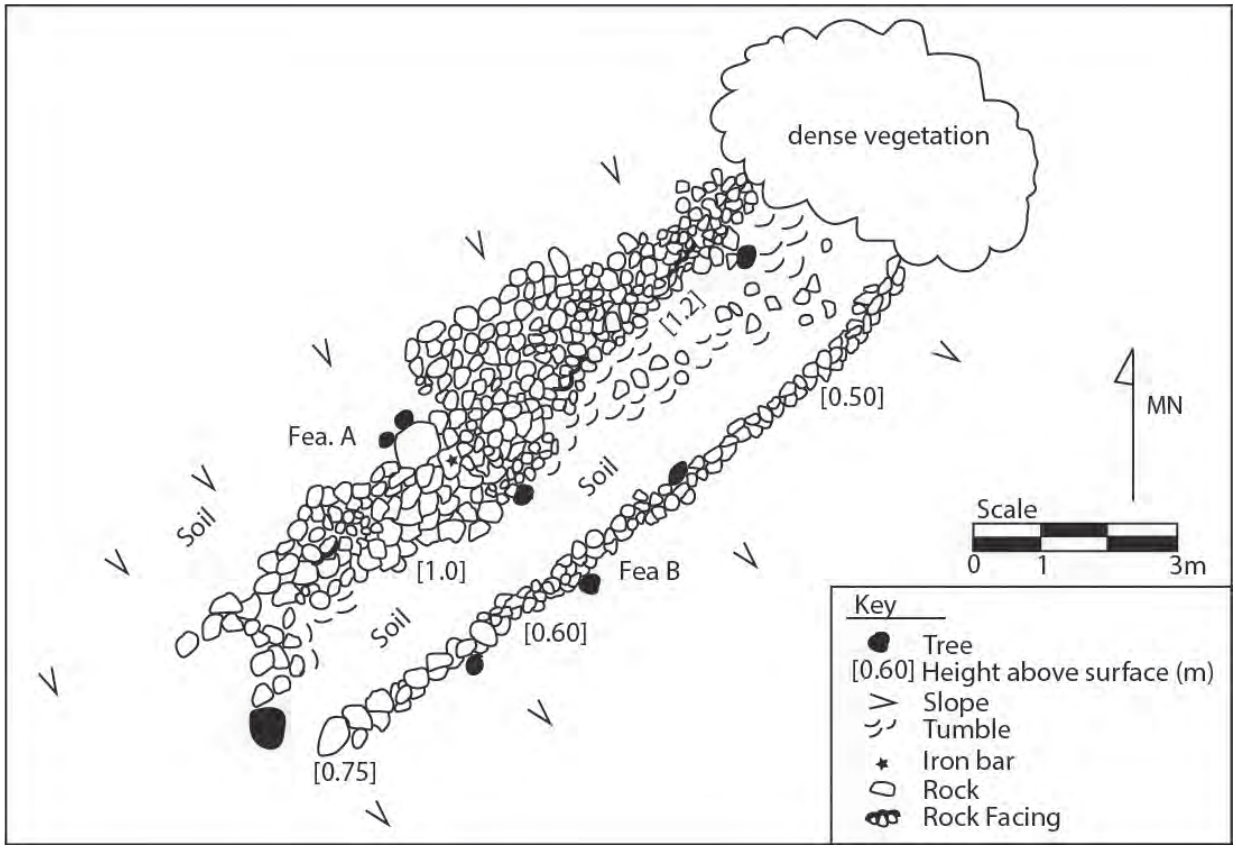
Site T-016, soil ditch, view to south.

SIHP No.:
Field No.: T-017
Site Type: Complex
Site Function: Agriculture
Site Condition: Fair
Description: Site T-017 is a complex comprised of a stone terrace (Feature A) and a soil terrace (Feature B) located ca. 173.0 meters southwest of Site T-016. The site is situated on a southeast facing slope and overall measures ca. 12.5 meters in length by 4.2 meters in width by 1.2 meters in maximum height.

Feature A consists of an irregularly shaped stone terrace located immediately upslope to the northwest of Feature B. The terrace is constructed of loosely stacked small to medium subangular basalt boulders and cobbles between two to four courses of stone in height along the southeast side. The interior surface of the terrace consists of a relatively flat subangular basalt boulder and cobble fill that has been severely jumbled by tree growth. A large rounded basalt boulder sits atop the southwest portion of the terrace. Feature A measures ca. 11.0 meters in length (northeast-southwest) by ca. 2.0-3.0 meters in width (northwest-southeast). The maximum height of Feature A is ca. 1.2 meters along the southeast side and 0.5 meter along the northwest side. The terrace is in fair condition. Tumbling has occurred along the southeast side and the surface stone fill has been jumbled by tree growth. A historic iron bar and metal wire were observed on the surface of Feature A. The bar measures ca. 2.2 meters in length by 0.03 meter in width by 0.02 meter in thickness. The metal wire is bent and measures 0.4 meter in length by 0.01 meter in diameter.

Feature B consists of a soil terrace with stone retaining wall located immediately down slope to the southeast of Feature A. The stone retaining wall is oriented roughly northeast to southwest and supports the soil terrace to the northwest. The retaining wall is constructed of small to medium subangular basalt boulders that have been loosely stacked up to two courses of stone in height. The interior surface of the terrace consists of a relatively flat area of soil. Feature B measures ca. 12.5 meters in length (northeast-southwest) by 1.0-2.0 meters in width (northwest-southeast). The maximum height of the retaining wall is ca. 0.75 meter along the southeast side. The terrace is in good condition, with minimal tumbling of the retaining wall and limited tree growth in the soil fill. No cultural material was observed at Feature B.

Site T-017 appears to have functioned as a traditional agricultural complex comprised of a stone terrace and an adjoining soil terrace. The site may have been modified and/or utilized into the historic period.



Planview map of Site T-017.

Site T-017, Fe. A, terrace, view to west.

Site T-017, Fe. B, terrace, view to northwest.

SIHP No.:
Field No.: T-018
Site Type: Stone/Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-018 consists of a stone and concrete ditch located ca. 125.0 meters west of Site T-016. It is oriented roughly east to west, and runs across a south facing slope. The linear ditch is split into two separate segments by a gap measuring ca. 20.0 meters in length. The western segment of the ditch is constructed of loosely stacked small basalt boulders and small to medium basalt cobbles between three to five courses of stone in height. The stones have been secured in place with concrete mortar. The western segment measures ca. 12.7 meters in length by 1.0 meter in width by 0.70 meter in height. The eastern segment is also constructed of loosely stacked small basalt boulders and small to medium basalt cobbles between three to five courses of stone in height. The stones have been secured in place with concrete mortar, except at the eastern end, where no concrete mortar was used in the construction of the ditch. The eastern segment measures ca. 11.3 meters in length by 1.0 meter in width by 0.70 meter in height.

Overall, the ditch is in fair condition. Some portions of the ditch have tumbled. Several modern plastic planting pots were observed within the ditch. Site T-018 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-018, stone/concrete ditch, view to west.

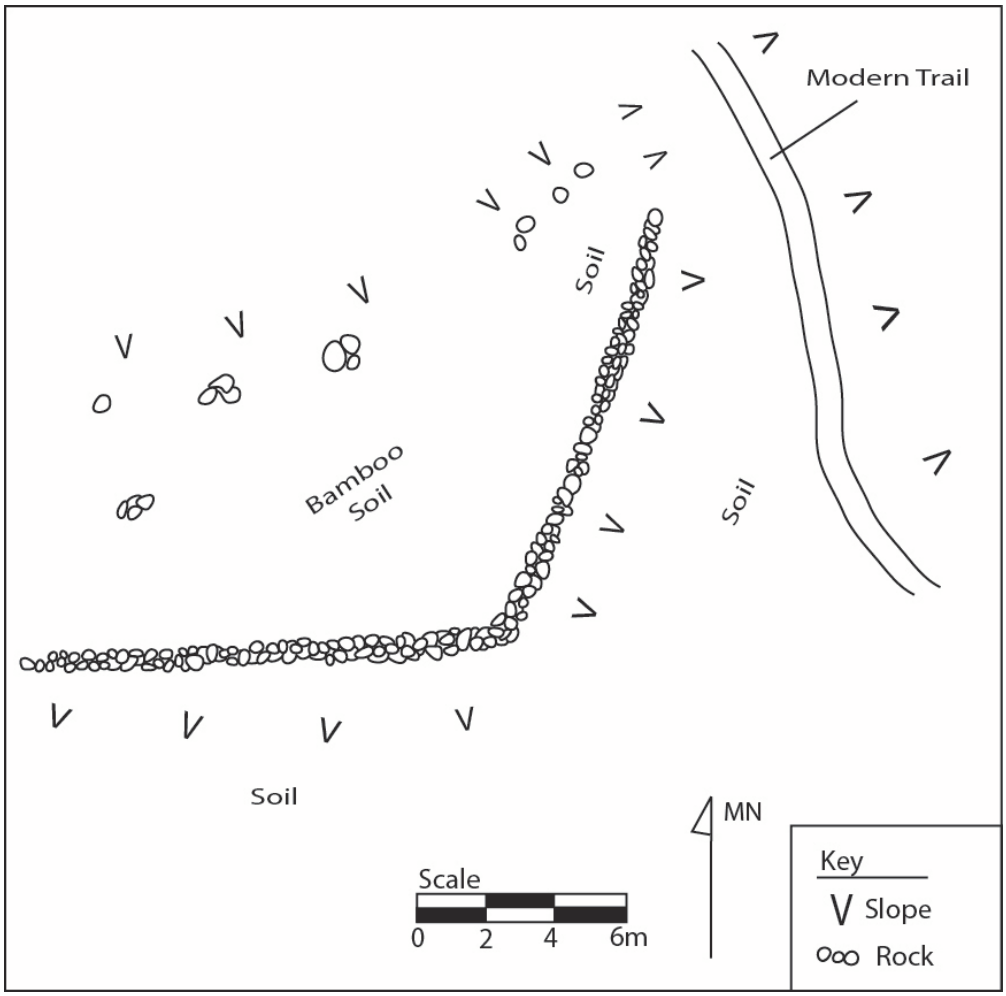
Site T-018, stone/concrete portion of ditch, view to northeast.

Site T-018, stacked stone portion of ditch, view to north.

SIHP No.:
Field No.: T-019
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-019 consists of a concrete ditch oriented roughly northwest to southeast and measuring ca. 27.0 meters in length by 0.48 meter in width and 0.2 meter in height. The ditch is constructed of preformed concrete segments each measuring ca. 0.9 meter in length. The southeastern end of the ditch has been bulldozed and broken apart. The north end of the ditch has a Y-shaped intersection. A short concrete section running down slope to the east from the main ditch measures ca. 0.80 meter in length and flows into a soil ditch. This short section of ditch has a sliding metal door with handle at the Y-shaped intersection to control water flow down slope. Site T-019 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-019, concrete ditch, Y-shaped intersection, view to south.

SIHP No.:
Field No.: T-020
Site Type: Terrace
Site Function: Agriculture
Site Condition: Fair
Description: Site T-020 consists of a large soil terrace with stone retaining wall located at the farthest southern point of the current project area. The terrace is located on the southeast facing side of a ridge, within a large stand of bamboo. Upslope of the terrace consists of a naturally eroding slope with trees, and down slope consists of soil. A walking trail oriented roughly northwest to southeast winds through the bamboo ca. 4.0 meters east of the terrace. The stone retaining wall runs roughly northeast to southwest for ca. 14.0 meters, then turns and runs east to west for ca. 14.0 meters. The retaining wall is constructed of loosely stacked medium to large basalt cobbles and small boulders between one to four courses of stone in height. The interior surface of the terrace consists of a relatively flat area of soil. Overall, the terrace measures ca. 28.0 meters in length by 3.0-4.0 meters in width by 0.6-1.0 meter in height. An L-shaped wall is located to the southwest of Site T-020, but it is outside the current APE by ca. 10.0 meters and was not recorded. Site T-020 appears to have functioned as a traditional agricultural terrace.



Planview map of Site T-020.

Site T-020, terrace, view to northeast.

Site T-020, terrace, view to northwest.

SIHP No.:
Field No.: T-021
Site Type: Complex
Site Function: Water Control
Site Condition: Poor
Description: Site T-021 is a complex comprised of six associated features of an abandoned water storage facility located immediately north of an active water pump facility.

Feature A consists of a large rectangular concrete water storage area located in the center of Site T-021. It measures ca. 17.5 meters in length (north-south) by 11.0 meters in width (east-west) with a maximum depth of 4.0 meters. The interior of Feature A is filled in with soil and several large *hao* trees. Two large metal pipes are visible protruding into the northern portion of the feature. The pipe protruding into the northwest corner measures ca. 0.61 meter (24 inches) in diameter. The pipe protruding into the northeast corner of the feature measures ca. 0.91 meter (36 inches) in diameter, with an old pump connected to the pipe.

Feature B consists of a circular concrete well located ca. 1.0 meter west of Feature A, and has a metal cap covering the opening. The well measures ca. 2.0 meters in diameter by 0.3 meters in height above ground surface. A depth could not be obtained for the feature.

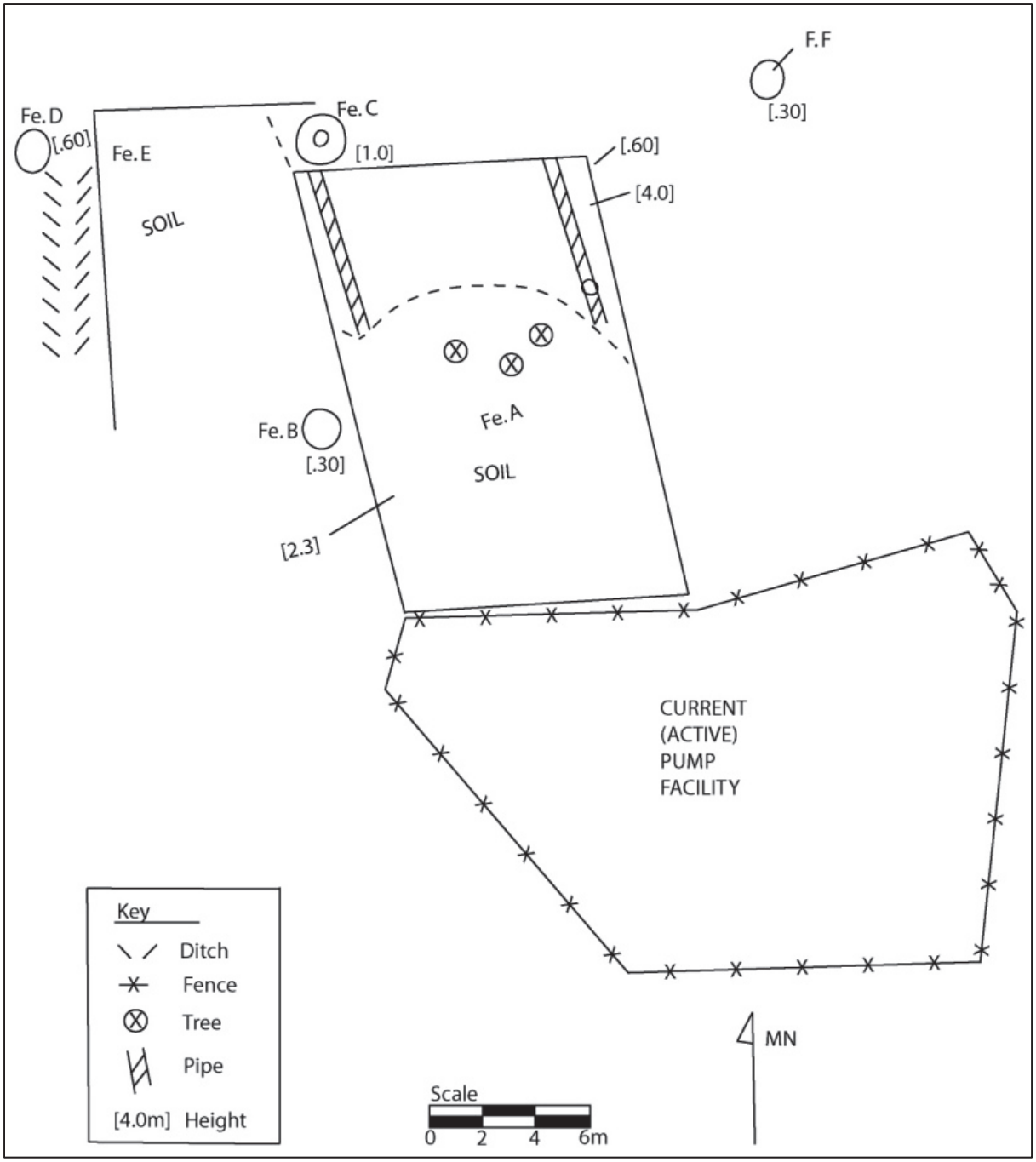
Feature C is a circular brick and mortar well located ca. 0.5 meter north of the northwest corner of Feature A. The well measures ca. 2.4 meters in diameter by 1.16 meters in depth. A metal pipe measuring ca. 0.36 meter (14 inches) in diameter and 2.0 meters in length is sticking out of the center of the well, which is mostly filled in with soil.

Feature D consists of a circular brick and mortar well located at the northwest side of Site T-021. The well measures ca. 1.8 meters in diameter by 0.6 meters in depth. A metal pipe measuring ca. 0.36 meter (14 inches) in diameter and 1.5 meters in length is sticking out of the center of the well, which is mostly filled in with soil.

Feature E is an L-shaped concrete and stone retaining wall located at the northwest side of Site T-021, immediately east of Feature D. The retaining wall runs north to south for ca. 12.0 meters then turns and runs east to west for ca. 8 meters. Overall, it measures ca. 20.0 meters in length by 0.6 meter in width by 0.4 meters in height. A soil ditch is located immediately to the west of the retaining wall.

Feature F is a circular brick and mortar well located ca. 6.0 meters northeast of Feature A. The well measures ca. 2.0 meters in diameter and 1.18 meters in depth. A metal pipe measuring ca. 0.36 meter (14 inches) in diameter and 1.5 meters in length is sticking out of the center of the well, which is mostly filled in with soil.

In addition, an old telephone pole is located 4.0 meters north of Feature A, and the site is littered with corrugated metal and modern trash. Site T-021 appears to be associated with water control related to the former commercial sugar plantation. This is likely the old pump facility shown on the old USGS map.



Planview map of Site T-021.

Site T-021, Fe. A, concrete water storage area, view to southwest.

SIHP No.:
Field No.: T-022
Site Type: Pump House
Site Function: Water Control
Site Condition: Fair
Description: Site T-022 is an active pump house located just off of the Malaekahana access road. The structure is identified as "K12 Pump House" written on an internal electric panel. The structure is surrounded by a chain-linked fence. Over all, the structure measures ca. 6.2 meters in length by 6.0 meters in width, and is constructed of a concrete foundation with plywood and plank sides and corrugated metal roofing. There are two concrete steps located on the southeast side of the structure. A white PVC pipe drains water into an abandoned concrete ditch located on the northeast side. There is an active power pole located on the southwest side of the structure, with an active HECO meter and electric box attached to the southeast side. Site T-022 appears to be associated with water control related to the former commercial sugar plantation and is still in use today, as water can be heard flowing through and seen dripping from internal pipes, as well as draining out of the PVC pipe at the rear of the structure. The abandoned concrete ditch appears to be an over flow since it is sealed by soil on both ends and flows nowhere.

Site T-022, pump house, view to north.

Site T-022, drainage at rear of pump house, view to northwest.

Site T-022, pump house, view to northwest.

SIHP No.:
Field No.: T-023
Site Type: Shed and Concrete Slab
Site Function: Storage
Site Condition: Poor
Description: Site T-023 consists of a plywood shed (Feature A) and a concrete slab (Feature B) located just off of the Malaekahana access road. There is a weighted lift-gate at the front of the property.

Feature A is a plywood shed with a corrugated metal A-frame roof constructed on top of a concrete foundation. The shed measures ca. 15.0 meters in length by 6.8 meters in width by 4.0 meters in height above ground surface. The shed is still in use, and is currently storing various pieces of equipment and supplies.

Feature B is a small concrete slab located to the southeast of the shed. The slab measures ca 7.4 meters in length by 4.1 meters in width. The slab may have been used for parking vehicles. Currently, a black metal trailer frame is parked to the northeast of Feature A and a camouflaged "military" trailer is parked to the north of Feature A.

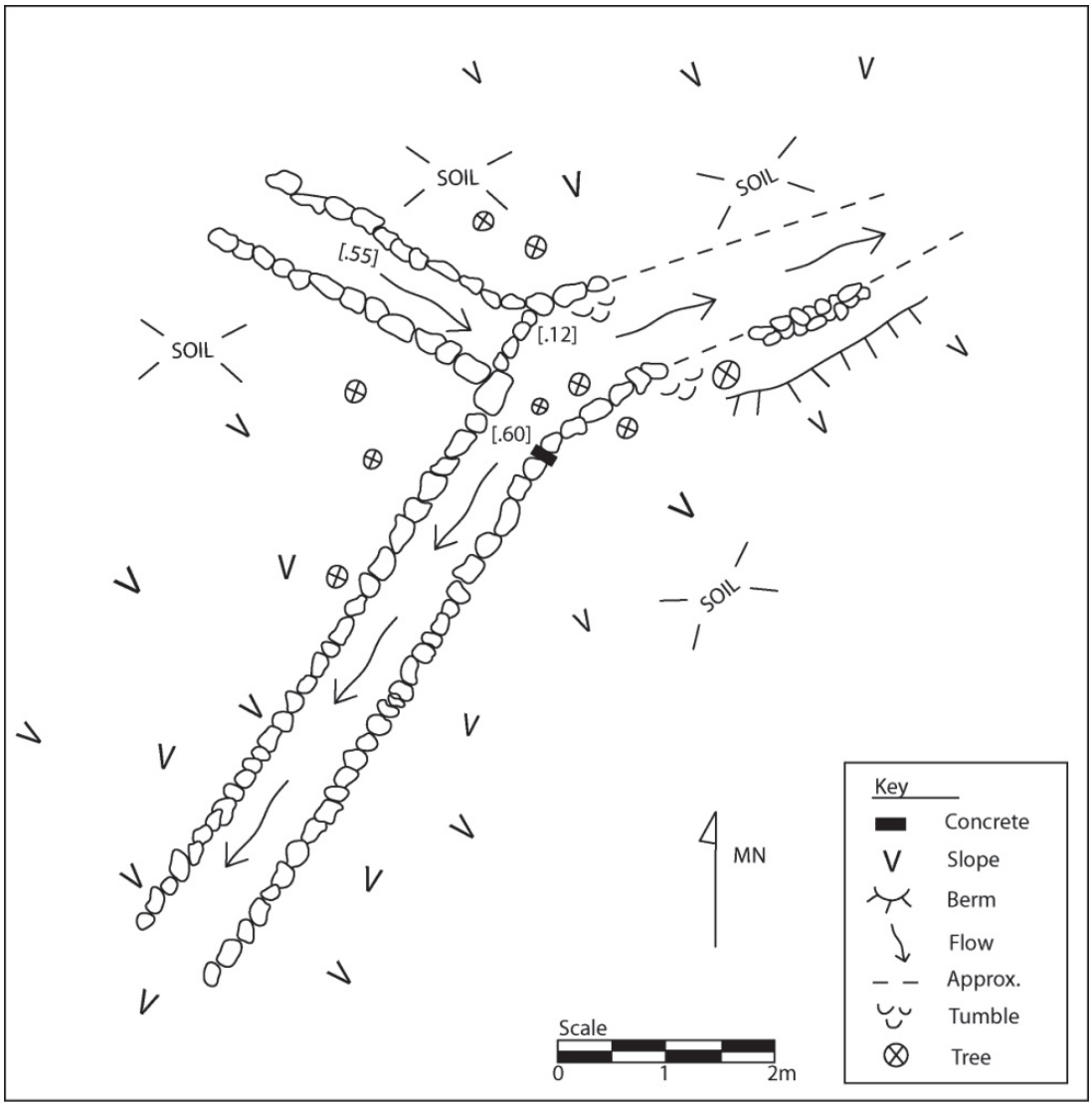
Site T-023 appears to have functioned as a storage area constructed during the historic period and currently still in use.

Site T-023, Fe. A, shed, view to west.

SIHP No.:
Field No.: T-024
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-024 consists of a concrete ditch located ca. 53.0 meters west of Site T-019 and ca. 5.0 meters east of an active agricultural field. The ditch is oriented roughly north to south. It is constructed with preformed concrete sections, each measuring ca. 0.9 meter in length. Every two to three sections, there are openings on both sides of the ditch, some of which have metal pieces that may have functioned as adjustable gates regulating water flow. The ditch measures ca. 44.0 meters in length by 0.28 meter in width by 0.21 meter in height. Site T-024 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-024, concrete ditch, view to northwest.

SIHP No.:
Field No.: T-025
Site Type: Stone Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-025 consists of a Y-shaped stone ditch intersection located on a southeast facing slope. It is constructed of loosely stacked basalt boulders and cobbles up to four courses of stone in height. The main portion of the ditch is oriented roughly northeast to southwest and measures ca. 10.4 meters in length by 0.5 meter in width by 0.3 to 0.6 meter in height. The other segment of the ditch flows into the main portion from upslope to the northwest. This ditch segment is oriented northwest to southeast and measures ca. 3.0 meters in length by 0.6 meter in width by 0.5 meter in height. In addition, several concrete pieces that may have been used to block the flow of water are incorporated into the stacked stone. Site T-025 appears to be associated with water transport related to the former commercial sugar plantation.



Planview map of Site T-025.

Site T-025, stone ditch, view to north.

Site T-025, stone ditch, view to view to west.

SIHP No.:
Field No.: T-026
Site Type: Stone Retaining Wall
Site Function: Roadway
Site Condition: Fair
Description: Site T-026 consists of a stone retaining wall constructed of medium to large basalt boulders. It is oriented roughly northeast to southwest, but does bend to the north. The wall supports an old road-cut upslope on the west side of the hillside. At the base of the wall are vestiges of a soil ditch that is mostly destroyed. The retaining wall measures ca. 88.0 meters in length by 2.0-3.0 meters in height. The boulders measure ca 0.35 to 1.3 meters in diameter. Site T-026 appears to have functioned as a retaining wall for a roadway constructed and utilized during the former commercial sugar plantation.

Site T-026, stone retaining wall, view to northwest.

SIHP No.:
Field No.: T-027
Site Type: Stone/Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-027 consists of a concrete ditch with several channels located adjacent to Site T-026. The ditch is constructed of basalt cobbles cemented in place with concrete, as well as preformed concrete ditch segments. The main ditch is oriented roughly east to west and measures ca. 10.5 meters in length by 0.45 meter in width by 0.3 meter in height. The main ditch flows into a larger concrete ditch, which flows down slope to the southeast and measures ca. 4.0 meters in length by 1.0 meter in width by 1.0 meter in height. A secondary ditch veers off from the main ditch to the northeast and extends for ca. 3.0 meters before it terminates into soil. Another ditch extends to the south for 2.0 meters before ending. Site T-027 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-027, stone/concrete ditch, view to west.

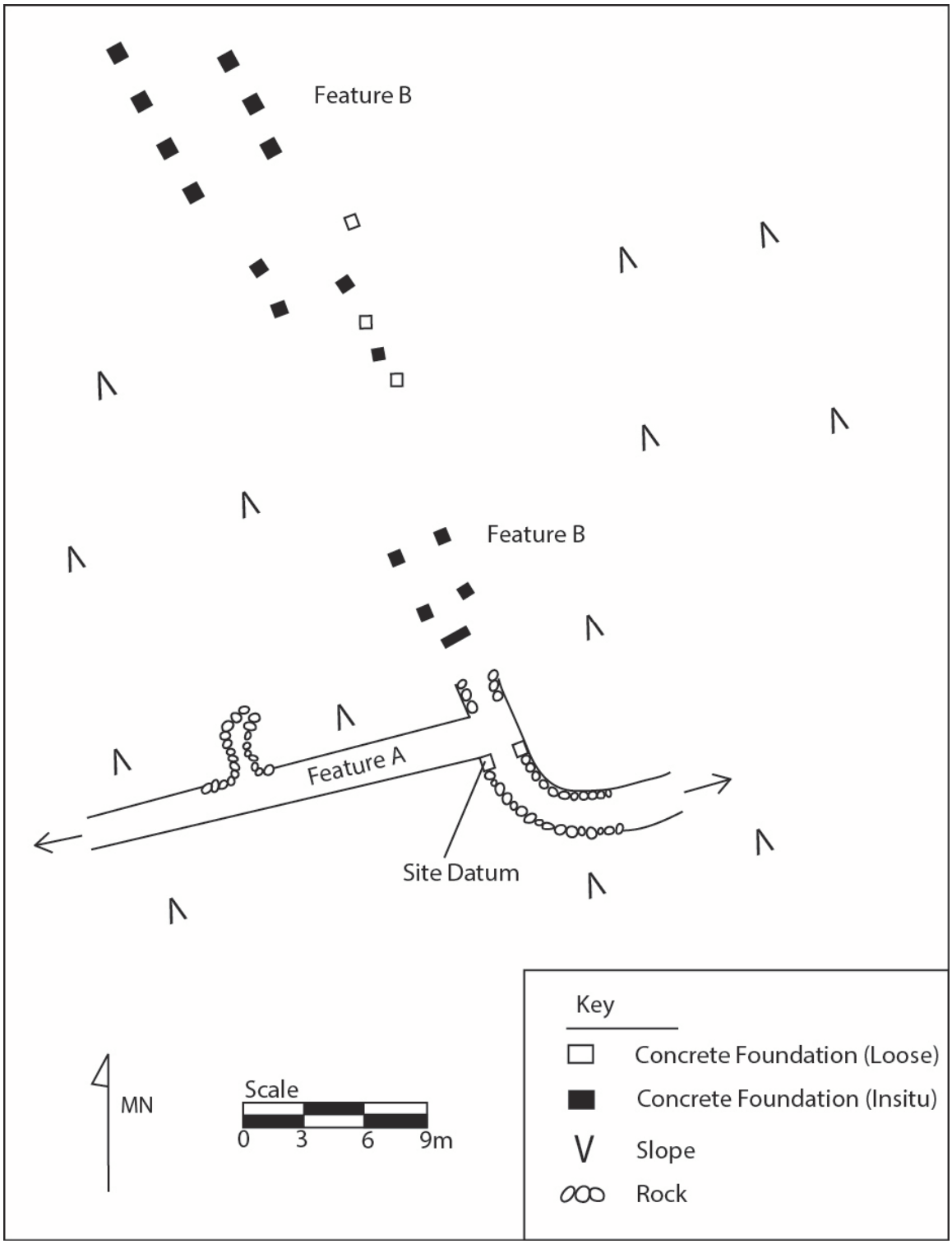
SIHP No.:
Field No.: T-028
Site Type: Complex
Site Function: Water Transport
Site Condition: Fair
Description: Site T-028 consists of a ditch (Feature A) and a series of concrete foundations (Feature B) located on a northwest facing slope. The ditch is oriented roughly northeast to southwest running across the slope of the hill. The western portion of the ditch is narrower than the eastern portion, although it is longer. The western portion measures ca. 175.0 meters in length by 1.3 meters in width by 0.4 meter in depth. It is constructed predominantly of soil, although several segments are lined with basalt cobbles on the down slope (north) side. The west end terminates at a large boulder outcrop. There are at least two outflow ditches that are partially stone-lined. The outflow ditch to the west measures ca. 5.0 meters in length by 0.4 meter in width by 0.35 meter in height, extending down slope before turning to the northeast and becoming indiscernible.

The eastern portion of the ditch measures ca. 75.0 meters in length by 1.4 meters in width by 0.7 meter in height. The eastern portion is slightly curved and is constructed of basalt cobbles mortared into place with concrete. There is a concrete foundation on both sides of the intersection where the eastern ditch merges with the west. These foundations measure ca. 0.5 meter in length by 0.4 meter in width by 0.75 meter in height. The foundations appear to have been used to support a gate for water. This segment of the ditch was constructed to accommodate large quantities of water. This ditch flows down slope into the vestiges of Feature B and measures ca. 2.6 meters in length by 0.8 meter in width by 0.2 meter in height.

Feature B consists of a series of concrete foundations extending down slope from Feature A towards the valley floor. There are a total of eight sets of concrete foundations oriented roughly northwest to southeast in two parallel lines. The foundations are set ca. 1.2 meters apart in each row, with the rows separated by ca. 3.0 meters. Each foundation is pyramid-shaped with a flat top and indentation where a beam or stand may have been. They measure ca. 0.30 meters in length by 0.30 meters in width by 0.35 meter in height. These footings were likely used to support a pipe or open ditch, although there is no current evidence of such a structure.

In addition, three historic glass bottles were observed at Site T-028, including a clear glass soda bottle with no markings, a green Rycroft bottle, and a green Gilbey gin bottle.

Site T-028 appears to be associated with water transport related to the former commercial sugar plantation.



Planview map of Site T-028.

Site T-028, Fe. A, ditch, view to south.

Site T-028, Fe. B, concrete foundations, view to northwest.

SIHP No.:
Field No.: T-029
Site Type: Complex
Site Function: Water Transport
Site Condition: Fair
Description: Site T-029 consists of three semicircular (c-shaped) abutting stone-lined ditch features located on a north facing slope. The ditches are shallow and short in length without well-defined beginnings to indicate the origins of the water flow.

Feature A is the longest ditch and is constructed of loosely stacked basalt cobbles between three to four courses of stone in height along a soil ditch. It measures ca. 1.2 meters in length by 1.1 meters in width by 0.5 meter in depth. The soil ditch runs to the southeast and measures ca. 7.0 meters in length by 0.7 meter in width by 0.5 meter in depth.

Feature B is located ca. 0.70 meter to the west of Feature A and is similar in style, but smaller in size. Features A and B are constructed back to back and form a small walkway over the ditches. The area between the features consists of soil, and there appears to be no opening for water to flow between them. Feature B measures ca. 0.4 meter in length by 0.5 meter in width by 0.25 meter in depth. It is constructed of basalt cobbles that have been loosely stacked up to two courses of stone in height. The soil ditch runs to the west for ca. 3.0 meters.

Feature C is situated ca. 0.5 meter to the northeast of Feature A. It is the smallest feature, although it is similar in shape and style to Features A and B. Feature C is constructed of basalt cobbles that have been loosely stacked between two to three courses of stone in height. The ditch measures ca. 0.5 meter in length by 0.7 meter in width by 0.4 meter in height. The soil ditch runs to the northeast for ca. 10.0 meters before terminating down slope. Like Features A and B, the gap between Features A and C consists of soil and resembles a walkway.

Site T-029 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-029, Fe. A, stone-lined ditch, view to northwest.

Site T-029, Fe. B, stone-lined ditch with Fe. A in background, view to east.

Site T-029, Fe. C, stone-lined ditch with Fe. A in background, view to south.

SIHP No.:
Field No.: T-030
Site Type: Complex
Site Function: Water Transport
Site Condition: Fair
Description: Site T-030 consists of a complex located along the southwestern edge of the current APE, in between Site T-070 and Site T-071.

Feature A consists of a long soil ditch oriented roughly northeast to southwest. It measures ca. 142.0 meters in overall length by 0.8-1.0 meter in width by 0.0-0.3 meter in depth. The ditch extends at least ca. 9.0 meters outside of the current project area to the southwest.

Feature B is a stone retaining wall constructed along the exterior bend of Feature A, near the northeast end of the ditch. The retaining wall is constructed of basalt cobbles that have been loosely stacked between three to six courses of stone in height. The wall supports a 90° bend in the Feature A, ditch. The northern portion of the wall runs to the northwest and measures ca. 5.6 meters in length by 0.3-0.7 meter in height. The southern segment runs to the southwest and measures ca. 12.0 meters in length by 0.45-0.8 meter in height. The corner where the two retaining wall segments meet is partially tumbled, exposing soil and stacked stones, one course deep. An orange plastic survey stake is located adjacent to Feature B indicating the approximate location of the property boundary.

Feature C consists of a stone retaining wall located ca. 4.0 meters down slope to the north of the Feature A, ditch, and 39.0 meters southwest of the Feature B, retaining wall. The retaining wall is oriented roughly northwest to southeast and is constructed of basalt cobbles and boulders loosely stacked between one to six courses of stone in height. The wall measures ca. 3.4 meters in length by 0.4 and 0.9 meters in width by 1.0 meter in height. There is a visible corner located at the northwest end of the feature. The wall continues for 1.1 meters from the corner, where it terminates into the slope of the hill. The retaining wall appears to have been constructed to support the down slope side of the Feature A, ditch.

Feature D is a concrete ditch situated within the Feature A, ditch, located ca. 18.0 meters north of the southern terminus of Feature A. Feature D is oriented roughly north to south and measures ca. 7.5 meters in length by 0.5-0.95 meter in width by 0.53-0.70 meter in depth. The northern third of Feature D is constructed of basalt cobbles cemented in place. There is steel pipe measuring ca. 0.28 meter (11 inch) in diameter, protruding from the ditch, extending down slope to the northeast. The central portion of the ditch is constructed of loosely stacked basalt cobbles on the upslope side and cemented basalt cobbles on the down slope side. The southern third of the ditch is constructed of solid concrete that has been formed and poured in place. On both ends of this section, slits are present indicating gates were once in place. This section also contains a steel pipe measuring ca. 0.28 meter (11 inch) in diameter, with the opening sealed shut with concrete. The angle of both of the metal pipes indicates water in this portion of the trench flowed to the north.

Site T-030 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-030, Fe. B, stone retaining wall, view to southeast.

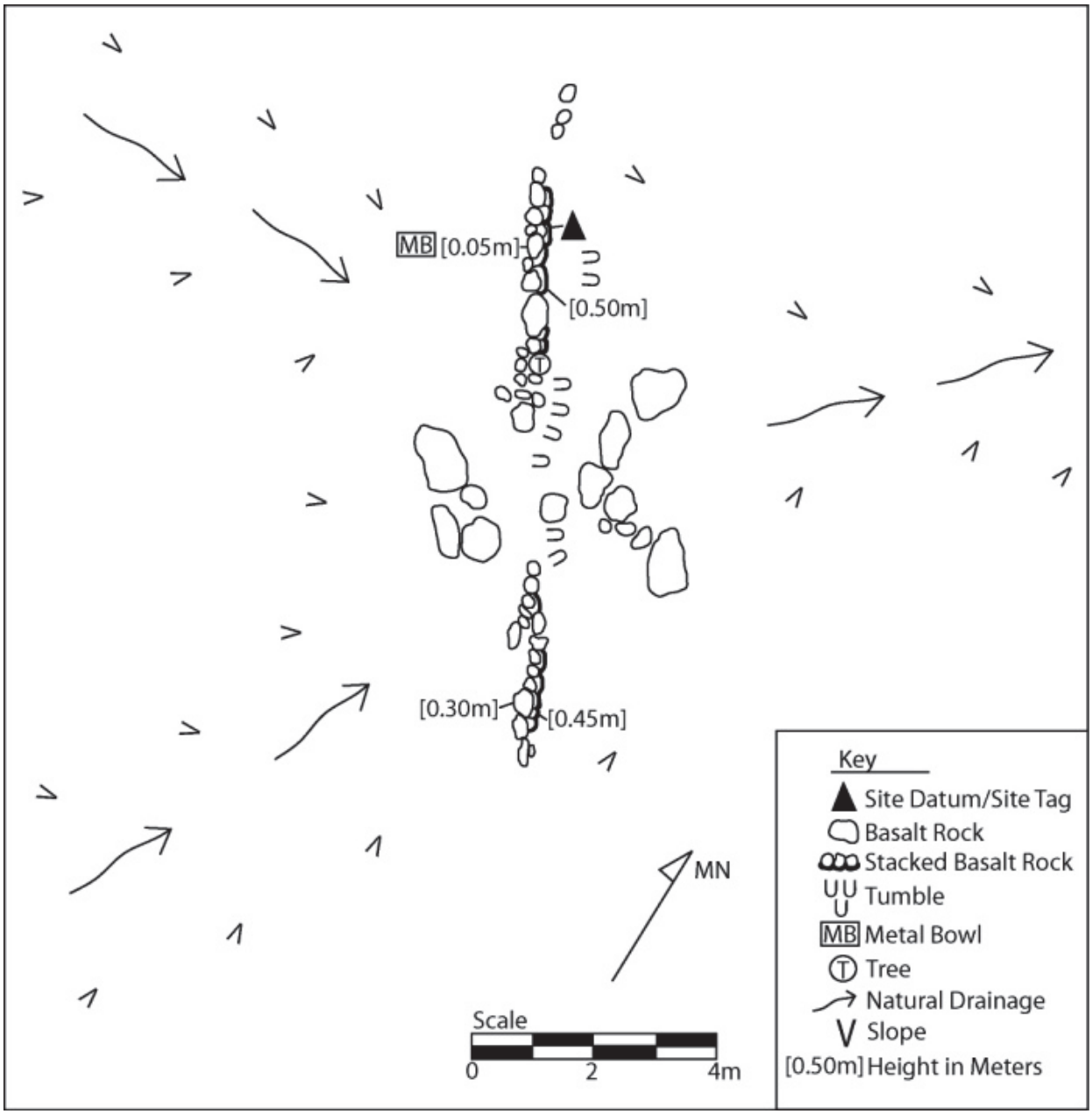
Site T-030, Fe. D, concrete ditch, view to north.

SIHP No.:
Field No.: T-031
Site Type: Terraced Soil Furrows
Site Function: Agriculture
Site Condition: Fair
Description: Site T-031 consists of a series of terraced soil furrows located along the southwest edge of the project area, ca. 30.0 meters down slope to the northwest of Site T-030. Overall, the site measures ca. 40.0 meters in length (north-south) by 30.0 meters in width (east-west). The furrows are relatively uniform in appearance and each measures ca. 30.0 meters in length (east-west) by 1.3 meters in width (north-south) by 0.15 meter in height. Site T-031 closely resembles the other terraced soil furrows recorded in the area (Site T-033, T-071). Site T-031 appears to have functioned as an agricultural field during the historic period.

Site T-031, terraced soil furrows, view to southeast.

SIHP No.:
Field No.: T-032
Site Type: Terrace
Site Function: Agriculture
Site Condition: Fair
Description: Site T-032 consists of a soil terrace with a linear stone retaining wall located near the southwest edge of the current APE. The terrace is oriented roughly northwest to southeast, and spans the convergence of two small drainages. The stone retaining wall is constructed of large basalt cobbles and small to medium basalt boulders that have been loosely stacked between one to two courses of stone in height. The surface of the terrace consists of a relatively flat area of soil. Overall, the terrace measures ca. 10.0 meters in length by 2.5 meters in width by 0.5 meter in height along the northeast edge. There is a gap at the center of the terrace measuring ca. 2.0 meters in length. Both ends of the terrace extend up into the sides of the drainage. The central portion of the terrace has been impacted by water flowing through the drainages. The western side of the terrace is in better condition and contains more soil than the eastern portion. A small historic metal bowl was observed on the western portion of the terrace. The bowl is gray and rusted, and measures ca. 18.0 centimeters in diameter by 8.0 centimeters deep. Site T-032 appears to have been used for agriculture during the historic period.

Site T-032, terrace, view to south.



Planview map of Site T-032.

SIHP No.:
Field No.: T-033
Site Type: Terraced Soil Furrows
Site Function: Agriculture
Site Condition: Fair
Description: Site T-033 consists of a series of terraced soil furrows located near the southwest edge of the current APE, ca. 0.5 meter northeast of Site T-032. The furrows run roughly northeast to southwest along a southeast facing slope. Overall, the site measures ca. 31.0 meters in length (northeast-southwest) by 26.0 meters in width (northwest-southeast). There are approximately 10 furrows going up the slope, where they disappear into a thick mass of lantana bushes. The furrows are relatively uniform in appearance and each measures ca. 31.0 meters in length by 1.0 meter in width by 0.15 meter in height. Site T-033 closely resembles the other terraced soil furrows recorded in the area (Site T-031, T-071). Site T-033 appears to have functioned as an agricultural field during the historic period.

Site T-033, terraced soil furrows, view to north.

SIHP No.:
Field No.: T-034
Site Type: Complex
Site Function: Water Transport/Control
Site Condition: Fair
Description: Site T-034 consists of a complex comprised of a soil ditch (Feature A) and a concrete footing (Feature B) located in the southwest portion of the current project area.

Feature A consists of a long soil ditch oriented roughly east to west and measuring ca. 350.0 meters in total length by 0.80-1.5 meters in width by 1.0 meter in depth. The east end of the ditch terminates near a dirt access road. Near the east end of the ditch is a segment lined with basalt and limestone cobble and boulder stacking on the south side of the ditch. The stacking is slightly curved and was appears to have been used to retain the soil slope above the ditch. The stone stacking measures ca. 4.8 meters in length by 0.4 meter in width by 0.95 meter in height. There is also a second set of stone stacking located near the east end of the ditch, to the west of Feature B, that measures ca. 2.7 meters in length by 0.3 meter in width by 0.5 meters in height. Located ca. 0.3 meter northeast of this stacking are the concrete supports of a gate which is no longer present. The concrete supports measure ca. 1.5 meters in length by 0.63 meter in height and there is a 0.6 meter opening where the gate used to be. Basalt and limestone cobble stacking is present on both sides of the concrete supports in order to hold them in place. The west end of the ditch terminates into a natural drainage above an active agricultural farm. Feature A appears to be associated with water transport related to the former commercial sugar plantation.

Feature B is a concrete footing located at the eastern end of the Feature A, ditch, approximately 1.5 meters north of the small stone lined portion of the ditch. The footing measures ca. 3.6 meters in length by at least 2.6 meters in width by 0.6 meter in height. The southern portion of the feature extends into the existing slope making it impossible to determine the overall width. The surface of the footing is filled in with soil and there is a broken off steel pipe measuring ca. 0.15 meters (6 inches) in diameter that extends out of the concrete. The pipe likely connected to another pipe with a 90˚ bend that is sticking out of the ground in front of the footing. A metal grate is also located near the pipe. Four pieces of rebar also extend out of the ditch near the footing. Feature B appears to be associated with water control related to the former commercial sugar plantation.

A clear glass wine bottle with a screw cap was found on the surface of the Feature B, concrete footing. The base is embossed with "CALIFORNIA WINE ASSOC. –SAN FRANCISCO CA.- REILLING PROHIBITED- 3665 L." It is a half-gallon jug with diamonds embossed around the neck. The bottle was not collected.

Site T-034 appears to be associated with water transport and control related to the former commercial sugar plantation.

Site T-034, Fe. A, soil ditch, view to east.

Site T-034, Fe. A, soil ditch, view to west.

Site T-034, Fe. B, concrete footing, view to south.

Site T-034, glass bottle, view to east.

SIHP No.:
Field No.: T-035
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Poor
Description: Site T-035 consists of a concrete ditch located in the southwestern portion of the project area, ca. 50.0 meters southwest of an active agricultural farm. The ditch curves around the contour of a slope in a roughly east to west direction. The west end of the ditch ties into the Site T-034, soil ditch, and the east end terminates at an area that has been previously bull-dozed. The ditch is constructed of preformed concrete segments, each measuring ca. 1.22 meters in length. Every other segment has openings on both sides measuring ca. 0.15 meter in length by 0.09 meter in width, with a metal cover used to allow water to flow out of the ditch. Overall, the ditch measures ca. 88.0 meters in length by 0.28 meter in exterior width by 0.23 meter in interior width by 0.2 meters in exterior height by 0.16 meters in interior depth. The concrete walls of the ditch are ca. 0.025 meters thick, but at each opening the concrete is slightly thicker measuring ca. 0.09 meters in thickness. Site T-035 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-035, concrete ditch, view to southeast.

SIHP No.:
Field No.: T-036
Site Type: Stacked Stone Ditch
Site Function: Water Transport
Site Condition: Good
Description: Site T-036 consists of a stacked stone ditch located approximately 8.0 meters down slope to the northeast of the Site T-034, soil ditch, and ca. 10.0 meters south of the Site T-037, concrete ditch. It is likely that Site T-034 fed into Site T-036. It is situated on an east facing slope. The ditch runs down slope to the east and then feeds into a T-shaped intersection that is oriented roughly north to south across the slope.

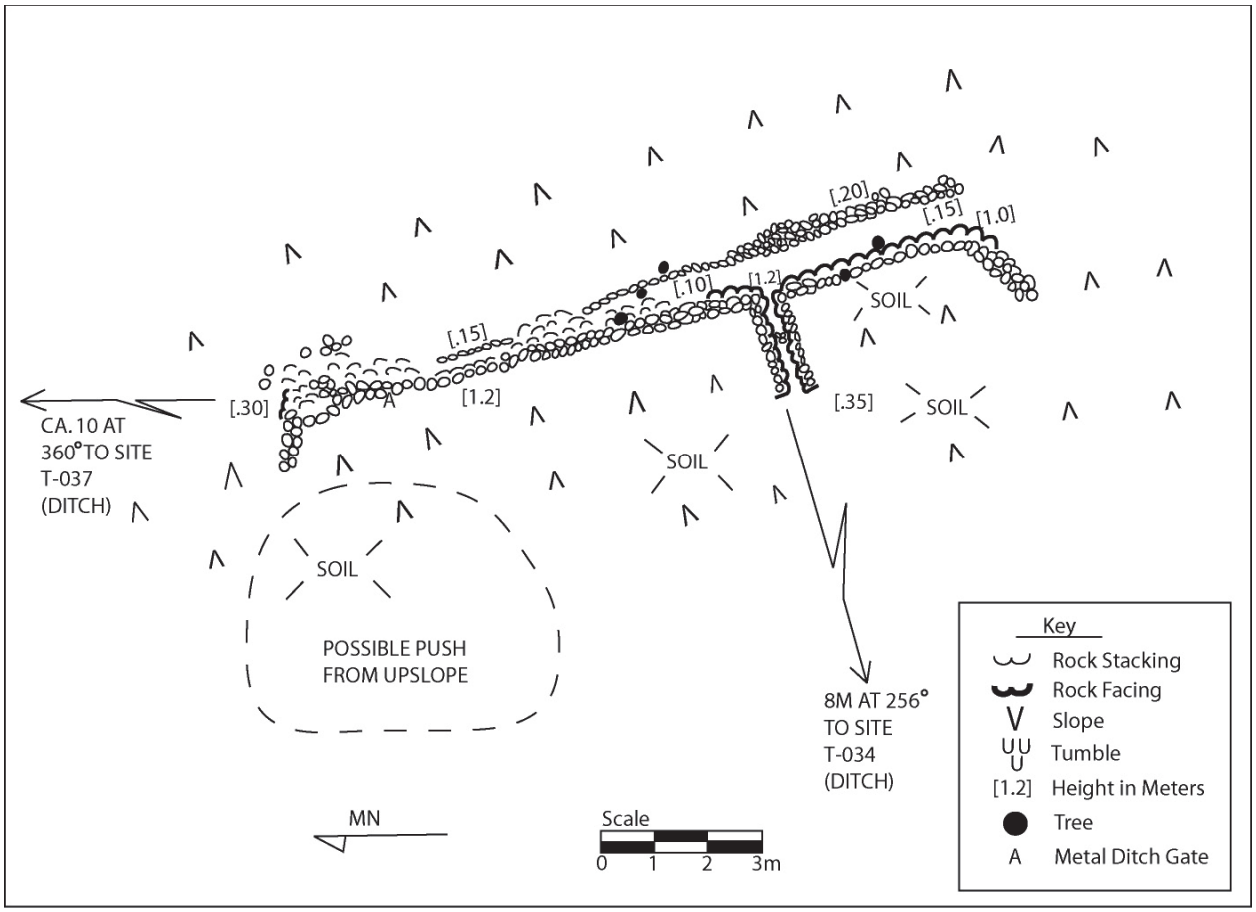
The east to west portion of the ditch is constructed of basalt boulders and cobbles that have been nicely stacked between two to five courses of stone in height. It measures ca. 2.0 meters in length by 0.75 meters in width by 0.5-1.2 meters in height. The south wall is ca. 0.2 meters thick and the north wall is 0.25 meters thick. The interior of the ditch measures ca. 0.3 meter in width and the ground is littered with rocks and leaves, as well as two tree stumps. There are two vertical concrete slabs facing one another at the west end of the east to west portion of the ditch. These likely would have housed a metal gate.

The north-south portion of the ditch extends along the slope and is constructed of basalt boulders and cobbles that have been nicely stacked between five to six courses of stone in height along the west side. It measures ca. 14.0 meters in length by 0.10 meter in width by 1.2 meters in height. The east side of the ditch is significantly shorter and constructed of basalt boulders that have been loosely stacked between one to two courses of stone in height, measuring ca. 0.3 meters in width by 0.1-0.3 meter in height. The interior of the ditch measures ca. 0.35-0.45 meters in width and is littered with rocks, leaves, and deadfall. The ditch merges into the slope at both the north and the south end.

Site T-036 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-036, stacked stone ditch, view to north.

Site T-036, stacked stone ditch, view to west.



Planview map of Site T-036.

SIHP No.:
Field No.: T-037
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-037 is a concrete ditch located immediately down slope of the Site T-034, soil ditch, and ca. 10.0 meters north of the Site T-036, stacked stone ditch. The ditch is oriented roughly northeast to southwest and is constructed of preformed concrete segments each measuring ca. 0.8 meters in length. The slope of the hill is relatively steep at the southwest end, but gradually becomes flatter as it extends down slope to the northeast. At the southwest end, Site T-037 connects with Site T-034, which would have fed into Site T-037. Overall, the ditch measures ca. 60.0 meters in length by 0.48 meters in width by 0.27 meters in height. The sides of the concrete segments measure ca. 0.03 meters in thickness. Every 2.0-3.0 meters there is a square or rectangular opening in the side of the ditch which holds a metal gate used to allow water to flow out of the ditch. The first ca. 4.0 meters at the southwest end are lined with sheet metal. In some areas, tree growth has disturbed some of the segments. Site T-037 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-037, concrete ditch, view to southwest.

SIHP No.:
Field No.: T-038
Site Type: Stone Alignment
Site Function: Water Transport
Site Condition: Poor
Description: Site T-038 consists of a linear stone alignment located ca. 19.0 meters southwest of the Site T-035, concrete ditch. The alignment is situated in a shallow drainage between two relatively flat soil areas. It is oriented roughly east to west and measures 5.0 meters in length by 0.4 meters in width by 0.5 meter in height. The alignment is constructed of basalt boulders set in a line. Tucked within the alignment are several small pieces of limestone which does not occur naturally in the area. There is a piece of metal measuring ca. 3.0 meters in length located on the south side of the alignment. It is possible that the metal was used in conjunction with the alignment, perhaps resting on or alongside the alignment to transport water down slope. Site T-038 is in poor condition. The east and west ends appear to have been damaged by water flow. Site T-038 appears to be associated with water transport related to the former commercial sugar plantation.

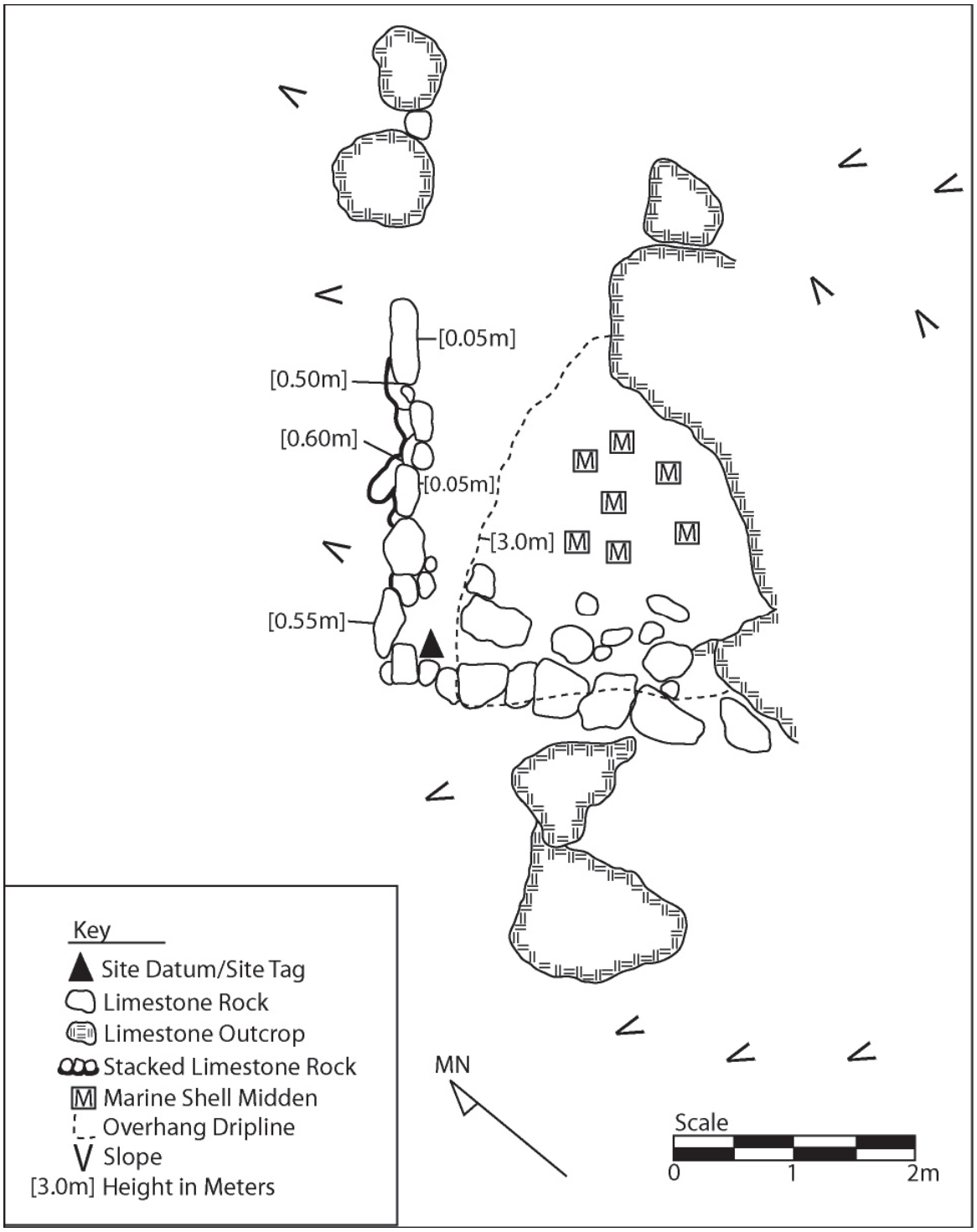
Site T-038, stone alignment, view to southeast.

SIHP No.:
Field No.: T-039
Site Type: Overhang Shelter with Terrace
Site Function: Habitation
Site Condition: Fair
Description: Site T-039 consists of a limestone overhang shelter (Feature A) and a soil terrace with an L-shaped stone retaining wall (Feature B) located in the north-central portion of the project area. It is situated along a limestone cliff face ca. 35.0 meters northeast from Site T-043.

Feature A consists of a limestone overhang shelter that opens to the northwest. It measures 3.2 meters in length by 2.0 meters in depth by 3.0 meters in height. The interior surface of the overhang consists of soil with limestone pebbles and small cobbles, as well as leaves and dead branches. The surface has been disturbed by chickens living in the vicinity. Several fragments of marine shell midden were observed on the interior surface of the overhang including one complete cone shell, one fragment of a cone shell, and five *pipipi*.

The interior surface of the overhang is supported by Feature B, which consists of a soil terrace with an L-shaped stone retaining wall. The retaining wall is constructed of partially stacked limestone boulders. The terrace extends ca. 1.0 meter out beyond the drip line of the overhang. The long axis of the retaining wall is oriented northeast to southwest and measures ca. 3.25 meters in length by 0.1-0.4 meters in width by 0.6 meter in height along the northwest edge and 0.05 meter in height along the southeast edge. The short axis is oriented roughly northwest to southeast and measures ca. 3.5 meters in length by 0.2-0.5 meters in width by 0.2-0.5 meters in height. The soil surface of the terrace measures ca. 3.0 meters in length (northeast-southwest) by 3.0 meters in depth (northwest-southeast).

Site T-039 appears to have functioned as a traditional habitation site.



Planview map of Site T-039.

Site T-039, Fe. A, overhang shelter and Fe. B, terrace, view to southeast.

Site T-039, sample of marine shell midden observed on interior surface of overhang.

SIHP No.:
Field No.: T-040
Site Type: Complex
Site Function: Habitation/Agriculture
Site Condition: Fair
Description: Site T-040 is a complex comprised of five associated terraces located in the central portion of the project area, ca. 25.0 meters upslope to the south of an active agricultural farm. The site is situated along the north side of a limestone cliff face.

Feature A consists of a soil terrace with a stone retaining wall situated along the north side of a limestone cliff face in the eastern portion of the site, immediately east of Feature B. It is the largest terrace at Site T-040, measuring ca. 11.0 meters in length by 3.5 meters in depth by 0.05-0.8 meters in height. The stone retaining wall is constructed of limestone boulders and cobbles that have been loosely stacked between two to three courses of stone in height. The terrace also utilizes several natural limestone outcrops. Some of the stones from the retaining wall have tumbled down slope. The surface of the terrace consists of a relatively flat area of soil that abuts the limestone cliff face to the south, which measures ca. 6.0 meters in overall height. There are some small overhangs along the cliff face, but they do not appear to have been utilized. There is a small circular soil depression located on the eastern portion of the surface of the terrace measuring ca. 0.7 meter in length by 0.6 meter in width by 0.12 meter in depth. It is unclear what the depression is, but it may be the hole left by an old fallen tree. A historic aqua glass bottle base is located within the depression. The bottle base is embossed with the "Diamond O-I" maker's mark indicating Owens-Illinois Glass Company manufacture. A few small unmodified basalt cobbles were also observed on the surface of the terrace. Feature A appears to have functioned as a traditional habitation terrace.

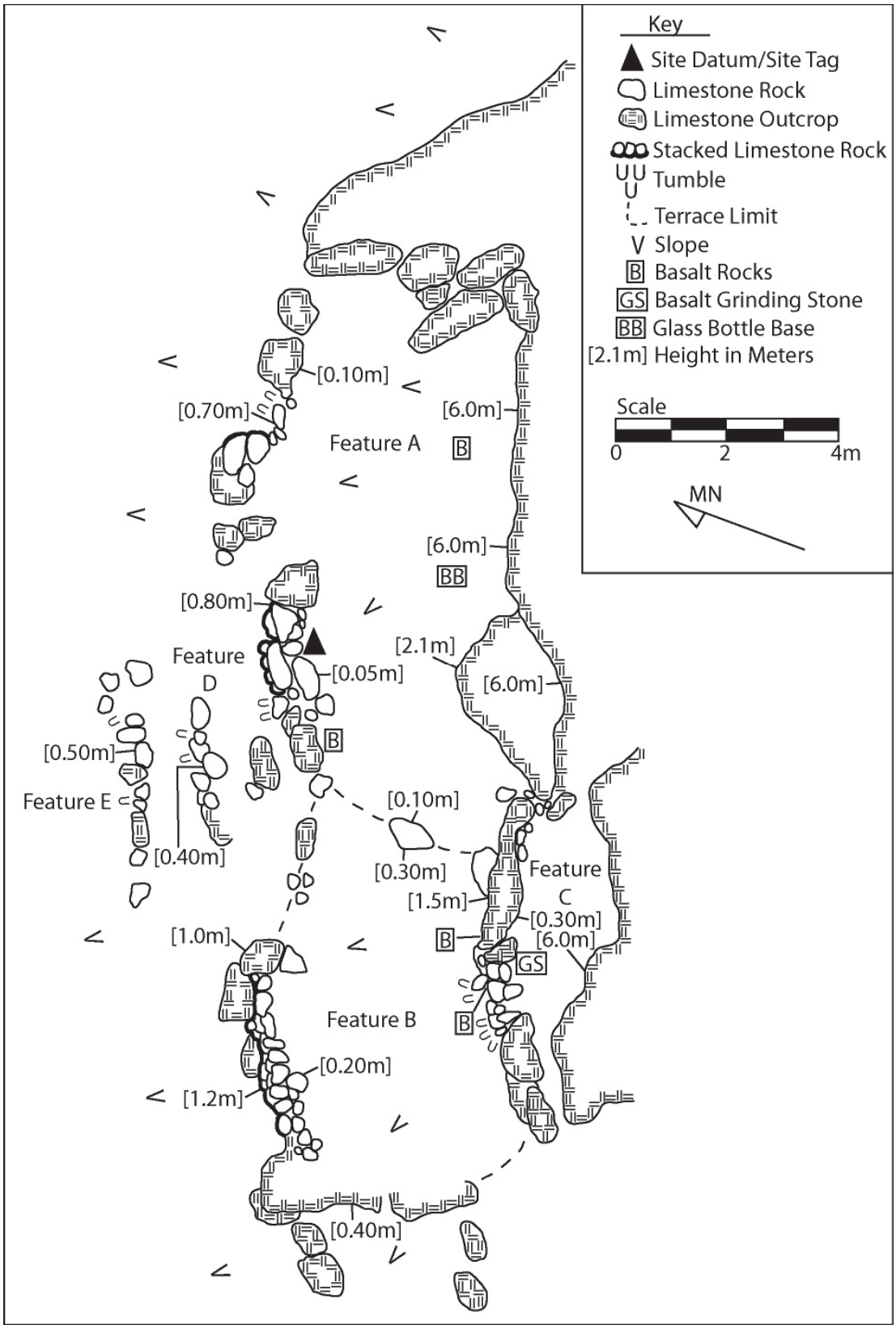
Feature B consists of a soil terrace with stone retaining wall situated on the west side of Site T-040, immediately west of Feature A and northwest of Feature C. The terrace measures ca. 6.0 meters in length by 4.0 meters in depth by 0.20-1.2 meters in height. The stone retaining wall is constructed of limestone boulders and cobbles that have been loosely stacked between two to six courses of stone in height. The terrace also utilizes several natural limestone outcrops. The surface of the terrace consists of a relatively flat area of soil that abuts Feature C to the southeast. There is a step down between Feature A and Feature B measuring ca. 0.1-0.3 meters in height which was likely edged with stone at one time, but most of the stone are now missing. Feature B appears to have functioned as a traditional habitation terrace.

Feature C is a small soil terrace with stone retaining wall located up against the base of the limestone cliff, at the rear of the Feature B, terrace. The terrace measures ca. 3.9 meters in length by 2.5 meters in depth by 0.3-1.5 meters in height. The stone retaining wall is constructed of limestone boulders and cobbles that have been loosely stacked up to three courses of stone in height in between several medium to large natural limestone outcrops. The surface of the terrace consists of an uneven area of soil and loose rock that abuts the cliff face which measures ca. 6.0 meters in overall height. The stacked portion of the retaining wall has partially tumbled out onto the surface of Feature B. One artifact was observed consisting of a basalt grinding stone located on the surface of Feature C, near the stone retaining wall. The stone is smooth and has visible use wear on at least two of the sides. It measures ca. 20.0 centimeters in length by

15.0 centimeters in width by 13.0 centimeters in thickness. The grinding stone was photographed, but not collected. At least two unmodified basalt cobbles were observed near the tumble from the stone retaining wall. Feature C appears to have functioned as a traditional habitation terrace.

Feature D consists of a soil terrace with stone retaining wall located immediately down slope to the northwest of Feature A. The terrace measures ca. 2.9 meters in length by 1.0 meter deep by 0.0-0.4 meter in height. The stone retaining wall is constructed of limestone boulders and cobbles that have been loosely stacked up to two courses of stone in height. A natural limestone outcrop is also incorporated into the western end of the retaining wall. Some of the stones from the retaining wall have tumbled down slope. The surface of the terrace consists of a sloped area of soil and rock that abuts the retaining wall of Feature A at the rear. Feature D appears to have functioned as a traditional agricultural terrace.

Feature E is a soil terrace with stone retaining wall located immediately down slope to the northwest of Feature E. The terrace measures ca. 3.9 meters in length by 1.0 meter deep by 0.0-0.5 meter in height. The stone retaining wall is constructed of limestone boulders and cobbles that have been loosely stacked up to two courses of stone in height. The terrace also utilizes several natural limestone outcrops. Some of the stones from the retaining wall have tumbled down slope. The surface of the terrace consists of a sloped area of soil and rock that abuts the retaining wall of Feature D at the rear. Feature E appears to have functioned as a traditional agricultural terrace.



Planview of Site T-040.

Site T-040, Fe. A, terrace, view to northeast.

Site T-040, Fe. B, terrace, view to southeast.

Site T-040, Fe. C, terrace, view to east.

Site T-040, Fe. D, terrace, view to southeast.

Site T-040, Fe. E, terrace, view to north.

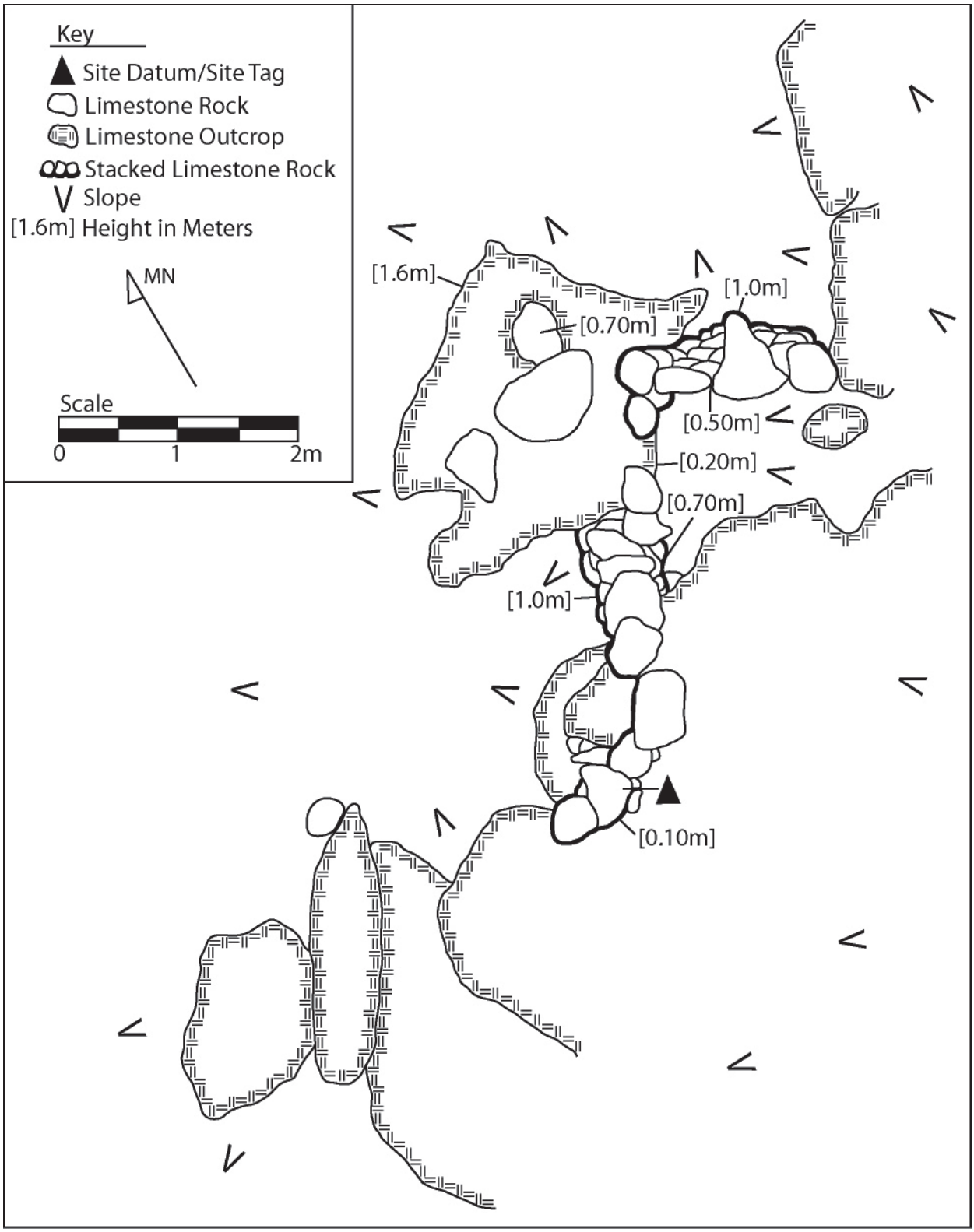
SIHP No.:
Field No.: T-041
Site Type: Filled Crevice
Site Function: Possible Burial
Site Condition: Fair
Description: Site T-041 is a filled limestone crevice located in the north-central portion of the project area, and situated along a limestone cliff on a ca. 35˚ slope. The surrounding vegetation includes *koa haole*, banyan, and a stand of *ti* located ca. 3.0 meters away. The crevice is near the top of a limestone cliff, but under a large limestone boulder slab which creates a small, cave-like overhang. The crevice measures ca. 0.9 meter in length by 0.3 meter in width, and is filled with small limestone slabs measuring ca. 0.15-0.3 meter in diameter by 0.05-0.1 meter in thickness. The area adjacent to the filled crevice does not contain any roof fall or debris suggesting that the material within the crevice is likely intentional. No cultural material was observed in the area. Site T-041 appears to be traditional in construction. Although no human skeletal remains were observed at the site, based on the style of construction, it is possible that a human burial may be present within the filled crevice.

Site T-041, filled crevice, view to east.

SIHP No.:
Field No.: T-042
Site Type: Terrace
Site Function: Agriculture
Site Condition: Fair
Description: Site T-042 consists of a terrace located in the north-central portion of the project area, near the top of a limestone cliff. The site is situated ca. 20.0 meters north/northeast of the Site T-041, filled crevice, on the same slope. Vegetation in the area includes *koa haole*, *noni*, banyan, *hau*, and Christmas berry. The feature is a stacked limestone terrace incorporating natural limestone outcrops. Overall, the terrace measures ca. 5.5 meters in length by 2.5 meters in width by 1.0 meter in height. The terrace wall is roughly L-shaped and built into the slope. The stone retaining wall is constructed of loosely stacked limestone boulder slabs and cobbles. The interior portion of the retaining wall is two courses of stone in height, while the exterior portion of the wall is between four to five courses high. The northern portion of the terrace is hollowed out and resembles a planting area. A small banyan tree is growing within the terrace on the north side, where a soil deposit is present. The south end of the terrace consists of soil and limestone outcrop.

Site T-042 appears to have functioned as a traditional agricultural terrace.

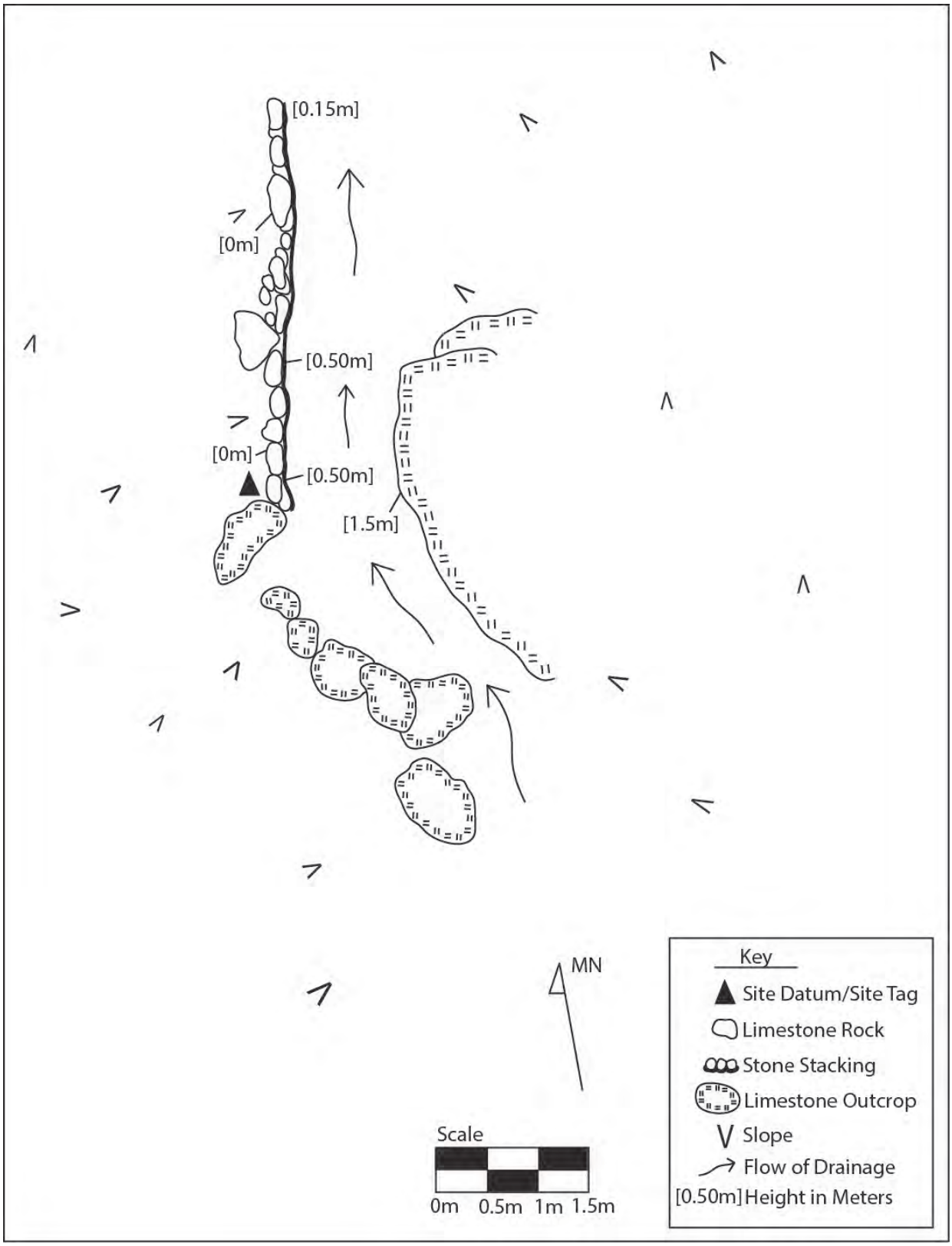
Site T-042, terrace, view to south.



Planview map of Site T-042.

SIHP No.:
Field No.: T-043
Site Type: Stone Lined Drainage
Site Function: Water Control
Site Condition: Fair
Description: Site T-043 consists of a stone-lined drainage located at the base of a limestone ridge in the north-central portion of the project area. Vegetation in the area includes *hau*, rubber tree, mango, *koa haole* and *ti*. The drainage appears natural in origin, but has been modified at its base with limestone stacking along the west side. The stacking measures 4.2 meters in length by 0.15-0.5 meter in height, and is constructed of loosely stacked limestone cobbles and slabs. At the base of the slope, the drainage measures ca. 1.1 meters wide. The east side of the drainage is a soil slope. The drainage is situated ca. 10.0 meters to the south above active agricultural fields and most likely fed the fields at one time. A modern, but abandoned chicken coop is located ca. 4.0 meters to the northeast. Modern trash is scattered throughout the site and includes aluminum soda cans, plastic bags, mattress springs, corrugated sheet metal, and plastic water bottles. This site is likely historic and was used to supply water to the nearby agricultural fields. Site T-043 appears to be associated with water control related to the former commercial sugar plantation.

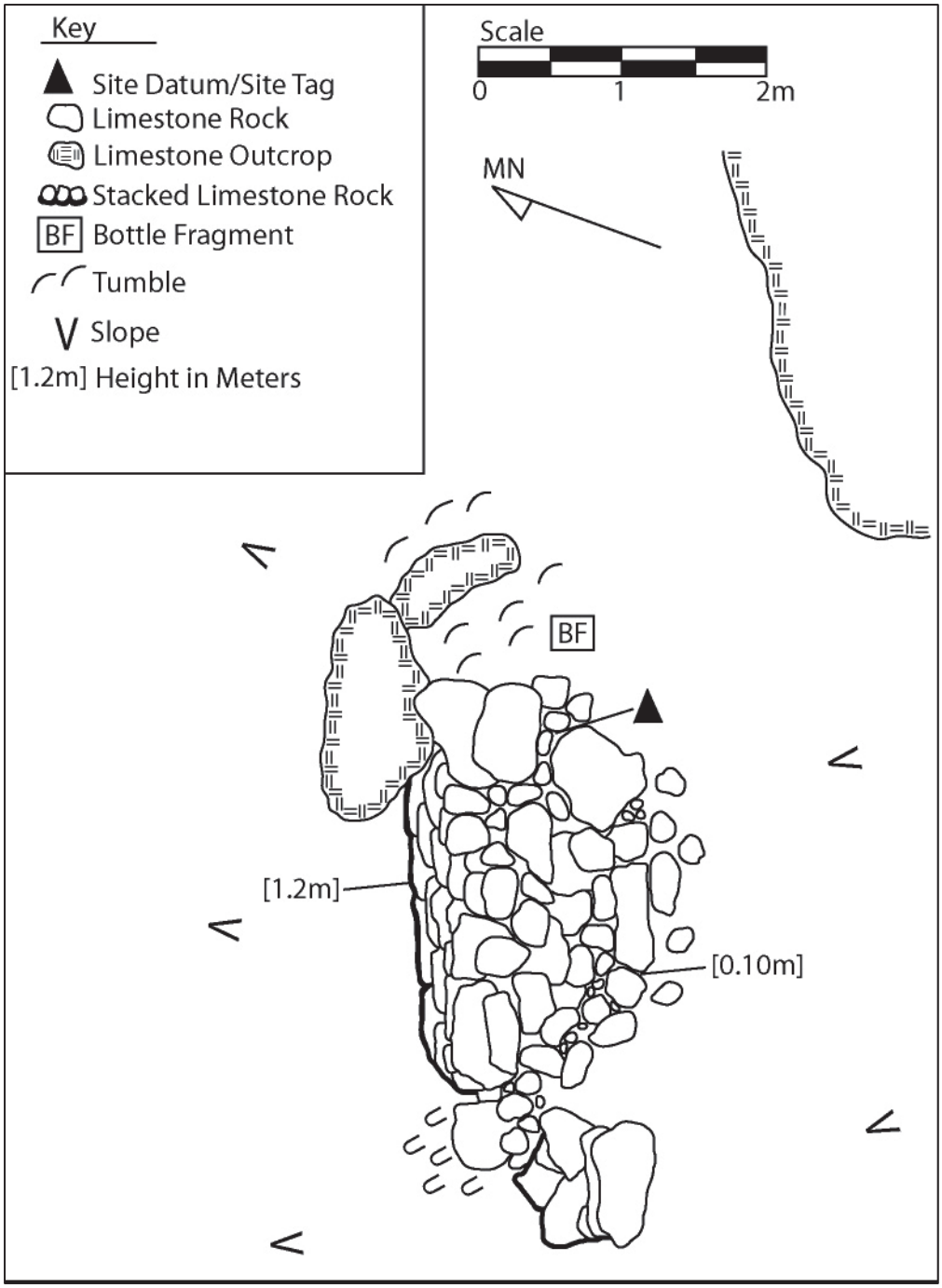
Site T-043, stone-lined drainage, view to west.



Planview map of Site T-043.

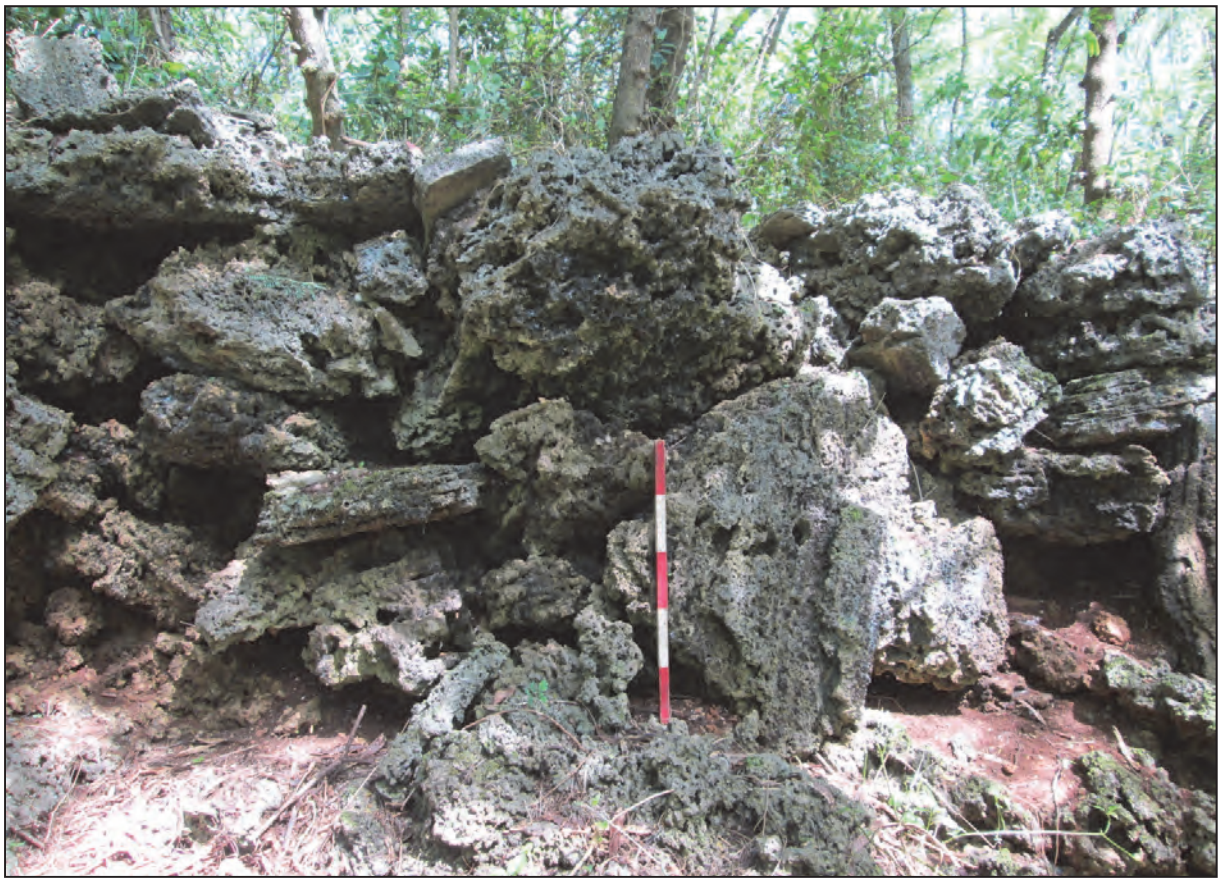
SIHP No.:
Field No.: T-044
Site Type: Terrace
Site Function: Uncertain
Site Condition: Fair
Description: Site T-044 consists of a stone terrace located on the north side of a limestone slope. Limestone outcrops are present on both the northeast and southwest sides of the site. The terrace is constructed of limestone slabs and boulders that have been loosely stacked between five to six courses of stone in height. Several limestone outcrops are also utilized. The interior surface of the terrace consists of limestone slabs, boulders, and cobbles. The terrace is oriented roughly northeast to southwest, and measures ca. 4.1 meters in length by 1.4 meters in depth by 0.1-1.2 meters in height. Both ends of the terrace have partially tumbled down slope. An aqua glass bottle fragment was observed on the east end of the terrace, but was not collected. The bottle fragment, which measures ca. 8.0 centimeters in length by 8.0 centimeters in width, is likely a secondarily deposited artifact from the above hillside. There is abundant trash and debris in the surrounding area. Site T-044 was likely constructed during the pre-Contact period, but the specific function is uncertain.

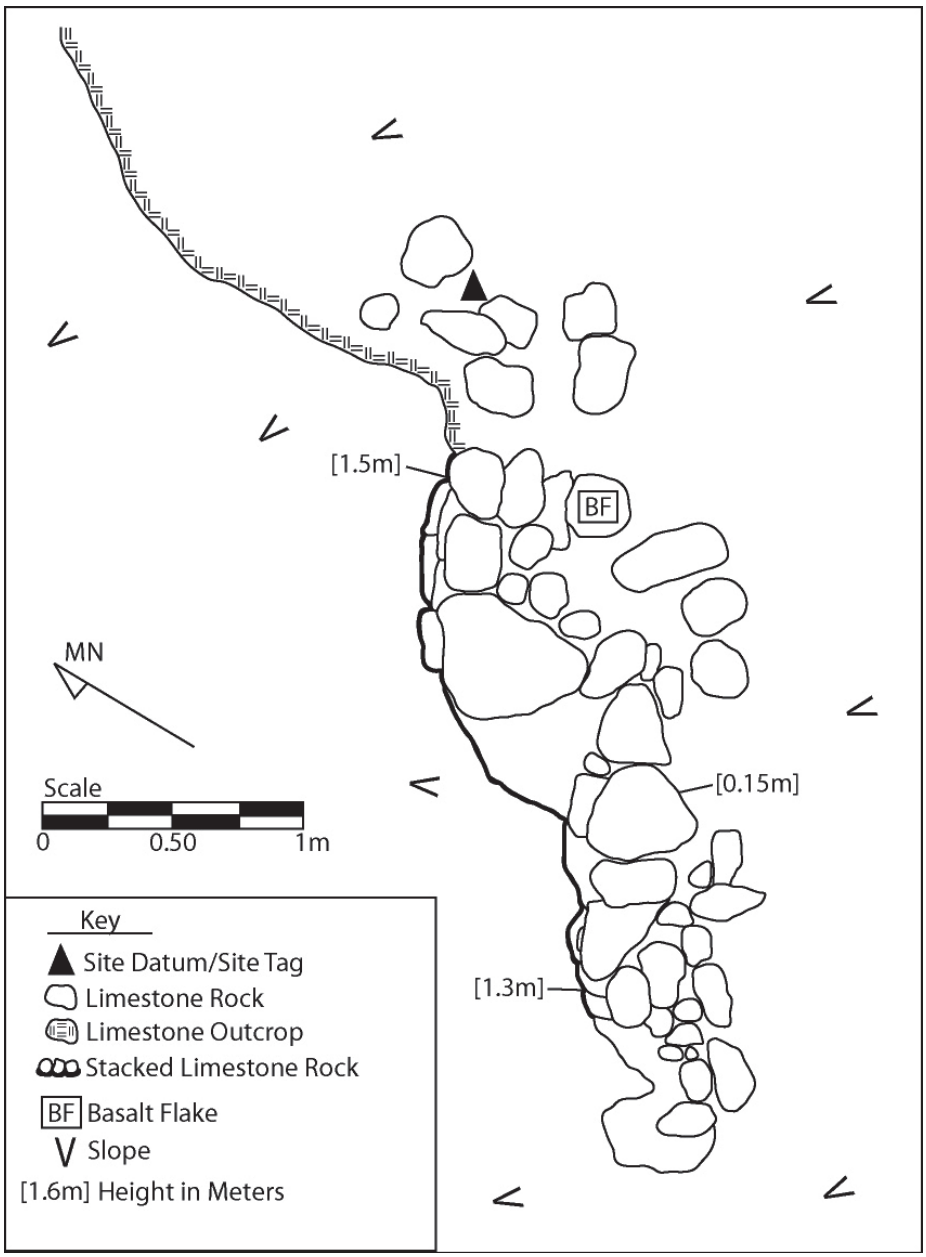
Site T-044, terrace, view to southwest.



Planview map of Site T-044.

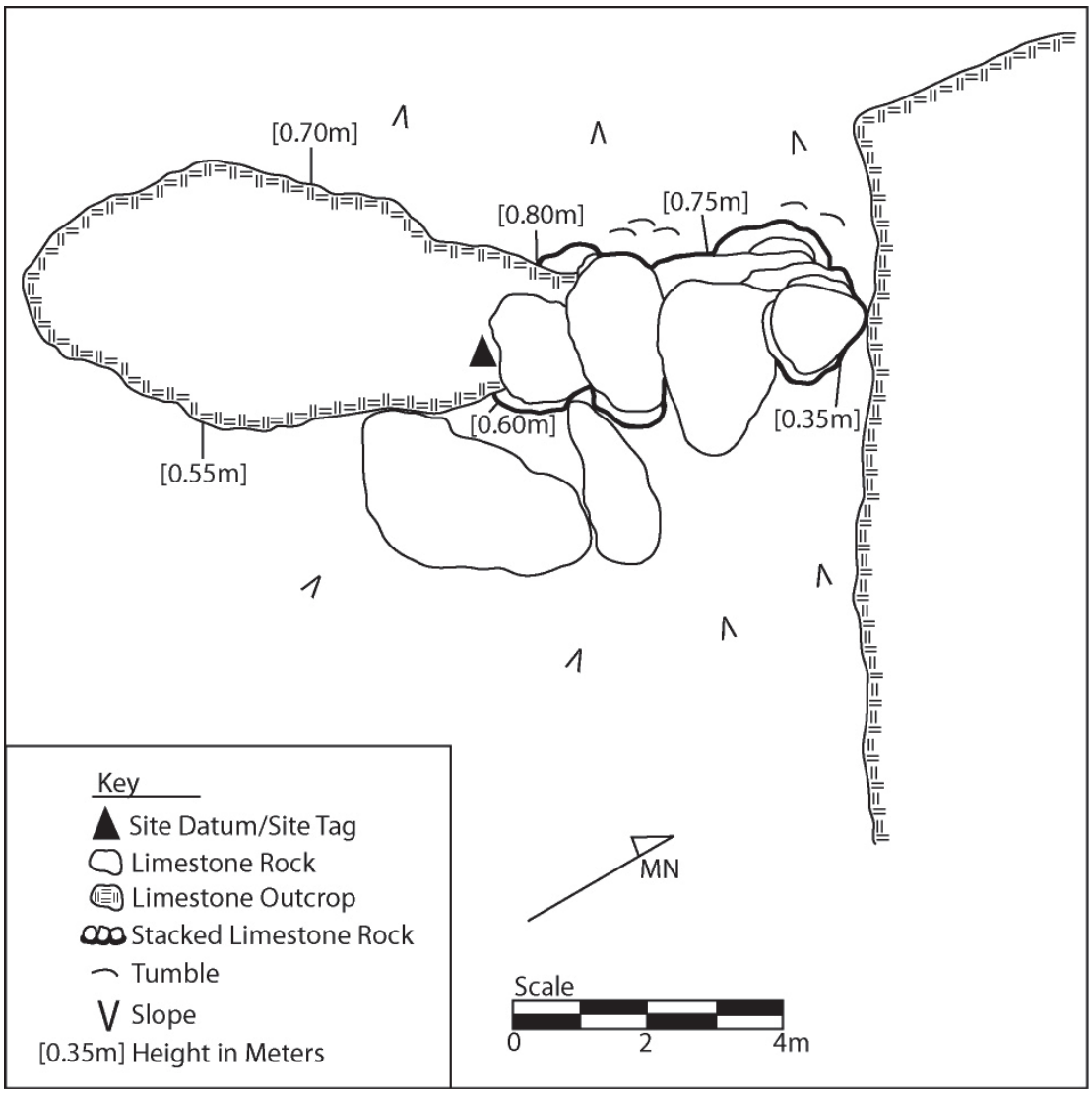
SIHP No.:
Field No.: T-046
Site Type: Terrace
Site Function: Agriculture
Site Condition: Fair
Description: Site T-046 consists of a single limestone terrace located along a ridgeline in the central portion of the project area, ca. 12.0 meters south of Site T-047. The terrace is oriented roughly northeast to southwest on a fairly steep northwest facing slope. It is constructed of loosely stacked limestone cobbles, boulders, and slabs. Some of the slabs have been placed vertically on end. Portions of the terrace are constructed on top of an exposed limestone outcrop. The surface of the terrace consists of an area of soil that blends into the slope of the hillside. The terrace measures ca. 4.0 meters in length by 1.25 meters deep by 0.15-1.5 meters in height. An area of disturbed bulldozer push is located ca. 15.0 meters to the east of the terrace. A large basalt flake measuring ca. 14.0 centimeters by 11.0 centimeters was observed on the northeast portion of the terrace, but was not collected. Site T-046 appears to have been constructed and utilized during the pre-Contact period for agricultural purposes.


Site T-046, terrace, view to southeast.



Planview map of Site T-046.

SIHP No.:
Field No.: T-047
Site Type: Terrace
Site Function: Agriculture
Site Condition: Fair
Description: Site T-047 consists of a single terrace located near the top of the limestone cliff, ca. 4.0 meters south of Site T-048. The terrace measures ca. 2.4 meters in length by 1.0 meter deep by 0.35-0.80 meter in height. The terrace is constructed of limestone slabs, boulders, and cobbles that have been loosely stacked in between two large limestone outcrops. Some of the stones have tumble down slope. The interior surface of the terrace consists of an area sloping soil. Approximately 2.0 meters to the south of the terrace is a possible modified outcrop. Site T-047 appears to have been constructed and utilized during the pre-Contact period for agricultural purposes.



Planview map of Site T-047.

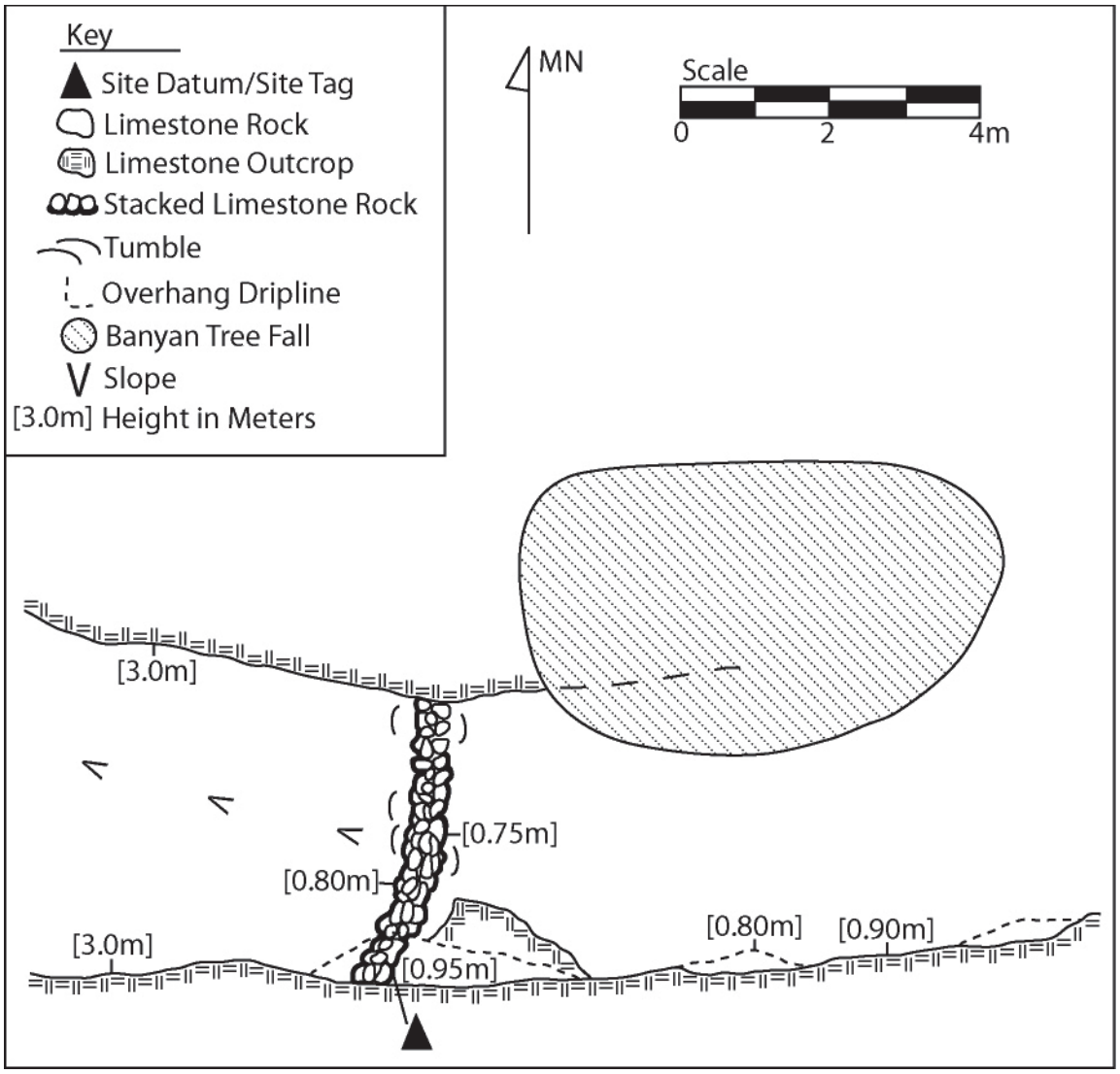
Site T-047, terrace, view to east.

SIHP No.:
Field No.: T-048
Site Type: Wall
Site Function: Uncertain
Site Condition: Fair
Description: Site T-048 consists of a limestone wall located in the central portion of the project area, in between Site T-047 and Site T-062. The wall is situated along the north side of a limestone cliff. The wall is constructed of loosely stacked limestone slabs, boulders, and cobbles. Some of the slabs have been placed vertically on end. The wall is oriented roughly northwest to southeast and measures ca. 4.9 meters in length by 0.9 meter in width by 0.5 meter in height. Site T-048 was likely constructed during the pre-Contact period, but the specific function is uncertain.

Site T-048, wall, view to east.

SIHP No.:
Field No.: T-049
Site Type: Wall
Site Function: Habitation
Site Condition: Fair
Description: Site T-049 consists of a limestone wall located in the north-central portion of the project area, situated at the top of a limestone ridge. The wall is oriented roughly north to south and is constructed of small to large limestone slabs and boulders which have been loosely stacked between one to four courses of stone in height in between two natural limestone outcrops. The limestone outcrop to the south forms a small overhang at the south end of the wall. The wall measures ca. 3.8 meters in length by 0.9 meter in width by 0.8 meter in height along the western edge and 0.75 meter in height along the eastern edge. The small overhang measures ca. 2.5 meters in length by 1.3 meters deep by 1.0 meter in interior height. The ground surface underneath the overhang consists of soil and loose limestone cobbles. The southern end of the wall is well preserved, but the northern end is partially tumbled. No cultural material was observed at Site T-049, except for one modern plastic water bottle.

The wall runs in between the two natural limestone outcrops, blocking access to the small overhang from the west. The south end of the wall helps to form a small protected area to the east, underneath the small overhang. Although no cultural material was observed, it appears likely that the soil area underneath the overhang and directly east of the wall was utilized as a small protected shelter. There is a large accumulation of soil, tree fall, and debris on the ground surface. Site T-049 appears to have been constructed and utilized during the pre-Contact period for temporary habitation.



Planview map of Site T-049.

Site T-049, wall, view to west.

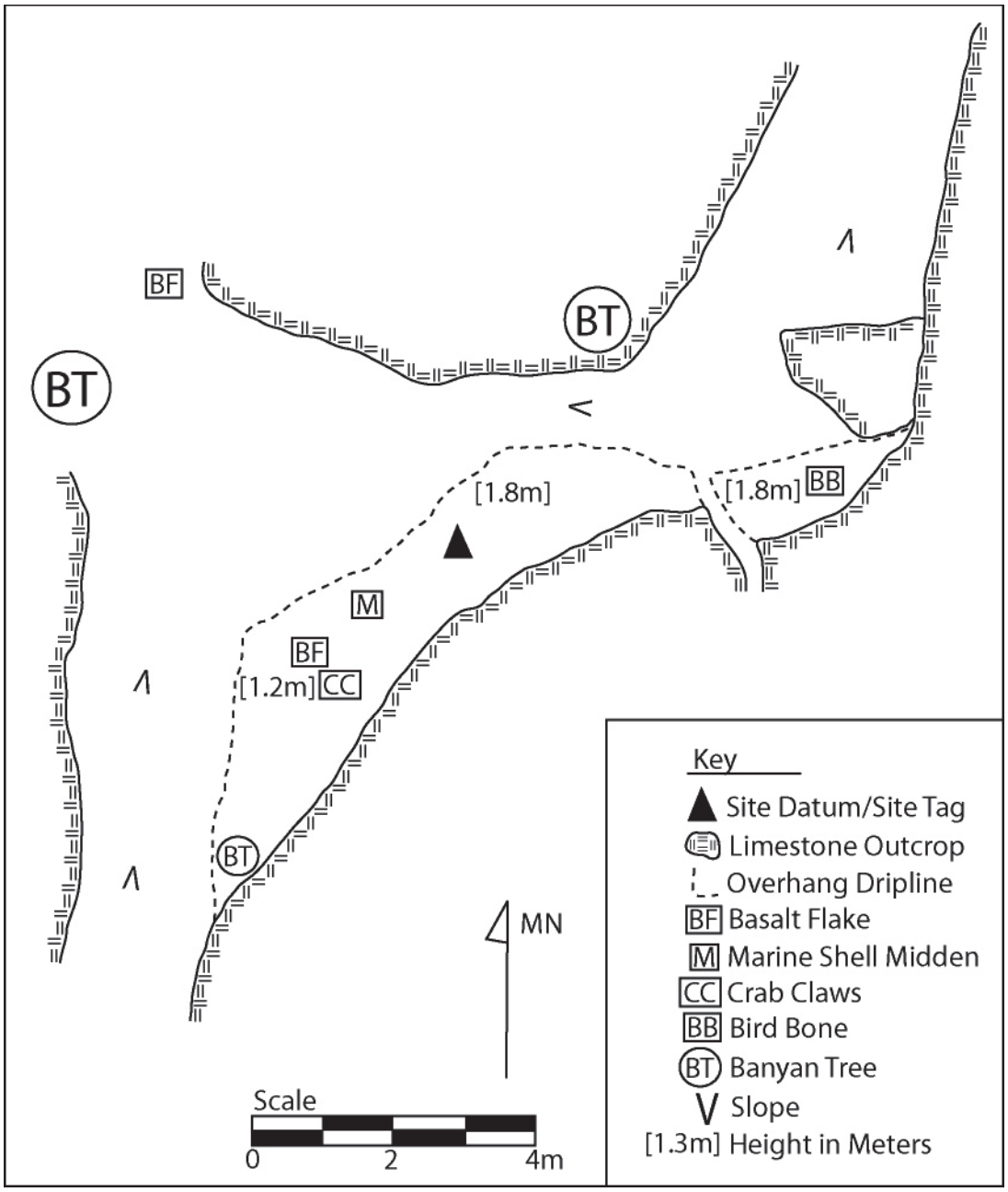
Site T-049, wall at overhang, view to south.

SIHP No.:
Field No.: T-050
Site Type: Wall
Site Function: Uncertain
Site Condition: Fair
Description: Site T-050 consists of a limestone wall located in the north-central portion of the project area, situated along a limestone ridge. The wall is oriented roughly east to west and is constructed of limestone boulder slabs that have been loosely stacked both vertically and horizontally. A few of the limestone slabs are very large in size measuring ca. 0.9 meter in length by 0.9 meter in width by 0.2 meter in thickness. Overall the wall measures ca. 50.0 meters in length by 0.7 meter in width by 0.6 meter in height. In several places the wall is overgrown with large banyan trees. The area contains numerous limestone outcrops, some of which are parallel to the slope, forming natural channel-like features. No cultural material was found in the immediate vicinity of the site. Site T-050 was likely constructed during the pre-Contact period, but the specific function is uncertain.

Site T-050, wall, view to northeast.

SIHP No.:
Field No.: T-051
Site Type: Overhang Shelter
Site Function: Habitation
Site Condition: Fair
Description: Site T-051 consists of a limestone overhang shelter located along a northwest facing limestone cliff in the north-central portion of the project area. The limestone cliff measures ca 2.5 meters in height. The surrounding vegetation includes several banyan trees, and the ground slopes gently to the northwest. The interior of the overhang measures ca. 11.0 meters in length by 2.2 meters in depth with a maximum interior height of 1.8 meters. The overhang, which faces northwest, is flanked by limestone outcrops on three sides. The outcrops range in height from ca. 0.9-2.20 meters in height. Traditional cultural material was observed at Site T-051, most of which was located within the southwestern portion of the overhang. Cultural material included marine shell midden, crab claws, *kukui* nut shell fragments, and charcoal flecking. Fragments of bird bone were observed in the northeastern portion of the overhang. Several basalt flakes were also observed within the overhang, and one basalt flake was encountered ca. 5.0 meters to the northwest of the shelter. No artifacts were collected. Site T-051 appears to have been utilized during the pre-Contact period for habitation.

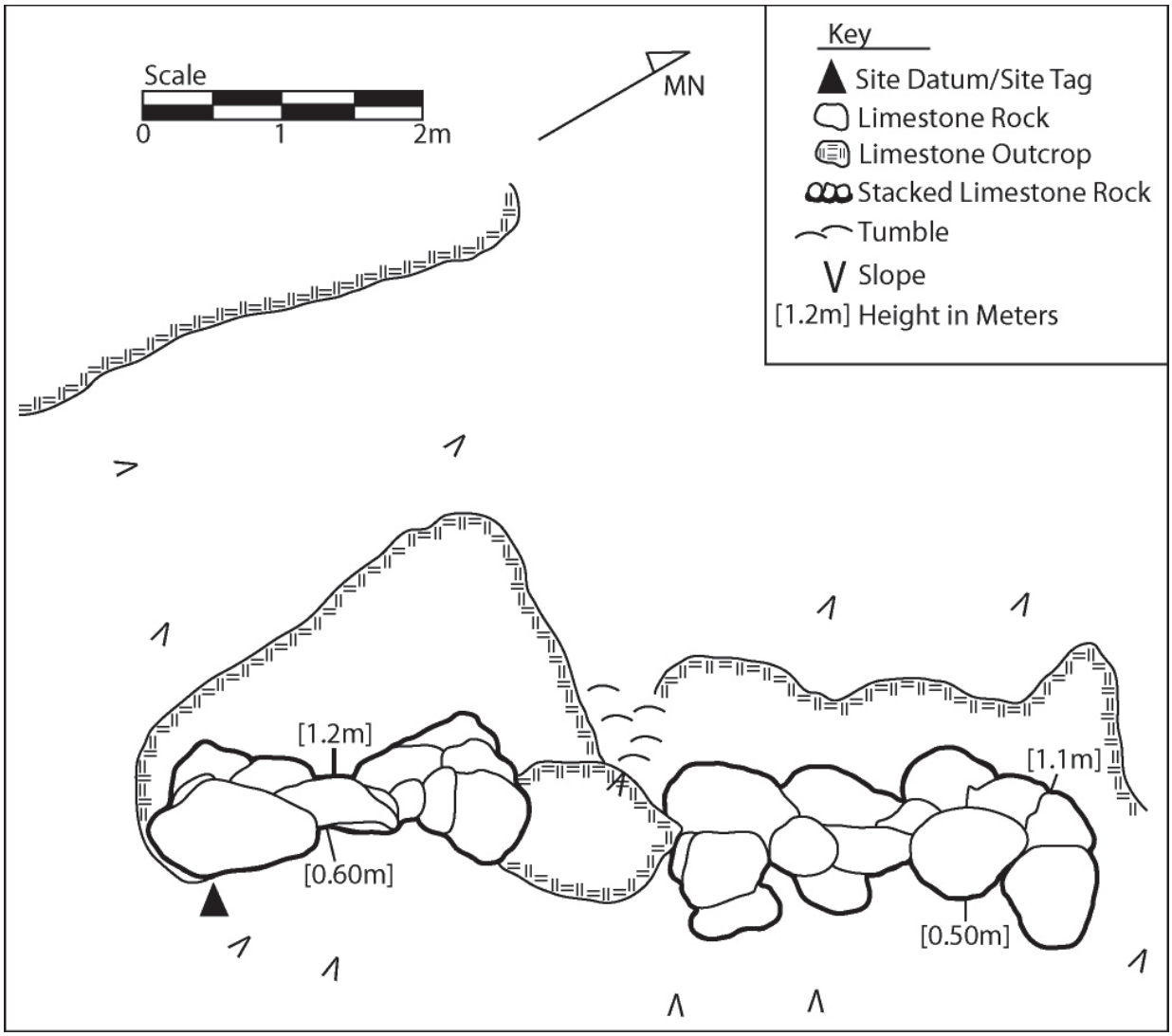
Site T-051, overhang shelter, view to northeast.



Planview map of Site T-051.

SIHP No.:
Field No.: T-052
Site Type: Wall
Site Function: Uncertain
Site Condition: Fair
Description: Site T-052 consists of a limestone wall located along along a limestone slope in the north-central portion of the project area. The wall is situated directly upslope to the east of a natural limestone channel. The wall is constructed of limestone slabs, boulders, and cobbles that have been loosely stacked between three to five courses of stone in height on top of several exposed limestone outcrops. Overall, the wall measures ca. 7.0 meters in length, although there is a small gap located in the central portion of the wall that measures ca. 0.8 meter in length. The northeastern wall segment measures ca. 3.2 meters in length by 0.75 meter in width by 0.5-1.1 meters in height. The southwestern wall segment measures ca. 2.3 meters in length by 0.5 meter in width by 0.6-1.1 meters in height. Several stones have tumbled down slope from the central portion of the wall, which may explain the small gap. Site T-052 was likely constructed during the pre-Contact period, but the specific function is uncertain.

Site T-052, wall, view to southeast.



Planview map of Site T-052.

SIHP No.:
Field No.: T-053
Site Type: Reservoir
Site Function: Water Control
Site Condition: Fair
Description: Site T-053 consists of a small reservoir located on the south-central boundary of the APE. The reservoir is a roughly circular soil depression measuring ca. 85.0 meters in length by 55.0 meters in width by 5.0 meters in depth. Site T-011 is located on the edge of Site T-053. The reservoir extends outside of the APE for an undetermined distance. The site is covered with buffalo grass and *koa haole* trees. Active farms abut the reservoir on the north and west sides. Recent trash associated with the farmers is scattered throughout the area. This reservoir is one of two located in the area. The second reservoir is located directly adjacent to Site T-053, but is outside the current project area to the south and was not recorded. Site T-053 appears to be associated with water control related to the former commercial sugar plantation.

Site T-053, reservoir, view to southeast.

SIHP No.:
Field No.: T-054
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-054 consists of a concrete ditch located in the north-central portion of the project area. The ditch meanders around the contours of the slope in a roughly east-southeast direction and is constructed of formed concrete along the interior and limestone cobbles concreted into place along the exterior. Overall, the ditch measures ca. 65.0 meters in length by 0.61 meter in width on the exterior by 0.3 meter in width on the interior by 0.3 meter in depth. There are two "Y" branches extending off of the main ditch. These branches only measure ca. 1.0 meter in length before terminating. Two historic glass bottles were observed near the west end of the ditch. The first bottle is a machine made clear glass bottle manufactured by Owens-Illinois Glass Company in 1959. The second bottle is a mouth blown aqua glass bottle neck and finish fragment that was manufactured using a turn mold. Neither artifact was collected. Site T-054 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-054, concrete ditch, view west.

Site T-054, clear glass bottle.

Site T-054, aqua glass bottle fragment.

SIHP No.:
Field No.: T-055
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-055 consists of a concrete ditch located in the north-central portion of the project area. The ditch is oriented in a roughly east to west direction, but meanders around the contour of the slope. The ditch is constructed of formed concrete along the interior and limestone cobbles concreted into place along the exterior. There are numerous off-shoots from the main ditch extending down slope to the north. The west end of the ditch consists of a Y-shaped intersection that fed into what maybe the remnants of a soil ditch. The east end of the ditch has been impacted by bulldozing, but continues after a ca. 5.8 meter break. Overall, the ditch measures ca. 100.0 meters in length by 0.95 meter in width (exterior) by 0.36 meter in width (interior) by 0.34 meter in depth (interior) by 0.25 meter in height (exterior).

Other ditches and an iron pipeline (Site T-057) are located in the vicinity. An off-shoot appears to have fed water into a limestone ditch (Site T-065) which was used to dispense the water further down slope. Site T-055 continues east and actually dives under Site T-057 (iron pipeline) then turns south, east, then south again. A metal gate and a release valve are located at the intersection of Site T-057 and Site T-055, which appears to have controlled the flow of the pipeline into the ditch. This segment of Site T-055 extends south almost out of the project area. It terminates ca. 12.0 meters north of the southern project boundary. A "Jan. 10, 1929"date is inscribed at the intersection of Site T-055 and Site T-057. Site T-055 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-055, inscribed date of "Jan. 10, 1929", view to east.

Site T-055, concrete ditch intersection, view to southeast.

SIHP No.:
Field No.: T-056
Site Type: Limestone Ditch
Site Function: Water Transport
Site Condition: Poor
Description: Site T-056 consists of a limestone ditch located in the northern portion of the project area. The ditch is constructed of a cut limestone outcrop and loosely stacked limestone slabs and cobbles. Large portions of the ditch are highly degraded and overgrown with vegetation. Where intact, the ditch measures ca. 0.4-0.5 meter in width by 0.2-0.3 meter in depth. The ditch walls measure ca. 0.15-0.4 meter in thickness. The ditch forks ca. 4.0 meters northeast of the southwest end, with one ditch extending to the north for ca. 29.0 meters. The other ditch extends to the east for ca. 48.0 meters, at which point it splits again, extending an additional 29.0 meters to the east and 69.0 meters to the west. Near the initial split, there are two concrete slabs situated opposite each other with a small slot where a metal gate would have been. This gate would be used to control the flow of water into this portion of the ditch. On one of the concrete slabs, the phrase "No 3" has been carved into the surface. Site T-056 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-056, limestone ditch, view to southwest.

SIHP No.:
Field No.: T-057
Site Type: Iron Pipeline
Site Function: Water Transport
Site Condition: Fair
Description: Site T-057 consists of a cast-iron pipeline located in the north-central portion of the project area, on the southeast side of a nearby dirt access road. The pipeline is oriented roughly northeast to southwest and measures ca. 136.0 meters in length by 0.28 meter diameter. The southwest end of the pipeline ties directly into the Site T-059, concrete ditch. It appears that water would flow from Site T-059 into Site T-057, which flows down slope to the north. At one point, Site T-057 crosses over the Site T-055, concrete ditch, where a valve with a circular wheel could control the flow of water into Site T-055. Site T-057 then continues down slope to the north, where it dives underground. Segments of the pipeline are supported by concrete footings as well as concrete and possibly wooden footings, although there are no remnants of the wooden supports. Site T-057 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-057, iron pipeline, view to southwest.

SIHP No.:
Field No.: Site T-059
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-059 consists of a concrete ditch located in the northern portion of the project area. The ditch is constructed of formed concrete along the interior and limestone cobbles concreted into place along the exterior. The main portion of the ditch measures ca. 0.8 meter in width by 0.55 meter in depth with walls that are 0.1 meter thick. The depth of the ditch decreases to ca. 0.4 meter, while wall thickness increases to 0.25 meter, although the overall width remains at 0.8 meter, as ditch continues in a southwesterly direction. The northeast end of Site T-059 connects to the Site T-057, iron pipeline. Approximately 13.0 m southwest of the connection with T-057, there is significant damage to the ditch, likely caused by bulldozer activity in the area. Approximately 17.3 meters southwest of the intersection with Site T-057 is a fork in the ditch. One branch extends in a southeasterly direction for ca. 45.0 meters before terminating at a bulldozer push-pile. Approximately 4.0 meters past the fork, this branch of the ditch reduces to 0.3 meter in height by 0.6 meter in width with walls 0.15 meter thick. The second branch extends west and terminates after ca. 52.0 meters, measuring ca. 0.8 meter in width by 0.1 meter in depth with walls 0.25 meter thick. Site T-059 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-059, concrete ditch, view to west.

Site T-059, concrete ditch, view to west.

SIHP No.:
Field No.: T-060
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Poor
Description: Site T-060 consists of a concrete ditch located in the north-central portion of the project area. The ditch is oriented roughly northwest to southeast and is constructed of pre-formed concrete sections that are fitted together and sealed with a tar-like substance. Overall, the ditch measures ca. 19.0 meters in length by 0.47 meter in width by 0.28 meter in depth. The southern end of the ditch has been impacted by a bulldozer, possibly when a nearby access road was constructed. There is a Y-shaped intersection on the south end of the ditch with rock and soil debris pushed into it. The north end is much narrower measuring only ca. 0.29 meter in width by 0.16 meter in depth. Each concrete piece measures ca. 0.88 meter in length. Every other segment contains small openings on each side measuring 0.09 meter in width by 0.12 meter in height. Several openings contain a small metal door that likely blocked or allowed water to flow out of the openings. Presumably all of the openings had doors, but most are now missing. The Y-shaped branch on the south end is oriented to the northeast and measures ca. 2.0 meters in length. The rest of this branch has been destroyed by bulldozing. On the exterior of the intersection is a small pile of limestone cobbles placed in order to reinforce the intersection. Site T-060 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-060, concrete ditch, view to southwest.

SIHP No.:
Field No.: T-061
Site Type: Complex
Site Function: Water Control/Transport
Site Condition: Fair
Description: Site T-061 is a complex comprised of four associated features located approximately 4.5 meters southeast of the dirt access road which serves as the main access road for the zip line. The entire site is surrounded by a chain link fence with a locked gate located on the northwest side.

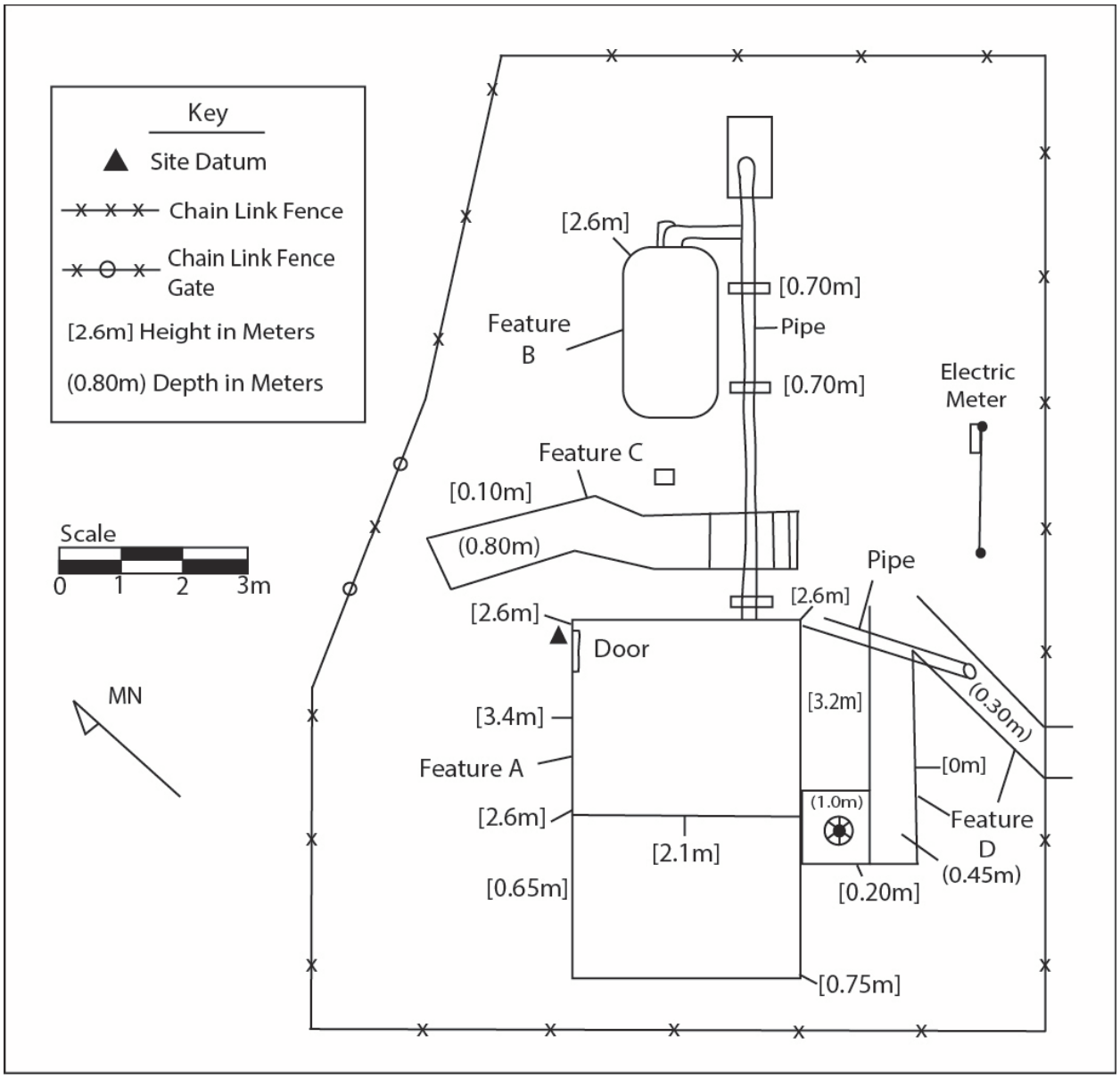
Feature A consists of a pump house located in the western portion of Site T-061. The structure measures ca. 3.5 meters in length by 3.0 meters in width by 3.4 meters in total height. The structure is wood plank and plywood constructed on top of a concrete foundation. A door and two small stairs are located at the northern corner of the structure. On the south side of the structure is a concrete footing covered with plywood and roofing material. The footing measures ca. 3.5 meters in length by 2.5 meters in width by 0.6 meter in height. The footing appears to be hallow inside. Inside the structure, there are two electrical boxes on the northwest facing wall and a metal pipe coming up through the floor boards which exits through the northeast facing wall and runs to the Feature B, tank. Feature A appears to be associated with water control related to the former commercial sugar plantation.

Feature B is a metal tank located at the northeast side of Site T-061. The tank measures ca. 1.2 meters in diameter and is sitting on top of two concrete slabs ca. 1.0 meter above the ground. A metal pipe measuring ca. 0.2 meter in diameter extends out of the northeast side of the tank and then turns and runs at ca. 0.7 meters above the ground surface southwest towards the northeast wall of the Feature A, pump house. The pipe is supported by several concrete slabs. Feature B appears to be associated with water control related to the former commercial sugar plantation.

Feature C consists of a concrete ditch located in between Feature A and Feature B. The ditch is oriented roughly northeast to southwest and measures ca. 5.5 meters in length by 1.0 meter in width by 1.0 meter in maximum depth. The walls of the concrete ditch measure ca. 0.25 meter in thickness. The southeast end of the ditch is filled with soil. Feature C appears to be associated with water transport related to the former commercial sugar plantation.

Feature D is a concrete ditch located immediately south of the Feature A, pump house. The ditch runs northeast to southwest for ca. 4.0 meters along the southeast side of Feature A, then turns abruptly and runs north to south and continues under the chain link fence that encompasses the site. The ditch measures ca. 0.9 meter in width by 0.3 meter in depth. The walls of the ditch measure ca. 0.15 meter in thickness. Feature D appears to be associated with water transport related to the former commercial sugar plantation.

Site T-061 appears to be associated with water control and transport related to the former commercial sugar plantation and appears to still partially be in use today. An active electrical meter is located along the southeast side of the site.



Planview map of Site T-061, pump house.

Site T-061, Fe. A, pump house, view to east.

Site T-061, Fe. B, tank, view to east.

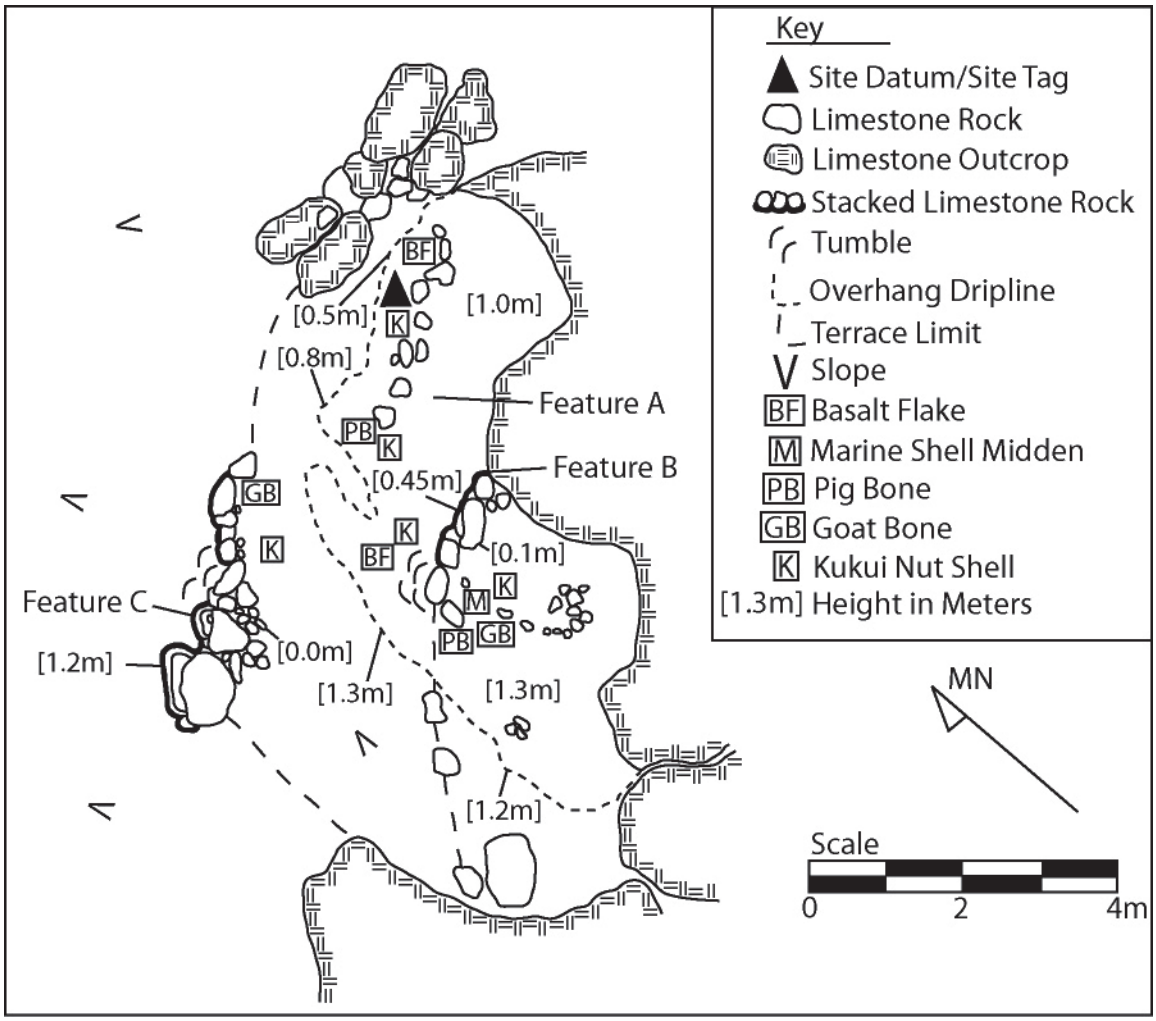
SIHP No.:
Field No.: T-062
Site Type: Overhang Shelter with Terraces
Site Function: Habitation
Site Condition: Fair
Description: Site T-062 is comprised of an overhang shelter with two associated terraces located in the north-central portion of the project area, ca. 8.0 meters north of Site T-048. The site is situated along the northwest side of a large limestone outcrop located near a series of fallow agricultural fields to the northwest. The site consists of an overhang shelter (Feature A) with an internal terrace (Feature B) and an exterior terrace (Feature C).

Feature A consists of a limestone overhang shelter located along the northwest side of a limestone cliff face. The interior of the overhang measures ca. 8.0 meters in length by 3.5 meters in depth by 1.3 meters height. The interior surface of the overhang consists mostly of soil with some scattered limestone boulders and cobbles. The Feature B, terrace, is also located within the overhang. Traditional cultural material including fragments of *kukui* nut shell, sea urchin, and two basalt flakes was observed on the surface of the interior of the overhang. The larger of the two basalt flakes is located at the east end of the overhang and measures ca. 11.2 centimeters in length by 10.4 centimeters in width by 5.0 centimeters in thickness. It has a prominent striking platform and bulb of percussion, with multiple flake scars visible on the dorsal surface. The second flake is located in the central portion of the overhang and measures ca. 3.0 centimeters in length by 2.5 centimeters in width by 0.4 centimeters in thickness. It is snapped in half and exhibits a prominent striking platform, but no bulb of percussion. Several fragments of non-human medium mammal bone, likely pig and goat, were also observed within the overhang. Feature A appears to have functioned as a traditional habitation shelter.

Feature B consists of a soil terrace with stone retaining wall located within the central-western portion of the Feature A, overhang. The terrace measures ca. 1.9 meters in length by 2.0 meters in depth by 0.1-0.45 meters in height. The stone retaining wall is constructed of limestone boulder and cobble slabs that have been loosely stacked between two to three courses of stone in height. Some of the stones forming the retaining wall have tumbled outward. The surface of the terrace consists of soil with several loose limestone boulders and cobbles. Traditional cultural material including fragments of *kukui* nut shell and marine shell midden was observed on the surface of the terrace. Several fragments of non-human medium mammal bone, likely pig and goat, were also observed on the terrace. Feature B appears to have functioned as a traditional habitation terrace.

Feature C consists of a soil terrace with stone retaining wall located just outside of the Feature A, overhang drip line. The terrace measures ca. 3.6 meters in length by 2.3 meters in depth by 0.0-1.2 meters in height. The stone retaining wall is constructed of limestone boulder slabs and cobbles that have been loosely stacked between two to four courses of stone in height. Some of the stones forming the retaining wall have tumbled outward. Fragments of *kukui* nut shell and non-human medium mammal bone, likely goat, were also observed on the terrace. Feature C appears to have functioned as a traditional habitation terrace.

Site T-062 appears to have functioned as traditional habitation site.



Planview map of Site T-062.

Site T-062, overview, view to south.

Site T-062, Fe. A, overhang shelter, view to south.

Site T-062, Fe. B, terrace, view to south.

Site T-062, Fe. C, terrace, view to southwest.

SIHP No.:
Field No.: T-063
Site Type: Cave with Terrace
Site Function: Habitation
Site Condition: Good
Description: Site T-063 consists of a limestone cave (Feature A) with an interior terrace (Feature B) located in the north-central portion of the project area. The site is situated along the north side of a limestone cliff face. There is a dirt access road located ca. 10.0 meters upslope to the south of the cave entrance, and one of the zip line runs is located ca. 5.0 meters to the north. Near the center of the entrance to the cave is a large debris pile of modern trash measuring ca. 5.0 meters in length by 4.0 meters in width. It consists of plastic trash bags with aluminum cans, plastic gallon jugs, a TV, refrigerator, miscellaneous metal fragments, car parts, etc. The trash appears to have been dumped into the site from slope above the entrance. The hillside above the cave entrance is also littered with modern trash.

Feature A consists of a large limestone cave. The entrance to the cave is also large and faces to the north, measuring ca. 19.0 meters in length by 3.2 meters in maximum height. The interior of Feature A measures ca. 30.0 meters (east-west) by 20.0 meters (north-south) by 3.2 meters in maximum height. The interior of the cave consists of limestone outcrops, loose limestone boulders, and relatively flat areas of accumulated soil.

The largest areas of soil are located in the eastern portion of the cave. The main area of occupation is located in the center of the eastern portion of the cave and consists of a relatively flat, cleared area of soil that is demarcated by large limestone boulders and limestone outcrops that form a natural terrace-like area. This area measures ca. 6.0 meters in length by 3.0 meters in width with an interior ceiling height of ca. 2.4 meters. The west edge of this area abuts the modern trash pile located at the drip line of the cave. The surface of this area is covered with fine ash-like soil, and likely contained one or several hearths, although there is no evidence of any on the surface. Fragments of charcoal, *kukui* nut shell, and marine shell midden are visible on the surface.

Immediately to the south of the main living area is a natural ledge that drops ca. 1.1 meters. This ledge is appears to be natural, but does contains a fair amount of soil with several loose limestone boulders. It measures ca. 6.8 meters in length by 2.5 meters in width with an interior ceiling height of 2.7 meters. Fragments of charcoal, *kukui* nut shell, and marine shell midden was observed on the surface of this ledge.

Located immediately to the south of this ledge, and situated at the southern most point of the cave, is the lowest internal area which appears to have been created by large limestone boulder roof fall that is lodged between the ceiling and floor of the cave creating an interior chamber. This chamber measures ca. 5.0 meters in length by 4.5 meters in width with an interior ceiling height of ca. 1.4 meters. The floor of the chamber consists of limestone pebbles, cobbles, and boulders, with no soil present. Within this chamber, a variety of traditional cultural material was observed consisting of one basalt adze (Artifact 1), one limestone hammerstone (Artifact 2), at least one basalt flake, numerous unmodified basalt cobbles, as well as fragments of charcoal,

burnt *kukui* nut shell, and marine shell midden. Several other internal chambers similar to this one were observed along the southern portion of the cave.

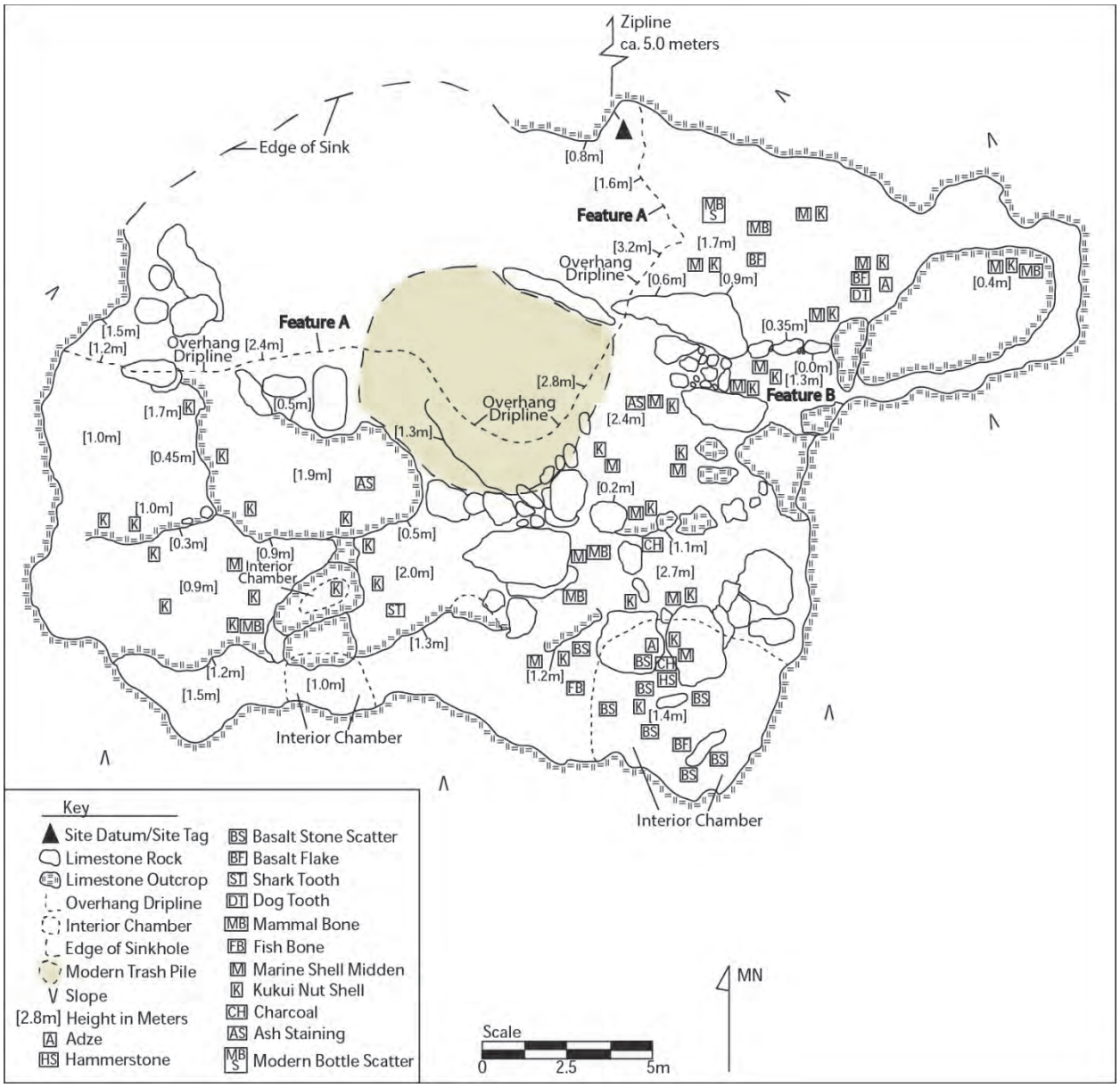
A second cleared soil area is located in the northeastern most portion of the cave, immediately north of the main area of occupation. This area measures ca. 7.5 meters in length by 6.0 meters in width with an interior ceiling height of ca. 1.7 meters. A large variety of traditional cultural material was observed on the surface of this area consisting of one basalt adze (Artifact 3), two basalt flakes, one dog tooth, fragments of non-human medium mammal bone, marine shell midden (cowrie, cone, *pipipi*), and *kukui* nut shell fragments. African land snails and smaller land snails are covering the floor. A scatter of eight modern glass beer bottles was also observed near the edge of the drip line. The Feature B, terrace, is located immediately south of this cleared area of soil.

Feature B consists of a small soil terrace with stone retaining wall located in between the two main cleared areas of soil in the eastern portion of the cave. The terrace measures ca. 2.8 meters in length by 2.0 meters in depth by 0.0-0.35 meters in height. The ceiling height at Feature B is ca. 1.3 meters. The stone retaining wall is constructed of three limestone boulders set in a line and several limestone cobbles. The terrace also utilizes several limestone outcrops to the east and set limestone boulders to the west. The surface of the terrace consists of soil with loose limestone pebbles. Traditional cultural material was observed on the surface of Feature B including fish bone, marine shell midden (cowrie, operculum, *pipipi*, crab, sea urchin), and numerous fragments of *kukui* nut shell.

The western portion of the cave contains less soil and limestone boulders. The floor surface consists of undulating sharp limestone with pockets of red silt clay soil. Numerous *kukui* nut shell fragments are present, but there is a significant lack of marine shell midden in this portion of the cave. A single shark tooth was observed on surface of this area, but did appear to be associated with any feature.

Aside from the modern trash, Site T-063 is in good condition. The area outside the cave entrance contains *koa haole* and banyan trees, and scrub vegetation. The vegetation under the adjacent zip line has been cut and appears to have been bulldozed, although it does not appear that this has had an effect on the cave site. There is evidence of people using the cave recently, including several partially burnt mosquito coils that were found tucked among the rocks on the west side of the cave, however, the cave does not appear to have been looted given the types of artifacts recovered.

Given the large size of the cave, the large variety and amount of traditional cultural material observed, and the proximity to other traditional sites in the vicinity, Site T-063 appears to have functioned as a traditional habitation site. The cave was likely well known and significant to those living in this area during the pre-Contact period. All three artifacts were collected and are presented in Section 8.0 of this report.



Planview map of Site T-063.

Site T-063, Fe. A, cave, with main soil area in foreground, view to south.

Site T-063, Fe. B, terrace, view to southeast.

Site T-063, shark tooth.

SIHP No.:
Field No.: T-064
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-064 consists of a concrete ditch located in the north-central portion of the project area, ca. 2.0 meters north of a dirt access road, 10.0 meters south of Site T-063, and 15.0 meters south of a zip line run. The ditch is oriented roughly east to west, paralleling the north side of the dirt access road along the top edge of a steep north facing slope.

The interior portion of the ditch is constructed of concrete, while the exterior portion is faced with limestone cobbles. Overall, the ditch measures ca. 25.0 meters in length by 0.85 meter in exterior width by 0.43 meter in interior width by 0.6 meter in exterior height. The east end of the ditch terminates, while the west end forms a T-shaped intersection. One branch continues north for ca. 1.8 meter before terminating. It is constructed of concrete and limestone cobbles and measures ca. 0.7 meters in exterior width and 0.26 meter in interior width by 0.2 meter in depth. The main ditch continues west, but is badly impacted and mostly destroyed.

There is a stone retaining wall located under a portion of the north side of the ditch. The retaining wall is constructed of loosely stacked limestone cobbles and measures ca. 15.0 meters in length by 0.8 meter in width by 0.4 meter in height.

Site T-064 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-064, concrete ditch, view to east.

SIHP No.:
Field No.: T-065
Site Type: Limestone Ditch
Site Function: Water Transport
Site Condition: Poor
Description: Site T-065 consists of a limestone ditch located in the north-central portion of the project area. The ditch is situated directly north of, and connected to, the Site T-055, concrete ditch. Site T-065 is very rough in appearance and may be partially natural. The ditch appears to have been at least partially excavated into an exposed limestone outcrop. It is oriented roughly northwest to southeast on a northwest facing slope. The main portion of the ditch measures ca. 13.0 meters in length by 0.7 meters in width by 0.7 meter in depth. Near the base of the slope the ditch splits into three separate ditches, one continuing straight downhill to the northwest, one veering west, and one veering east. The ditch to the northwest runs for an additional 13.0 meters before terminating. The ditch to the east resembles more of a soil-like ditch. It measures ca. 21.0 meters in length by 0.9 meter in width by 0.25 meter depth and simply ends. The ditch to the west runs along the base of an exposed limestone slope for ca. 17.0 meters before terminating. The western ditch measures ca. 1.0 meter in width by 0.25 meter in depth.

Site T-065 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-065, limestone ditch, view to northwest.

SIHP No.:
Field No.: T-066
Site Type: Stacked Stone Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-066 consists of a stacked stone ditch that runs parallel to the Site T-037, concrete ditch, ca. 1.0 meter to the north. It is constructed of basalt cobbles and boulders that have been loosely stacked up to two courses of stone in height. The ditch is oriented roughly northeast to southwest and measures ca. 23.0 meters in length by 1.3 meters in width by 0.4 meter in depth. The walls of the ditch measure ca. 0.3 meter in thickness. The northeastern end of the ditch is blocked by several basalt boulders. The southwestern end terminates at an area that appears to have been bull-dozed, similar to Site T-037. Based on the location of Site T-065, it may have connected to the Site T-034, soil ditch, at one time.

Site T-066 appears to be associated with water transport related to the former commercial sugar plantation.

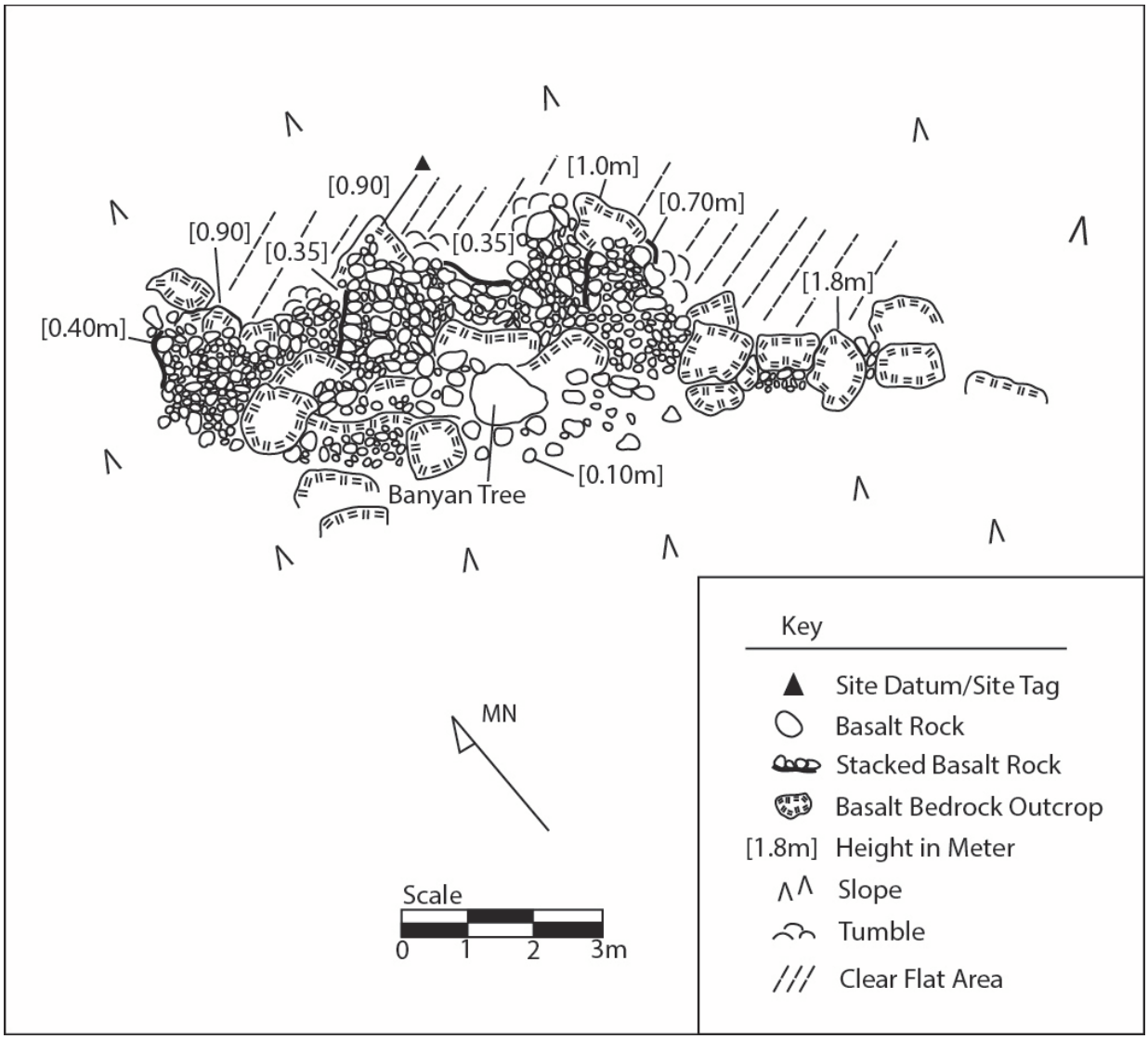
Site T-066, stacked stone ditch, northwest.

SIHP No.:
Field No.: T-067
Site Type: Modified Outcrop
Site Function: Uncertain
Site Condition: Poor
Description: Site T-067 consists of a single modified outcrop located within the southwest portion of the current project area, ca. 5.0 meters down slope to the north of the Site T-030, Feature C, stone retaining wall. The site is situated on a moderate to steep north facing slope, in an area of natural basalt outcrops and loose subangular basalt boulders and cobbles. The vegetation surrounding the site consists of *koa haole* trees, one banyan tree, several undetermined species of tree, as well as a ground cover of non-native grass.

Site T-067 consists of an irregularly shaped modified outcrop constructed of small subangular basalt boulders and large cobbles that have been partially piled and partially loosely stacked up to two courses of stone in height on top of several adjacent large basalt bedrock outcrops. The modified outcrop measures ca. 9.0 meters in length (northwest-southeast) by 5.0 meters in width (northeast-southwest) by 0.9 meters in height along the northeast down slope edge and 0.1 meter in height along the southwest upslope edge. There is a narrow, relatively clear, flat area located along the northeast down slope edge of the modified outcrop which measures ca. 8.0 meters in length (northwest-southeast) by 0.7-2.0 meters in width (northeast-southwest). No cultural material was observed at Site T-067.

Site T-067 is in poor condition. Some of the stone stacking and piling remains intact, however there appears to be a significant amount of stone tumble located along the northeast down slope edge. A banyan tree is growing out of the southeast-central portion of the feature which appears to have caused additional disturbance.

The function of the Site T-067, modified outcrop, is uncertain. Due to the steep slope of the area, it appears unlikely that the upslope portion of the feature was utilized as a terrace, either for habitation or agriculture. The small, relatively clear, flat area along the northeast down slope edge of the feature appears to have been the area of focus, although it is unclear whether the space was used for habitation or agriculture based on the lack of cultural material observed and the poor condition of the feature itself. The modified outcrop does appear to have been constructed and utilized during the pre-Contact period based on the style of construction.



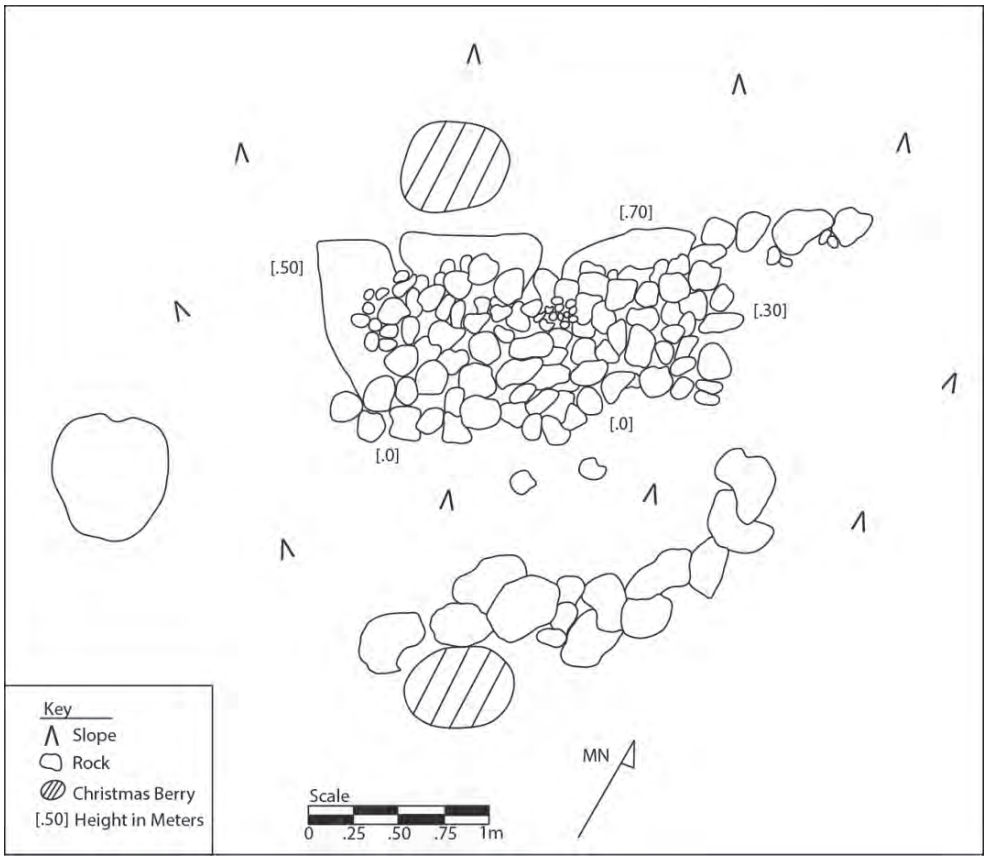
Site T-067, modified outcrop.

Site T-067, modified outcrop, view to southwest.

SIHP No.:
Field No.: T-068
Site Type: Stone Terrace
Site Function: Uncertain
Site Condition: Fair
Description: Site T-068 consists of a stone terrace located in the southwest portion of the project area, just upslope to the southeast from the Site T-030, soil ditch, and northeast of the Site T-069, terraces. The site is situated on a steep northwest facing slope. Vegetation in the area consists of rubber tree, Christmas berry, banyan, *koa haole*, guava, and *ti*. The hillside is fairly rocky with basalt pebbles, cobbles, and boulders evenly spread out. Sites in the vicinity consist of the Site T-069, traditional terraces, the Site T-030, historic soil ditch, and the Site T-070, historic artifact scatter.

Site T-068 is a single stone terrace oriented roughly northeast to southwest and measuring ca. 2.2 meters in length by 1.3 meters in depth by 0.7 meter in height. The terrace is constructed of basalt boulders on the north and southwest sides. The boulders are ca. 0.7 meter in diameter while the cobbles are ca. 0.12-0.2 meter in diameter. The interior surface of the terrace consists of piled basalt cobbles. The upslope side (southeast) of the terrace blends into the hillside. No artifacts, coral, or midden was observed at the terrace, and no human remains were present.

The function of the Site T-068 is uncertain. The terrace appears too small and rocky for habitation or agriculture. The surrounding area is too rocky for the feature to be a clearing mound, and the terrace does not resemble a burial feature. The stone terrace does appear to have been constructed and utilized during the pre-Contact period based on the style of construction.



Planview map of Site T-068, stone terrace.

Site T-068, stone terrace, view to southwest.

SIHP No.:
Field No.: T-069
Site Type: Terraces (2)
Site Function: Habitation/Agriculture
Site Condition: Good
Description: Site T-069 consists of two terraces (Feature A and B) located at the southwest edge of the current project area. The current project boundary runs through the Feature B, terrace. The site is situated on a moderate west-northwest facing slope in an area with natural basalt bedrock outcrops and scattered basalt boulders and cobbles. The vegetation surrounding the site consists of *koa haole* trees and several undetermined species of trees and shrubs, as well as a few *noni* trees, and a few stands of *ti* located down slope to the west-northwest. Overall, Site T-069 measure ca. 10.0 meters in length (northeast-southwest) by 9.0 meters in width (northwest-southeast).

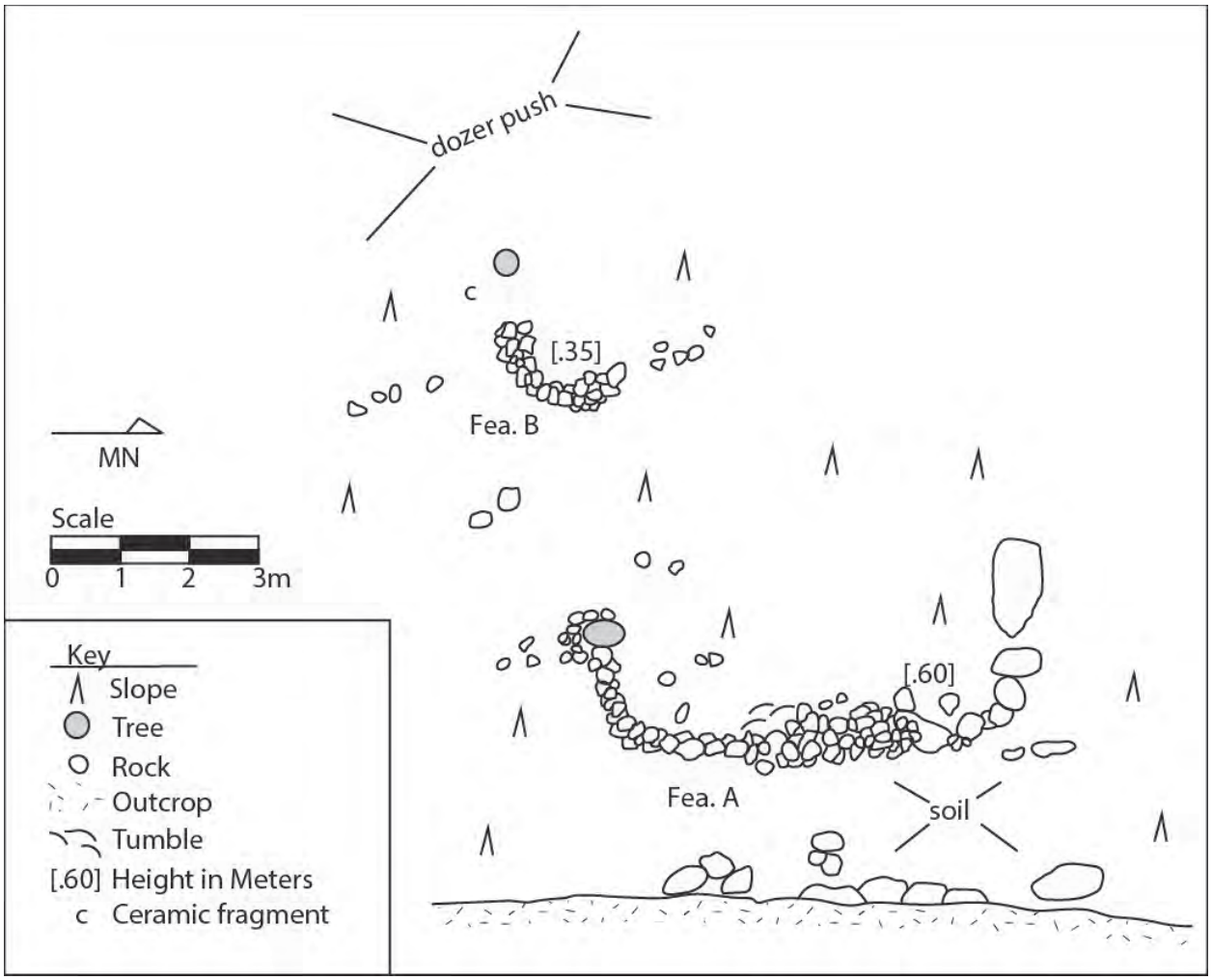
Several features are in close proximity to Site T-069. A small unrecorded stone mound (no site number) is located ca. 5.0 meters southwest of Feature B, just outside the current project boundary. A large circular depression and historic bottle/ceramic scatter (Site T-070) is located between ca. 1.0-5.0 meters northwest, west, and southwest of the site. A linear bulldozer push pile is located ca. 3.0-10.0 meters southwest of Site T-069.

Feature A consists of a roughly linear soil terrace with stone retaining wall which has been constructed near the base of a linear natural basalt outcrop. The stone retaining wall is constructed of small to medium subangular basalt boulders and large cobbles which have been loosely stacked between one to three courses of stone in height along the northwestern exterior edge. The stone retaining wall is oriented roughly northeast to southwest and curves down slope to the northwest at both ends. The retaining wall measures ca. 6.5 meters in length (northeast-southwest) by 0.3-0.8 meter in width (northwest-southeast) by 0.3-0.6 meter in height along the northwestern exterior edge and ca. 0.0-0.25 meter in height along the interior southeastern edge. The interior surface of the terrace consists of a relatively cleared, flat area of soil with a few basalt boulders at the northeast and southwest ends. The soil interior surface measures 8.0 meters in length (northeast-southwest) by 2.5 meters in width (northwest-southeast) from the stone retaining wall to the natural bedrock outcrop. Feature A appears to have function as a habitation terrace constructed and utilized during the pre-Contact period based on the style of construction and the relatively clear, flat, soil area at the base of the natural bedrock outcrop.

Feature B is located ca. 3.2 meters west of Feature A, and consists of a soil terrace with curved stone retaining wall. The retaining wall is constructed of small subangular basalt boulders and large cobbles which have been loosely stacked between one to two courses of stone in height. The wall is oriented roughly northeast to southwest and curves down slope to the northwest at both ends. The wall measures ca. 2.0 meters in length (northeast-southwest) by 0.3-0.5 meter in width (northwest-southeast) by 0.2-0.35 meter in height along the northwestern exterior edge and ca. 0.0-0.15 meter in height along the interior southeastern edge. The interior surface consists of a relatively flat area of soil with scattered basalt cobbles. The interior surface measures ca. 2.5 meters in length (northeast-southwest) by 1.5 meters in width (northwest-southeast). Feature B appears to have functioned as a small agricultural terrace constructed and

utilized during the pre-Contact period based on the style of construction, small size, and the stone wall which retains a small amount of soil on the west-northwest facing slope.

Site T-069 appears to have functioned as a traditional site constructed and utilized during the pre-Contact period. Feature A likely functioned as a habitation terrace, while Feature B likely functioned as an agricultural terrace. It is possible that the site was also utilized into the historic period based on the close proximity of nearby historic features and artifacts.



Planview map of Site T-069.

Site T-069, Fe. A, terrace, view to north.

Site T-069, Fe. A, terrace, view to south.

Site T-069, Fe. B, terrace, view to southeast.

SIHP No.:
Field No.: T-070
Site Type: Artifact Scatter
Site Function: Dump
Site Condition: Fair
Description: Site T-070 is located in the southwestern portion of the project area near the southern project boundary. The site is situated on a moderate northwest facing slope in between the Site T-030, soil ditch and the Site T-069, terraces. Vegetation in the area consists of *noni*, *ti,* Christmas berry, and guava. Site T-070 consists of a historic artifact scatter comprised of glass bottles and ceramics that covers a large area measuring ca. 28.0 meters in length (north-south) by 7.0 meters in width (east-west). Numerous beer and soda bottles are present including several clear glass bottles with "Hawaiian Soda Works, Honolulu T.H." embossed on the body and an "It" embossed on the base. Several aqua glass bottles with "AB" and "ES" embossed on the base were also observed. Other artifacts included a clear glass bottle fragment with "HONOLULU B+M CO, LTD- HONOLULU, T.H." embossed on the body and an unidentifiable embossing on the base, an amber beer bottle with "WF& S MIL. 46" embossed on the base, at least five clear glass unmarked wine bottles, and two clear glass, screw-top bottles with chamfered corners. Ceramics observed included several white ceramic plate fragments, and a hand-painted blue on white rice bowl with kanji on the base.

Site T-070 appears to represent a dump which occurred during the historic period.

Site T-070, artifact scatter, rice bowl.

Site T-070, artifact scatter, rice bowl base.

Site T-070, artifact scatter, Hawaiian Soda Works bottle.

SIHP No.:
Field No.: T-071
Site Type: Terraced Soil Furrows
Site Function: Agriculture
Site Condition: Fair
Description: Site T-071 is located in southwestern portion of the project area, just inside the project boundary and ca. 5.0 meters south of the Site T-030, soil ditch. Vegetation in the area consists of a large banyan tree, guava, Christmas berry and rubber trees. Site T-071 consists of a series of between 25 to 50 terraced soil furrows evenly spaced across a gentle to moderate slope. Each furrow is similar in size and shape, measuring ca. 80.0-100.0 meters in length by 1.7 meters wide by 0.25 meter in height. Overall, the site measures ca. 103.0 meters in length (northeast-southwest) by 46.0 meters in width (northwest-southeast). The area is mostly devoid of rock, although some small basalt cobbles are loosely scattered about. Site T-071 closely resembles the other terraced soil furrows recorded in the area (Site T-031, T-033). Site T-071 appears to have functioned as an agricultural field associated with the former commercial sugar plantation.

Site T-071, terraced soil furrows, view to west.

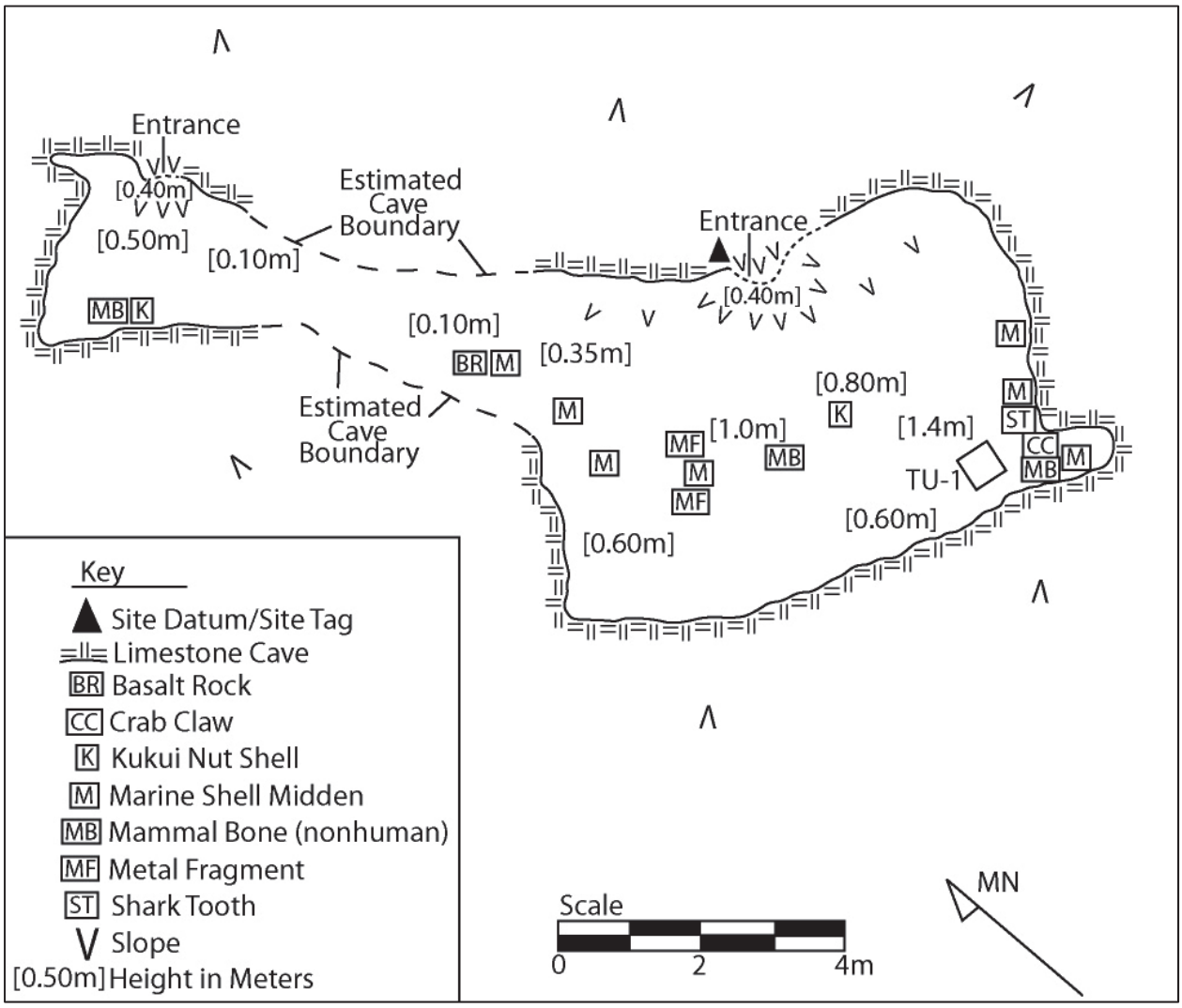
SIHP No.:
Field No.: T-072
Site Type: Cave
Site Function: Habitation
Site Condition: Fair
Description: Site T-072 consists of a limestone cave located in the central-eastern portion of the project area, within the newly added survey area. It is situated on a gentle northeast facing slope ca. 42.0 meters northeast of the Site T-073, concrete ditch. The surrounding area appears to have been graded by the former sugar plantation and is covered in *koa haole* and guava with loosely scattered limestone cobbles and boulders.

Site T-072 consists of a relatively small limestone cave with two separate small entrances. Overall, the interior of the cave measures ca. 15.0 meters in length (northwest-southeast) by 5.0 meters in width (northeast-southwest) with a maximum interior height of 1.4 meters. The main entrance to the main chamber is located at the southeast side of the cave. This entrance measures ca. 0.6 meters in length by 0.4 meters in width by 0.4 meters in height and is partially filled in with soil that appears to have been pushed in from around the entrance. This was likely done by the former sugar plantation, possibly in an attempt to seal the cave. The southeastern chamber is the largest portion of the cave measuring ca. 8.0 meters in length by 5.0 meters in width with a maximum interior height of 1.4 meters. The interior surface consists of soil with several loosely scattered limestone boulders and cobbles. A large variety of cultural material was observed on the interior surface of the cave including fragments of marine shell midden (cone, cowrie, *pipipi*, turban, sea urchin), one shark tooth, one crab claw, *kukui* nut shell, non-human medium mammal bone (likely cow and goat), at least one basalt cobble, as well as one fragment of metal, possibly a cover of some sort. No human skeletal remains were observed. The northwestern portion of the main chamber leads to the smaller chamber located at the northwest side of the cave, however, this portion of the cave is extremely small, measuring ca. 4.0 meters in length by 1.0 meter in width with a maximum ceiling height of only 0.1 meter. This portion of the cave was too small to be thoroughly inspected.

The smaller northwestern chamber is accessible from an entrance on the surface located at the northwest side of the cave. This entrance measures ca. 0.3 meter in length by 0.3 meter in width by 0.4 meter in height, and is also partially filled in with soil. The interior surface of the northwestern chamber also consists of soil with loosely scattered limestone cobbles and pebbles. This chamber measures ca. 4.0 meters in length by 3.0 meters in width with a maximum interior height of 0.5 meter. Fragments of *kukui* nut shell and non-human medium mammal bone (likely cow) were observed. No human skeletal remains were observed.

Site T-072 appears to have functioned as a traditional habitation cave that was likely utilized into the historic period.

A single 50 by 50 centimeter test unit was excavated at the back of the main southeastern chamber of the cave. The test unit uncovered a buried cultural deposit containing metal at the top of the excavation, along with basalt flakes, marine shell midden and non-human bone. Two charcoal samples were submitted for radiocarbon analysis and returned a date between the mid-1600s and 1800s. The results of the excavation are presented in Section 7.0 of this report.



Planview map of Site T-072.

Site T-072, main cave entrance, view to southwest.

Site T-072, main cave entrance, view to southwest.

SIHP No.:
Field No.: T-073
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-073 consists of a concrete ditch located in the central-eastern portion of the project area within the new survey area. The ditch is oriented roughly northwest to southeast and measures ca. 175.0 meters in length by 0.8-1.0 meter in width by 0.46-1.0 meter in depth. It is constructed formed concrete along the interior and stacked limestone cobbles and concrete along the exterior. Both ends of the ditch have been destroyed by bull-dozing activities. Site T-073 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-073, concrete ditch, view to southeast.

SIHP No.:
Field No.: T-074
Site Type: Complex
Site Function: Water Transport
Site Condition: Fair
Description: Site T-074 is located in the central-eastern portion of the project area within the new survey area. The site consists of five associated features; an aqueduct (Feature A), two concrete ditches (Feature B and Feature E), a soil ditch (Feature C), and a limestone retaining wall (Feature D). Overall, Site T-074 measures ca. 117.0 meters in length.

Feature A consists of a concrete aqueduct located on the west side of Site T-074. It is oriented roughly north to south and spans a small drainage. The aqueduct measures ca. 21.0 meters in length by 1.08 meters in width and has a maximum height of 2.4 meters. Feature A has two gentle arches and a third rectangular gap located on the south end. These arches allow water to pass underneath the aqueduct without damaging the structure. Each arch measures ca. 5.6 meters in width by 1.8 meters in height. The rectangular gap measures ca. 2.6 meters in width by 1.2 meters in height. A large banyan tree is growing near the center of the aqueduct, and has actually encased part of structure and broken through in several sections. The northern portion of the aqueduct flows directly into the Feature B, concrete ditch.

Feature B is a concrete ditch that is connected to the north end of the Feature A, aqueduct. The ditch is oriented roughly east to west along the northern slope of the drainage. It measures ca. 38.0 meters in length by 1.04 meters in width (exterior) by 0.61 meter in width (interior) by 0.36 meter in depth. It is constructed of red brick and rebar, covered by concrete. The exterior portion of the ditch consists of stacked and cemented limestone cobbles. The east end of Feature B gradually flows into the Feature C, soil ditch.

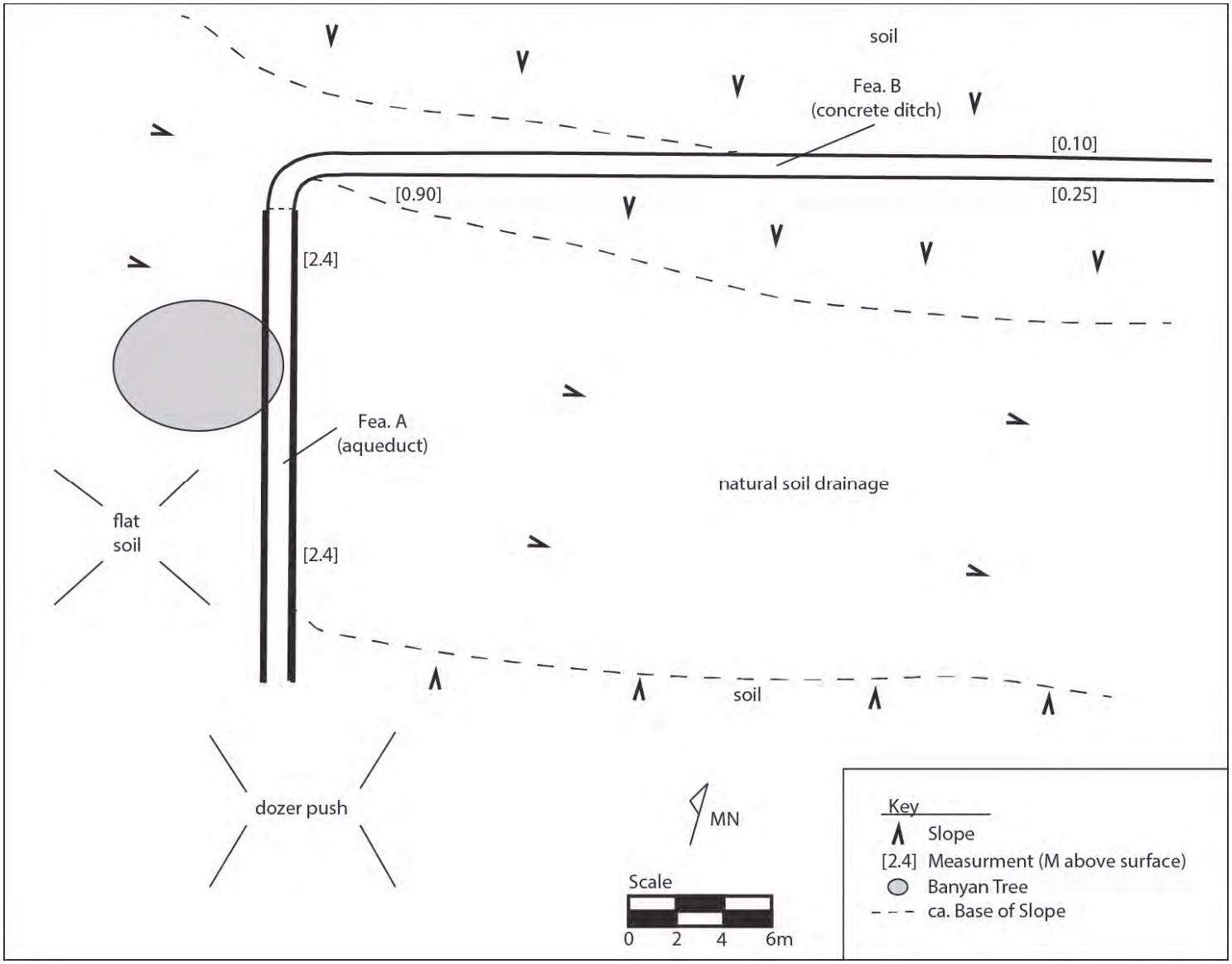
Feature C consists of a soil ditch connected to the east end of the Feature B, concrete ditch. Feature C measures ca. 46.3 meters in length by 1.2 meters in width by 0.3 meters in depth. The ditch abuts a section of the Feature D, limestone retaining wall, to the south, and flows directly into the Feature E, concrete ditch, at the east end.

Feature D is a limestone retaining wall located along the south side of the Feature C, soil ditch. The retaining wall is constructed of limestone boulders and cobbles that have been loosely stacked between three to five courses of stone in height. Overall, Feature D measures ca. 3.0 meters in length by 1.0 meter in depth by 0.8 meter in height. It was likely used to support and retain the Feature C, soil ditch.

Feature E consists of a concrete ditch connected to the east end of the Feature C, soil ditch. The ditch is constructed of concrete and fragments of red brick and stacked limestone cobbles. Overall, Feature E measures ca. 11.7 meters in length by 1.0 meter in width by 0.3 meter in depth. Only the south edge of the ditch is visible. The north side of the ditch is covered with soil and debris from bull-dozing upslope. The east end of the ditch terminates at an active agricultural field. A large track excavator is parked nearby. A metal/iron railroad spike was observed on the surface of Feature E and measures ca. 12.0 centimeters in length by 1.0

centimeter in width. It was likely deposited on the ditch from the bull-dozing disturbance above, although there is no evidence of a railroad in the area.

Site T-074 appears to be associated with water transport related to the former commercial sugar plantation.



Planview map of Site T-074, Features A and B.

Site T-074, Fe. A, aqueduct, view to southwest.

SIHP No.:
Field No.: T-077
Site Type: Soil Ditch
Site Function: Water Transport
Site Condition: Fair
Description: Site T-077 consists of a soil ditch located in the central-eastern portion of the project area, ca. 5.0 meters east of an active banana farm. The northern end of the ditch is located ca. 10.0 meters south of the Site T-074, Feature A, concrete aqueduct. There is a bulldozed area between the two sites. The ditch is oriented roughly north to south, and overall, measures ca. 258.0 meters in length by 2.0-3.0 meters in width by 0.5-1.0 meter in depth. The ditch is split into two sections with an 11.0 meter gap bulldozed in between them. The northern portion of the ditch measures ca. 140.0 meters in length and the southern portion measures ca. 118.0 meters in length. The ditch curves around the contour of the slope and terminates on the south end where it has been filled in with soil and deadfall. Site T-077 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-077, soil ditch, view to north.

SIHP No.:
Field No.: T-078
Site Type: Concrete Ditch
Site Function: Water Transport
Site Condition: Poor
Description: Site T-078 consists of a concrete ditch intersection located ca. 2.5 meters south of the existing Department of Agriculture road "A". The site is situated on a small slope beneath an existing agricultural lot. Vegetation in this area includes Christmas berry and *koa haole* trees. The ditch is constructed of concrete along the interior and basalt cobbles concreted in place along the exterior. Overall, the site measures ca. 5.0 meters in length (east-west) by 3.5 meters in width (north-south). The ditch is ca. 0.6 meter in width by 0.55 meter in interior depth and 0.9 meter in maximum exterior height. There are built in slots for a gate. A modern PVC pipe is used by the farm to transport water. Site T-077 appears to be associated with water transport related to the former commercial sugar plantation.

Site T-078, concrete ditch, view to south.

APPENDIX C

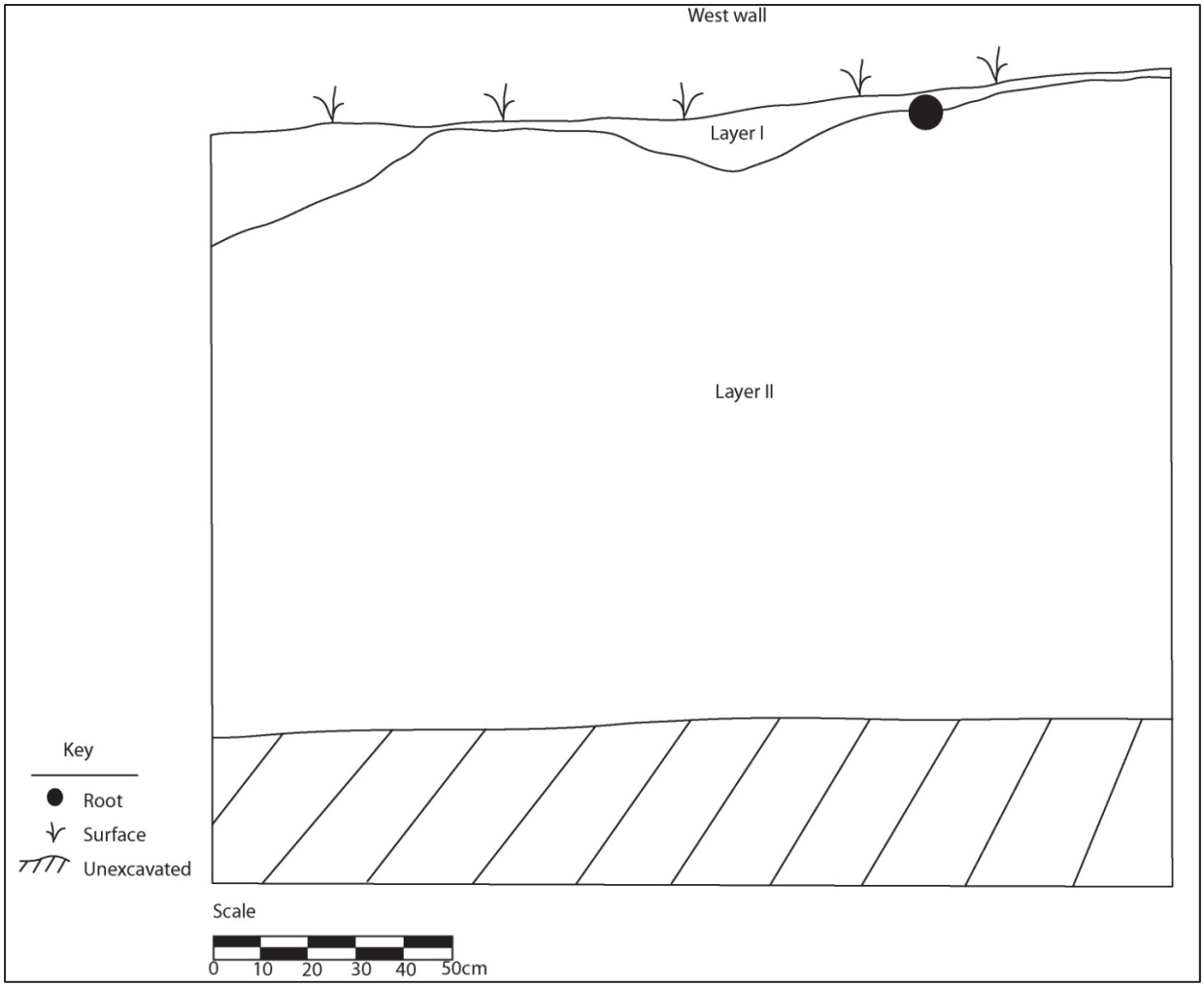
TRENCH DESCRIPTIONS

This appendix presents descriptions of the stratigraphic profiles revealed in the 16 backhoe trenches excavated within the project APE. The locations of the backhoe trenches are shown in Figure 19. The location, orientation, and size of each trench is presented; the soil layers are described, drawn in profile, and a photograph is presented.

Trench 1

Trench 1 is located in the N/E portion of the project area, c. 5 meters south of a E/W dirt access road, c. 20 meters south of an active agricultural field (basil), and c. 10 meters north of a N/E-S/W drainage (Figure 19). The trench is located in a natural sand deposit. The trench is oriented N-S (350°-170°) and measures c. 5.50 meters in length (N-S) by 0.80-1.20 meters in width (E-W) by 1.35 meters in depth.

Trench 1, west wall.



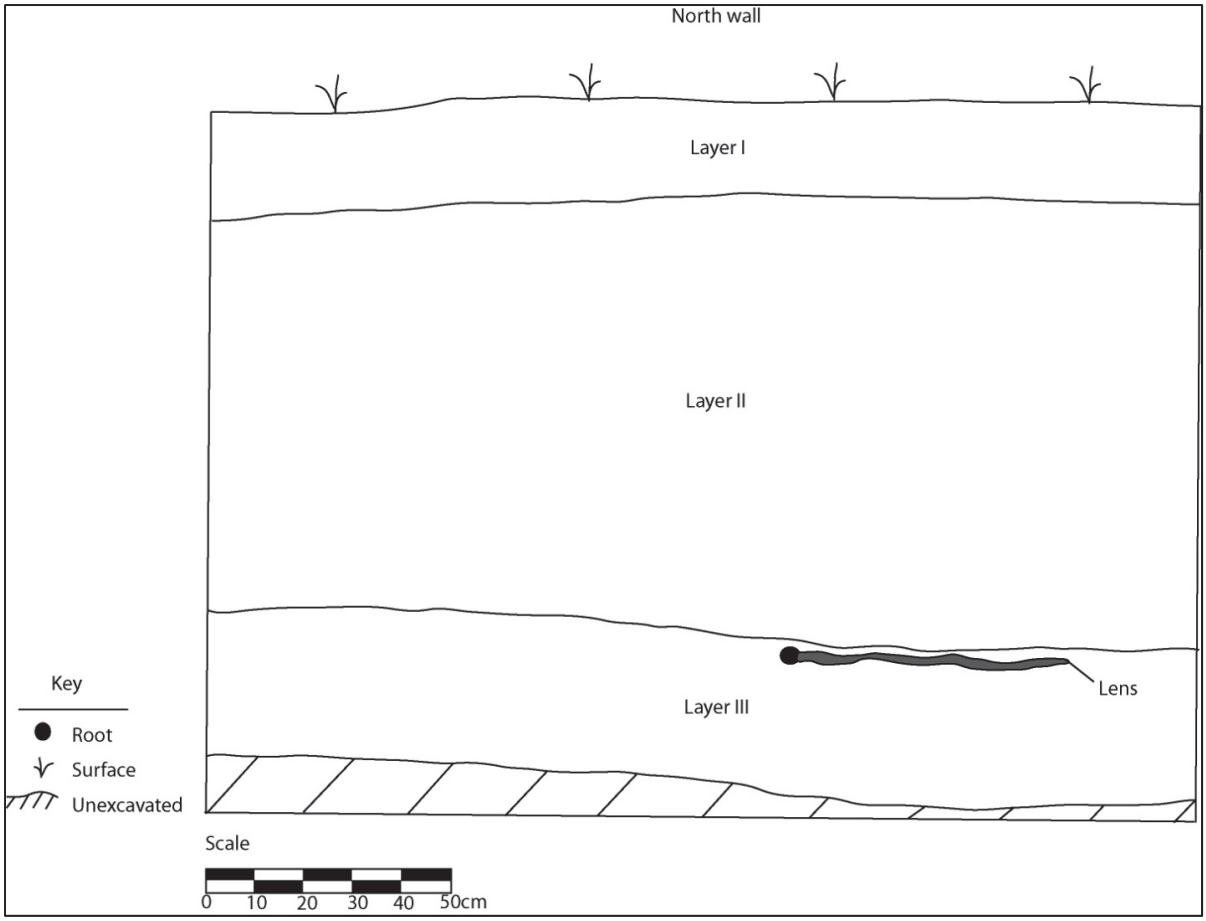
Trench 1, west wall profile.

Layer	Depth	Description
Layer I	0-22 cmbs (22 cm)	Very dark brown (10YR 2/2) sandy loam; weak, fine granular; loose, noncoherent, nonsticky, nonplastic; abrupt wavy boundary. Mixture of soil/sand.
Layer II	2-135 cmbs (133 cm)	Pale yellow (2.5Y 8/3) sand; structureless, fine, single grain; loose, noncoherent, nonsticky, nonplastic. Sand.

Trench 2

Trench 2 is located in the N/E portion of the project area, in between two active agricultural fields, c. 2 meters south of a dirt access road (Figure 19). Trench 2 is located in a sand deposit. Trench 2 is oriented E/W (90°-270°) and measures 5.5 m long.

Trench 2, north wall.



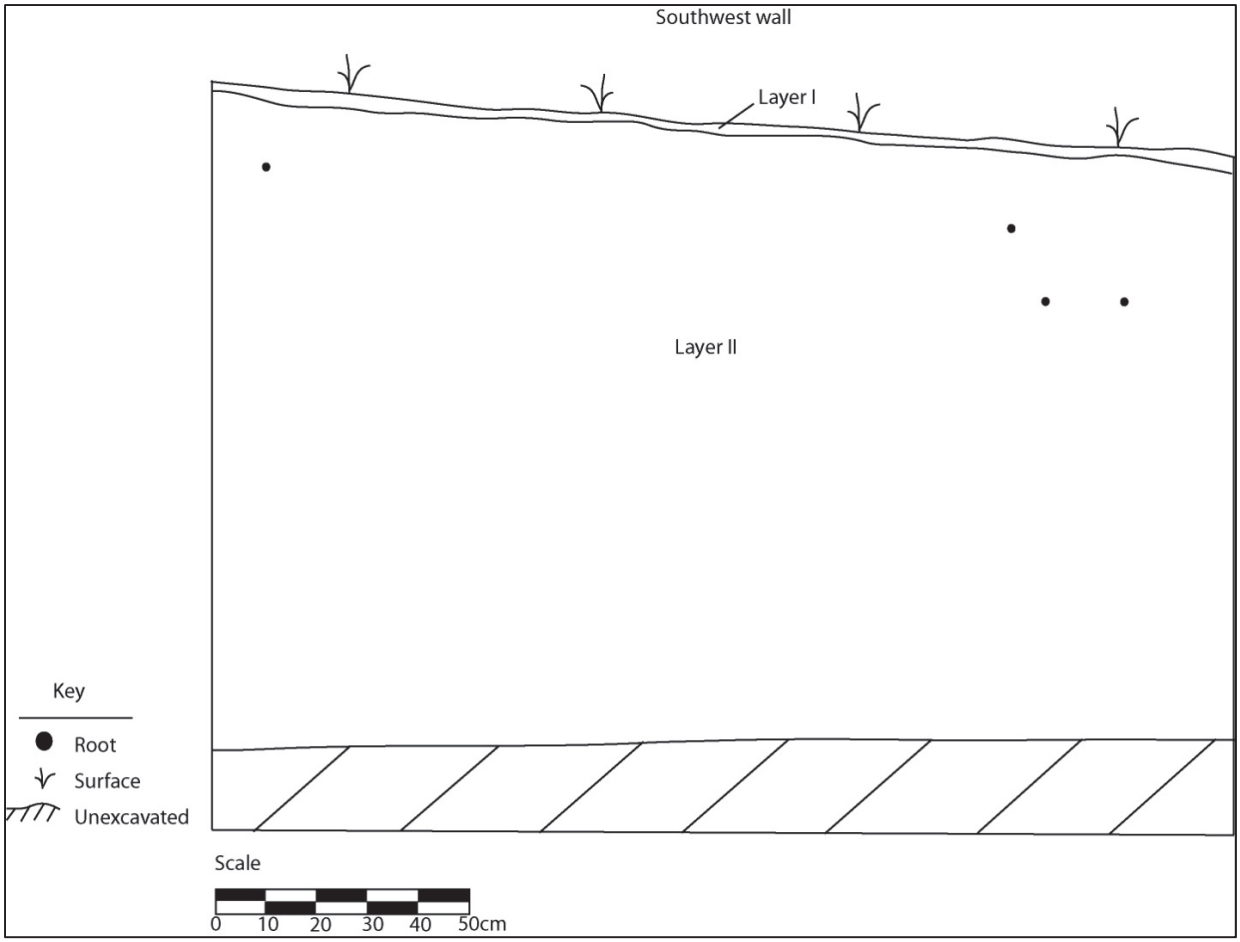
Trench 2, north wall profile.

Layer	Depth	Description
Layer I	0-22 cmbs (22 cm)	Dark yellowish brown (10 YR 3/4) sandy loam; weak, fine, granular; very friable, nonsticky, nonplastic; abrupt smooth boundary. Mixture of soil and sand.
Layer II	20-110 cmbs (90 cm)	Very pale brown (10YR 8/3) sand; structureless, fine, single grain; loose, noncoherent, nonsticky, nonplastic; abrupt smooth boundary. Sand.
Layer III	101-141 cmbs (31 cm)	Dark brown (7.5YR 3/3) silty clay; moderate, coarse, crumb; friable, sticky, plastic. Soil.
Lens	112-115 cmbs (3 cm)	Dark brown with charcoal flecking and ash (7.5 YR 3/3) silty clay with charcoal/ash; moderate, coarse, crumb; friable, sticky, plastic; abrupt smooth boundary. Soil with charcoal/ash, root burn.

Trench 3

Trench 3 is located in the eastern portion of the project area, within the proposed pad for Turbine #9, north of the center point for Turbine #9 (Figure 19). Trench 3 is situated c. 2 meters west of a N-S dirt access road and c. 2 meters N/E of an active agricultural field. Trench 3 is oriented N/W-S/E (310°-130°) and measures c. 3.5 meters in length (N/W-S/E) by 0.70-0.80 meters in width (N/E-S/W) by 1.2 meters in depth.

Trench 3, southwest wall.



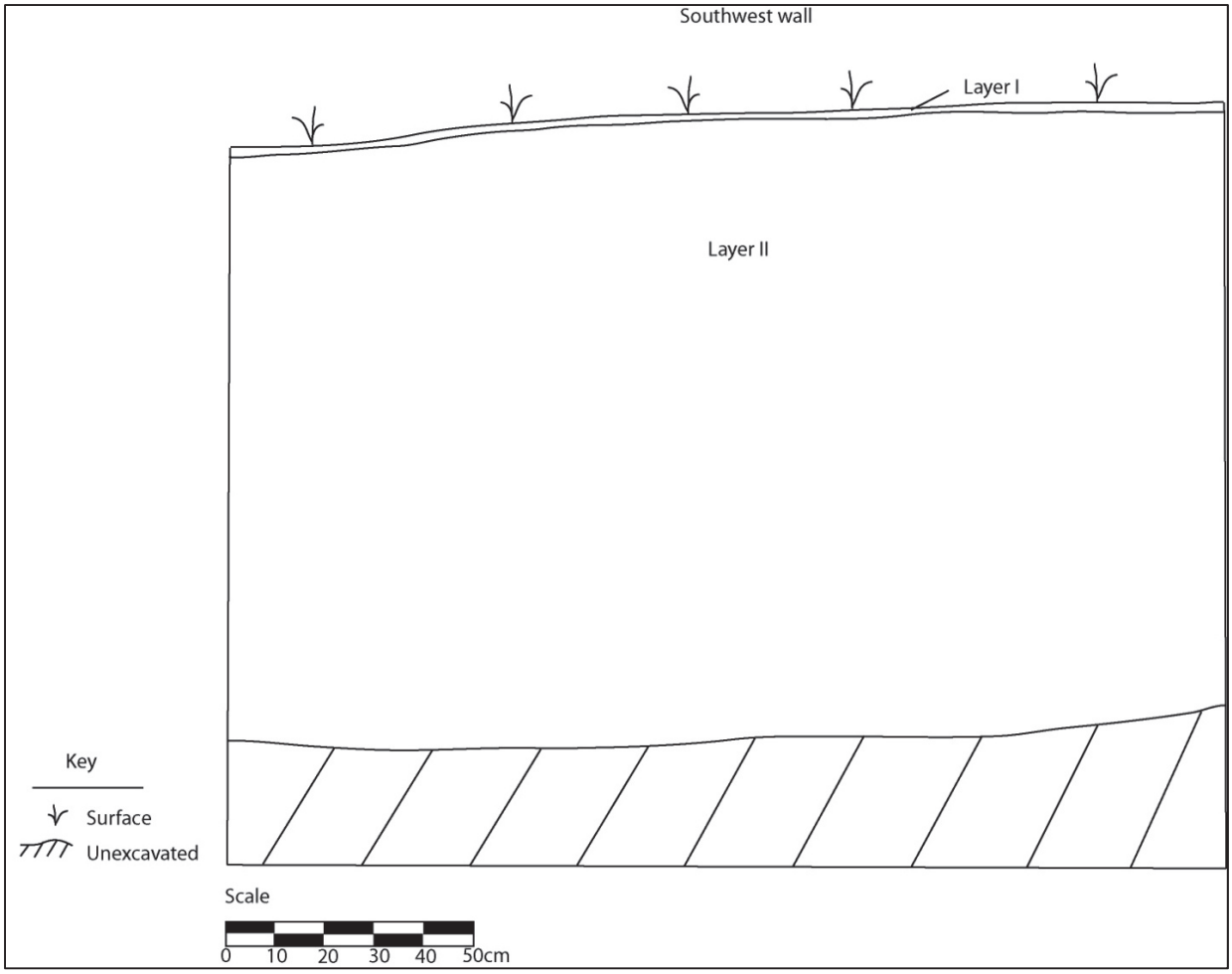
Trench 3, Southwest wall profile.

Layers	Depth	Description
Layer I	0-2 cmbs (2 cm)	Dark reddish brown (5YR 3/3) silty clay with recent organics; moderate, coarse, crumb; friable, sticky, plastic; abrupt smooth boundary. Contains recent organic material.
Layer II	2-127 cmbs (125 cm)	Dark reddish brown (5YR 3/4) silty clay; moderate, medium, platy; friable, sticky, plastic.

Trench 4

Trench 4 is located in the central portion of the project area, within the proposed pad for Turbine #6, east of the center point for Turbine #6 (Figure 19). Trench 4 is situated on a N/W-S/E dirt access road, c. 2 meters east of an active agricultural field (taro). Trench 4 is oriented N/W-S/E (310°-130°) and measures c. 4 meters in length (N/W-S/E) by 0.60-0.80 meters in width (N/E-S/W) by 1.20 meters in depth. Trench 4 consists of Layer I and Layer II.

Trench 4, southwest wall.



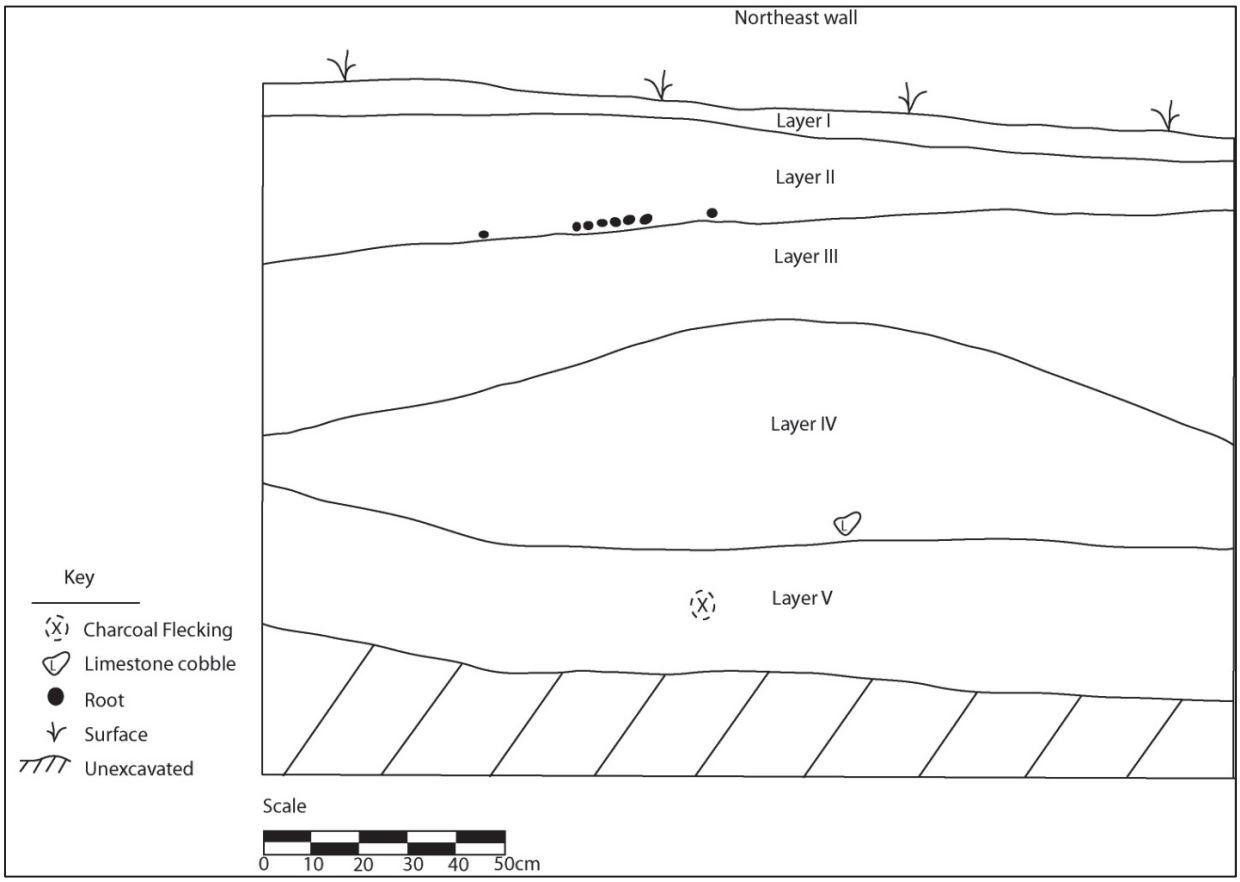
Trench 4, southwest wall profile.

Layer	Depth	Description
Layer I	0-2 cmbs (2 cm)	Dark reddish brown (5YR 3/2) silty clay with grass; strong, medium, subangular blocky; very firm, sticky, plastic; abrupt smooth boundary. Contains grass and recent organic material.
Layer II	2-119 cmbs (117 cm)	Dark reddish brown (2.5 YR 3/4) silty clay; moderate, coarse, crumb; firm, sticky, plastic. Contains small amounts of charcoal flecking.

Trench 5

Trench 5 is located in the northern central portion of the project area, along the proposed transmission line route (Figure 19). Trench 5 is situated c. 2 meters S/E of a N/E-S/W dirt access road. Trench 5 is oriented N/W-S/E (320°-140°) and measures c. 3.8 meters in length (N/W-S/E) by 0.90 meters in width (N/E-S/W) by 1.25 meters in depth. Trench 5 consists of Layer I, Layer II, Layer III, Layer IV, and Layer V.

Trench 5, northeast wall.



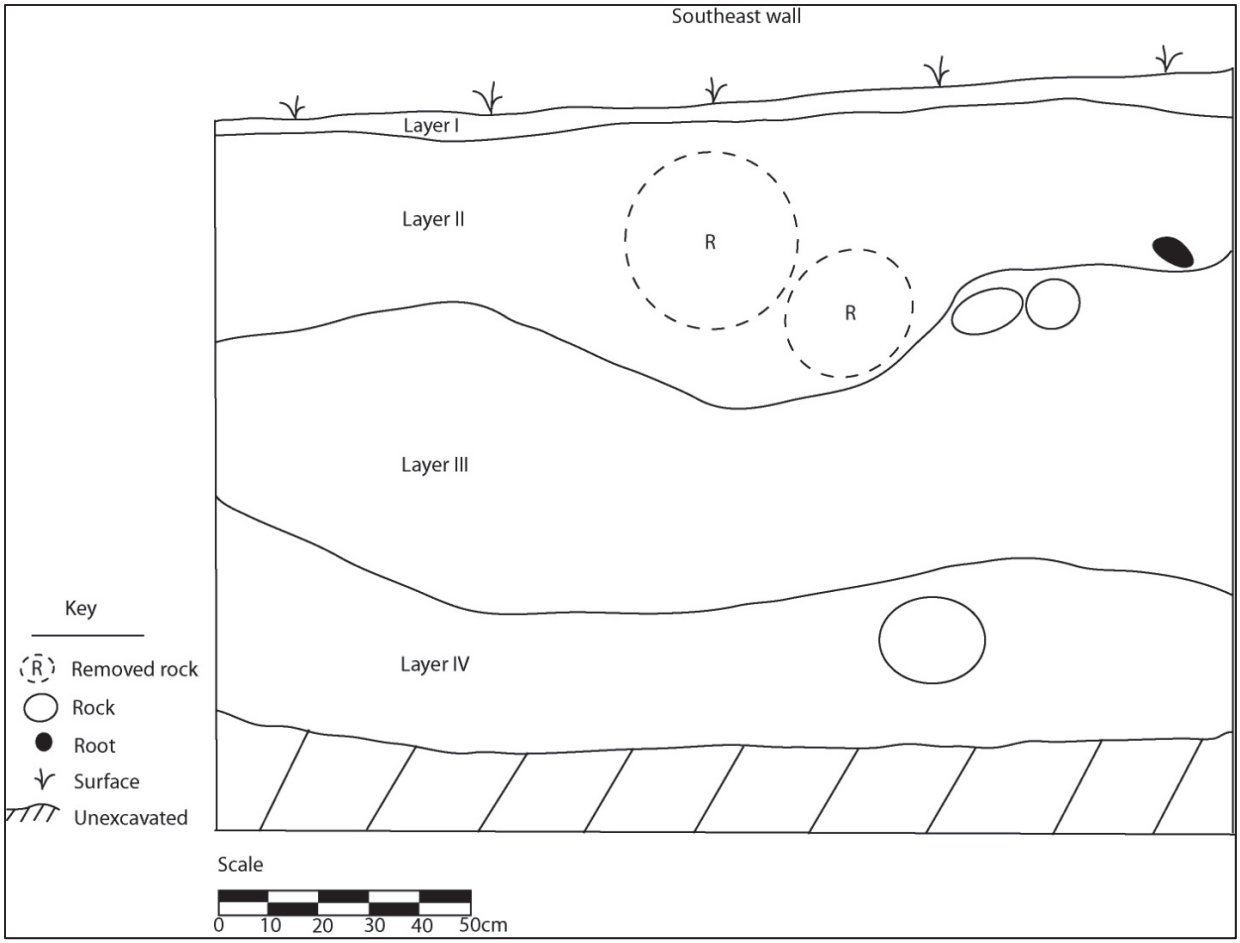
Trench 5, northeast wall profile.

Layer	Depth	Description
Layer I	0-9 cmbs (9 cm)	Dark Reddish Brown (5YR 3/3) silty clay; strong, medium, subangular blocky; firm, sticky, plastic; abrupt smooth boundary. Contains grass and recent organic material.
Layer II	9-37 cmbs (30 cm)	Dark Reddish Brown (5YR 3/3) silty clay; strong, medium, subangular blocky; firm, sticky, plastic; abrupt smooth boundary. Contains fragments of limestone.
Layer III	25-79 cmbs (47 cm)	Dark reddish brown (5YR 3/3) silty clay; strong, fine, subangular blocky; very firm, sticky, plastic, abrupt wavy boundary.
Layer IV	42-90 cmbs (40 cm)	Dark brown (7.5 YR 3/3) silty clay; strong very fine, subangular blocky; very firm, sticky, plastic; abrupt smooth boundary. Contains fragments of limestone.
Layer V	83-125 cmbs (30 cm)	Dark Reddish brown (5YR 3/4) silty clay; moderate, very fine, subangular blocky; friable, sticky, plastic. Contains a small amount of charcoal flecking.

Trench 6

Trench 6 is located in the north central portion of the project area, along the proposed transmission line (Figure 19). Trench 6 is situated on a N/E-S/W dirt access road c. 5 meters S/E of a natural N/E-S/W drainage. Trench 6 is oriented N/E-S/W (40°-220°) and measures 4.5 meters in length (N/E-S/W) by 0.90-1.10 meters in width (N/W-S/E) by 1.25 meters in depth. Trench 6 consists of Layer I, Layer II, Layer III, Layer IV.

Trench 6, southeast wall.



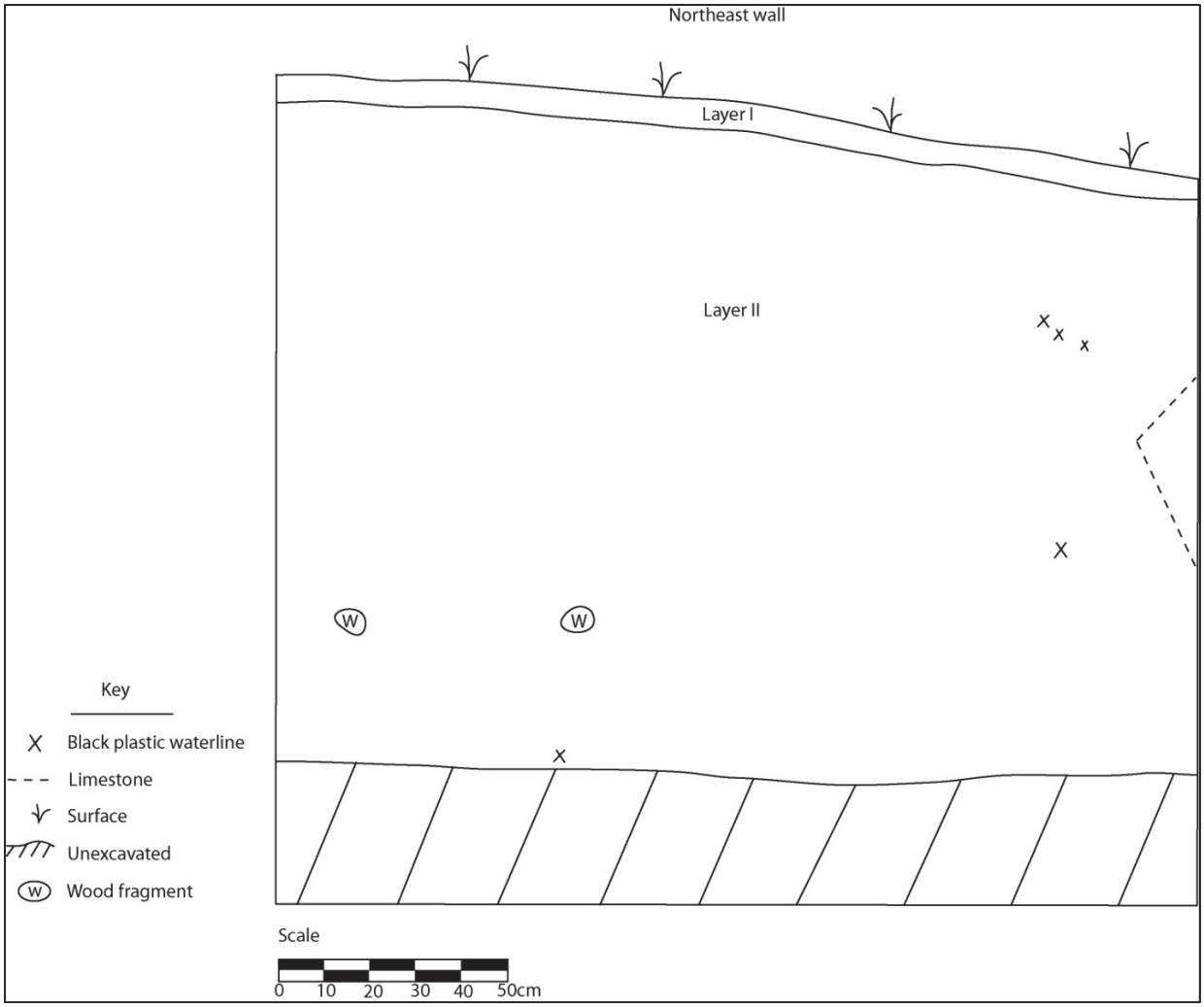
Trench 6, southeast wall profile.

Layer	Depth	Description
Layer I	0-9 cmbs (9 cm)	Very dark brown (7.5 YR 2.5/3) silty clay; moderate, medium, subangular blocky; friable, very sticky, very plastic; abrupt smooth boundary. Contains grass and recent organic material.
Layer II	6-67 cmbs (65 cm)	Very dark brown (7.5 YR 2.5/2) silty clay; moderate, fine, subangular blocky; friable, sticky, plastic, abrupt wavy boundary. Contains basalt boulders.
Layer III	36-102 cmbs (65 cm)	Very dark brown (7.5 YR 2.5/3) silty clay; moderate, medium, platy; firm, very sticky, very plastic; abrupt wavy boundary. Contains basalt boulders
Layer IV	86-125 cmbs (40 cm)	Brown (7.5 YR 4/3) silty clay; moderate, fine, subangular blocky; friable, sticky, plastic. Contains basalt boulders and decomposing rock.

Trench 7

Trench 7 is located in the south central portion of the project area, within the proposed pad for Turbine #7, S/W of the center point for Turbine #7 (Figure 19). Trench 7 is situated c. 3 meters S/E of a N/E-S/W dirt access road and c. 3 meters S/W of an active agricultural field (tomato). Trench 7 is oriented N/W-S/E (320°-140°) and measures c. 4.7 meters in length (N/W-S/E) by 0.70-0.90 meters in width (N/E-S/W) by 1.5 meters in depth. Trench 7 consists of Layer I, Layer II.

Trench 7, northeast wall.



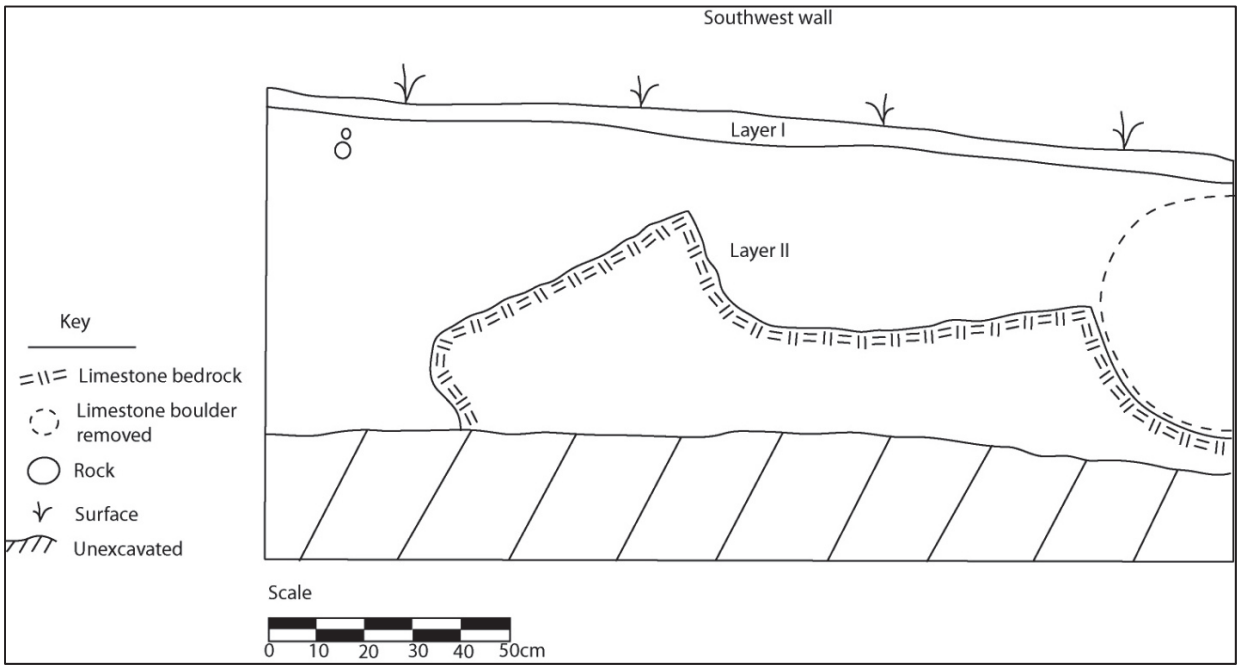
Trench 7, northeast wall profile.

Layer	Depth	Description
Layer I	0-9 cmbs (9 cm)	Very dark brown (7.5 YR 2.5/3) silty clay; strong, medium, subangular blocky; firm, sticky, plastic; abrupt smooth. Contains recent organic material and modern agricultural rubbish.
Layer II	9-150 cmbs (141 cm)	Very dark brown (7.5 YR 2.5/3) silty clay; moderate, fine, subangular blocky; friable, very sticky, very plastic. Contains modern agricultural rubbish and fragments of limestone and decomposing natural wood fragments.

Trench 8

Trench 8 is located in the north eastern portion of the project area, c. 15 meters S/E of an E-W dirt access road (Figure 19). Trench 8 is oriented N/W-S/E (340°-160°) and measures c. 3.7 meters in length (N/W-S/E) by 0.90-1.6 meters in width (N/E-S/W) by 0.72 meters in depth. Trench 8 consists of Layer I, Layer II.

Trench 8, southwest wall.



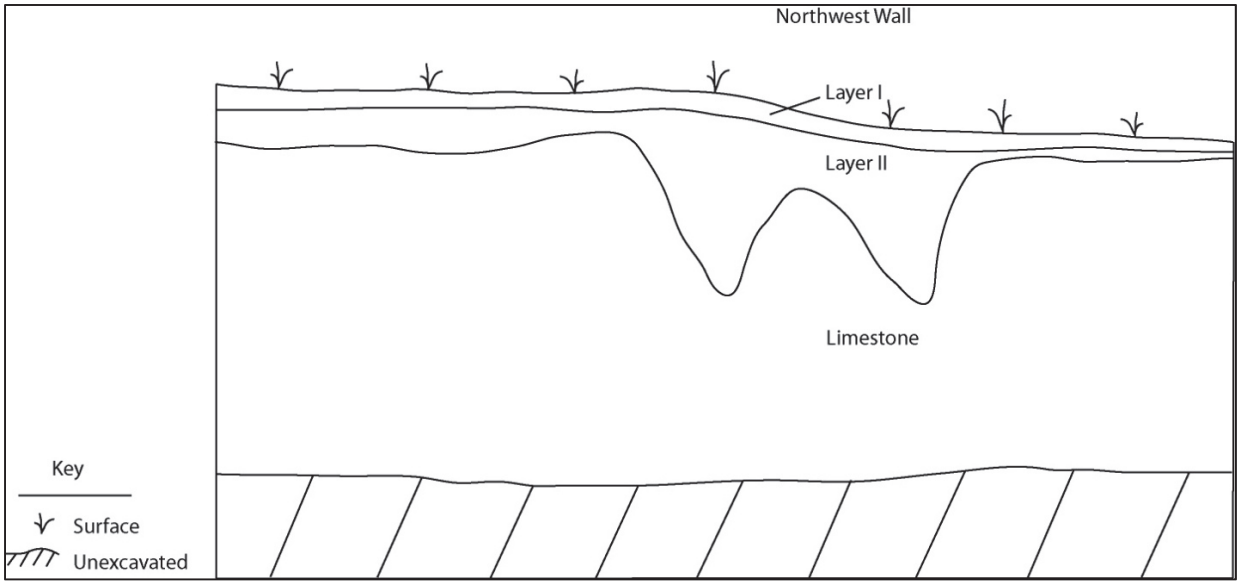
Trench 8, southwest wall profile.

Layer	Depth	Description
Layer I	0-6 cmbs (6 cm)	Dark brown (7.5 YR 3/3) silty clay; moderate, medium, crumb; very friable, slightly sticky, slightly plastic; abrupt smooth. Contains rootlets and recent organic material.
Layer II	6-72 cmbs (66 cm)	Dark brown (7.5 YR 3/4) silty clay; moderate, coarse, subangular blocky; friable, sticky, plastic.
-	20-72 cmbs	Limestone bedrock and boulders.

Trench 9

Trench 9 is located in the central eastern portion of the project area, within the eastern portion of the proposed lay down area, east of the center for the proposed Turbine #10 (Figure 19). Trench 9 is situated in an old sugar cane field that is overgrown with *koa haole* trees. Trench 9 is oriented N/E-S/W (50°-230°) and measures c. 4 meters in length (N/E-S/W) by 0.60-0.90 meters in width (N/W-S/E) by 0.82 meters in depth. Trench 9 consists of Layer I, Layer II.

Trench 9, northwest wall.



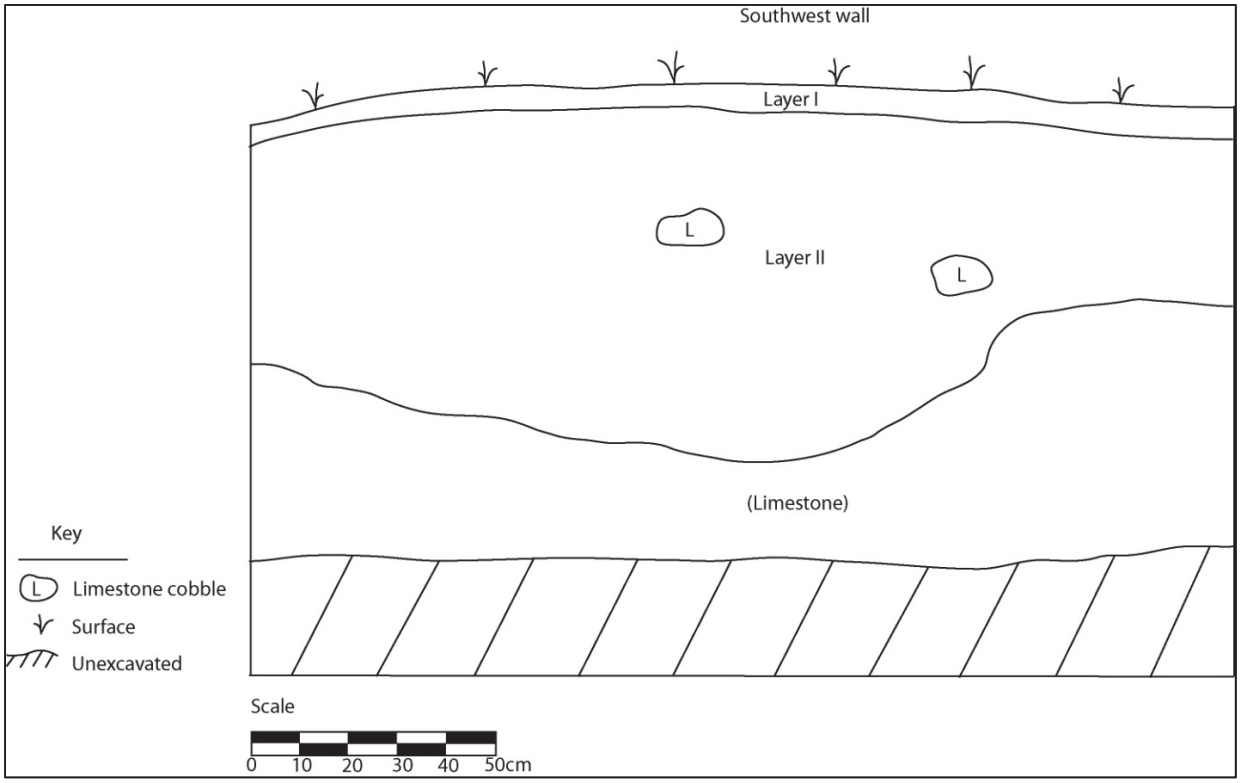
Trench 9, northwest wall profile.

Layer	Depth	Description
Layer I	0-12 cmbs (6 cm)	Dark yellowish brown (10YR 4/4) silty clay; moderate, medium, crumb; very friable, slightly sticky, slightly plastic, abrupt smooth boundary. Contains grass and recent organic material. Also contains fragments of limestone.
Layer II	5-42 cmbs (37 cm)	Strong brown (7.5YR 4/6) silty clay; moderate, fine, subangular blocky; friable, sticky, plastic
-	10-82 cmbs (70 cm)	Limestone bedrock.

Trench 10

Trench 10 is located in the central eastern portion of the project area, within the N/W portion of the proposed lay down area, N/W of the center point for the proposed Turbine #10 (Figure 19). Trench 10 is situated in an old sugarcane field that is overgrown with *koa haole* trees. Trench 10 is oriented N/W-S/E (310°-130°) and measures c. 3.5 meters in length (N/W-S/E) by 0.85-1.40 meters in width (N/E-S/W0 by 1.0 meters in depth. Trench 10 consists of Layer I, Layer II.

Trench 10, southwest wall.



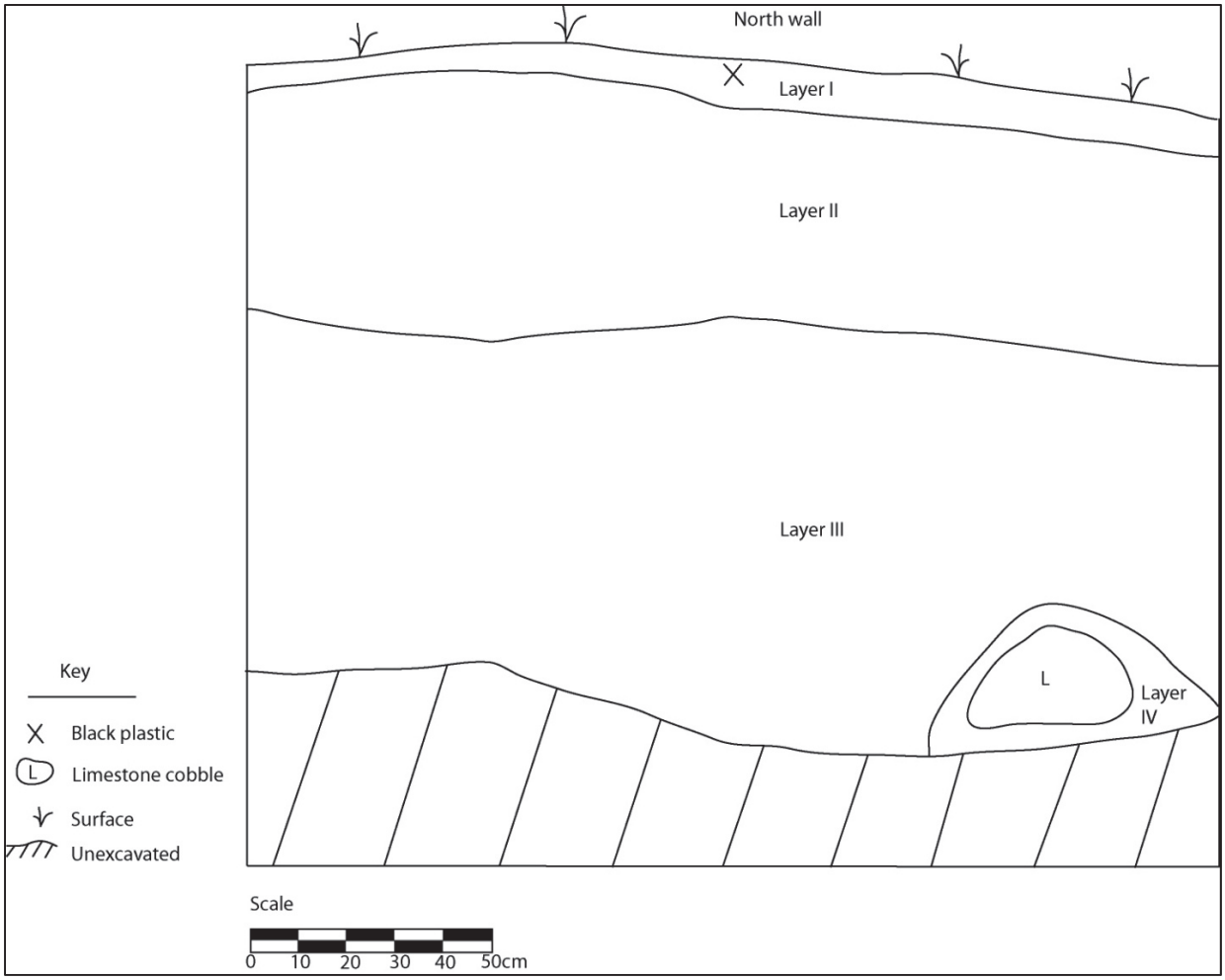
Trench 10, southwest wall profile.

Layer	Depth	Description
Layer I	0-12 cmbs (7 cm)	Dark brown (7.5 YR 3/4) silty clay; moderate, medium, crumb; friable, slightly sticky, slightly plastic; abrupt smooth boundary. Contains recent organic material.
Layer II	6-79 cmbs (74 cm)	Dark reddish brown (5 YR 3/4) silty clay; moderate, fine, subangular blocky; friable, sticky, plastic. Contains fragments of limestone. Outside of profile, contains some pieces of modern agricultural plastic.
	45-100 cmbs (55 cm) +	Limestone.

Trench 11

Trench 11 is located in the northeastern portion of the project area, S/W of the proposed road to Turbine #11 (Pad #11) and west of the center point for Turbine #11 (Figure 19). Trench 11 is situated c. 2 meters east of an active agricultural field (bananas). Trench 11 is oriented E-W (90°-270°) and measures c. 3.8 meters in length (E-W) by 0.60-0.65 meters in width (N-S) by 1.46 meters in depth. Trench 11 consists of Layer I, Layer II, Layer III, Layer IV.

Trench 11, north wall.



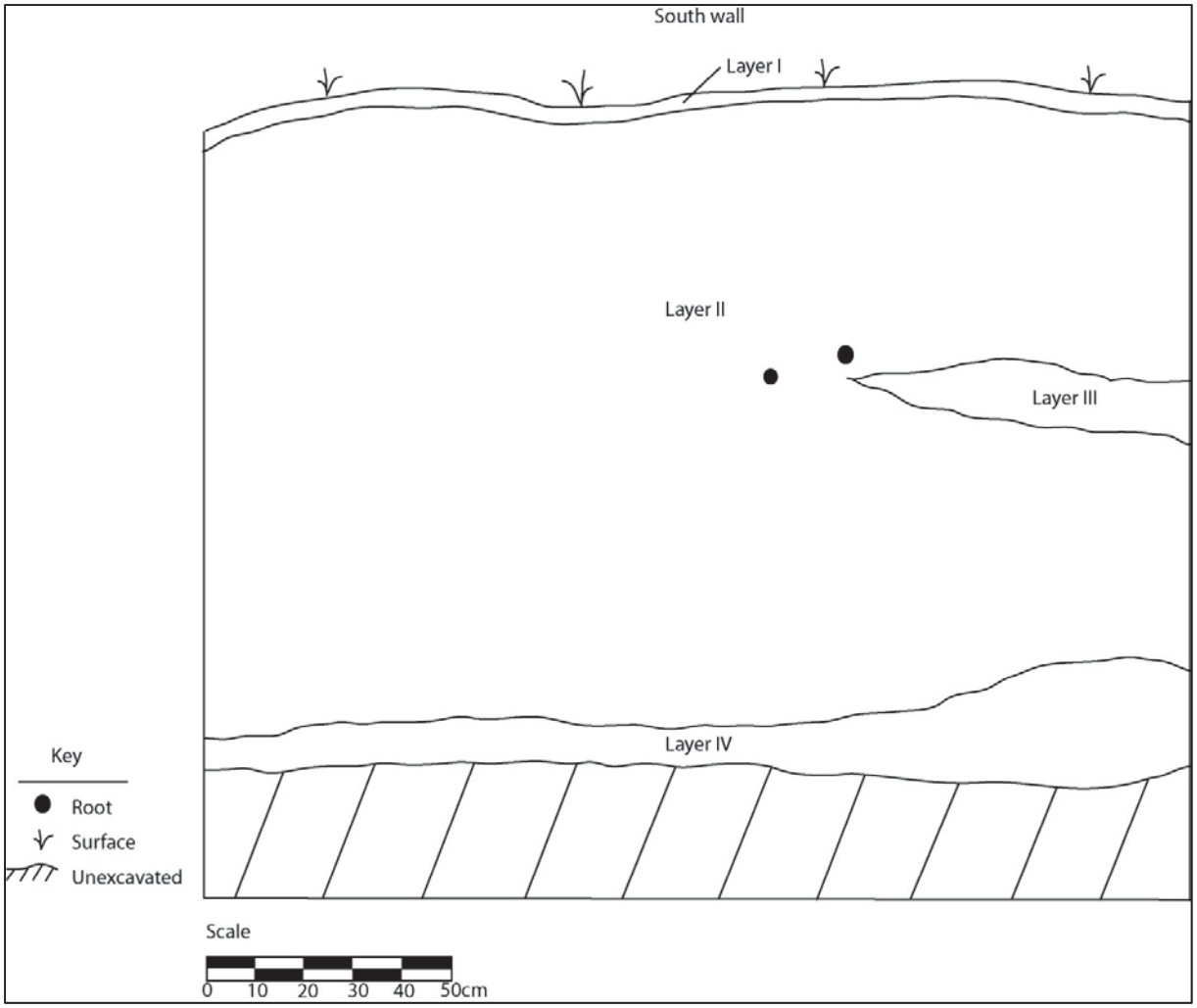
Trench 11, north wall profile.

Layer	Depth	Description
Layer I	0-25 cmbs (12 cm)	Dark brown (7.5 YR 3/3) silty clay; strong, fine, subangular blocky; very firm, very sticky, very plastic; abrupt smooth boundary. Contains grass and recent organic material. Also contains fragment of modern black bag plastic.
Layer II	5-67 cmbs (57 cm)	Dark brown (7.5 YR 3/3) silty clay; strong, medium, subangular blocky; firm, very sticky, very plastic; abrupt smooth boundary.
Layer III	58-146 cmbs (90 cm)	Dark brown (7.5 YR 3/4) silty clay; weak, medium, platy; firm, very sticky, very plastic. Contains some charcoal flecking.
Layer IV	115-146 cmbs (30 cm)	Strong brown (7.5 YR 4/6) silty clay; moderate, fine, subangular blocky; firm, sticky, plastic. Contains limestone.

Trench 12

Trench 12 is located in the southeastern portion of the project area, in the southwestern portion of the proposed pad for Turbine #12, S/W of the center point for Turbine #12 (Figure 19). Trench 12 is situated on an E-W dirt access road. Trench 12 is oriented E-W (110°-290°) and measures c. 4 meters in length (E-W) by 0.60-.80 meters in width (N-S) by 1.41 meters in depth. Trench 12 consists of Layer I, Layer II, Layer III, Layer IV.

Trench 12, south wall.



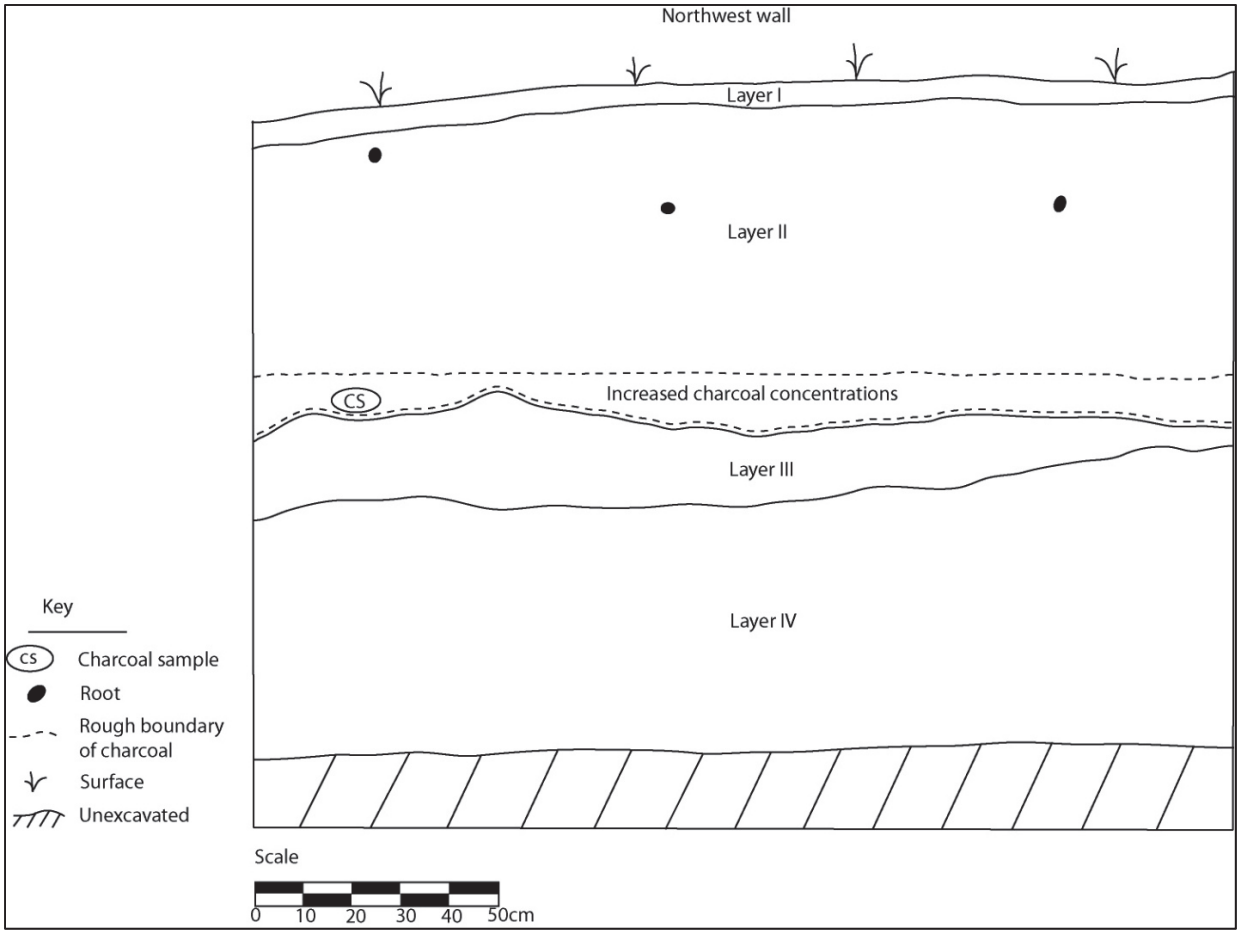
Trench 12, south wall profile.

Layer	Depth	Description
Layer I	0-3 cmbs (3 cm)	Dark reddish brown (5 YR 3/3) silty clay; moderate, coarse, crumb; firm, very sticky, very plastic; abrupt smooth boundary. Contains leaves and roots and recent organic material.
Layer II	3-123 cmbs (125 cm)	Dark reddish brown (5 YR 3/4) silty clay; weak, medium, crumb; friable, sticky, plastic; abrupt smooth boundary.
Layer III	56-69 cmbs (13 cm)	Dark reddish brown (5 YR 3/4) with brown (7.5 YR 4/4) silty clay; weak, medium, crumb; friable, slightly sticky, slightly plastic; abrupt smooth boundary.
Layer IV	115-141 cmbs (26 cm)	Dark reddish brown (5 YR 3/4) with brown (7.5 YR 4/4) silty clay; weak, medium, crumb; friable, slightly sticky, slightly plastic.

Trench 13

Trench 13 is located in the eastern portion of the project area, within the proposed access road to Pad #8/Turbine #8, southwest of Pad #8/Turbine #8 (Figure 19). Trench 13 is situated in a previously cleared area that is now overgrown with grass and weeds. Trench 13 is oriented N/E-S/W (40°-220°) and measures c. 4.5 meters in length (N/E-S/W) by 0.55-0.80 meters in width (N/W-S/E) by 1.38 meters in depth. Trench 13 consists of Layer I, Layer II, Layer III, and Layer IV. The charcoal identified between layers II and III is the result of modern agricultural activities.

Trench 13, northwest wall.



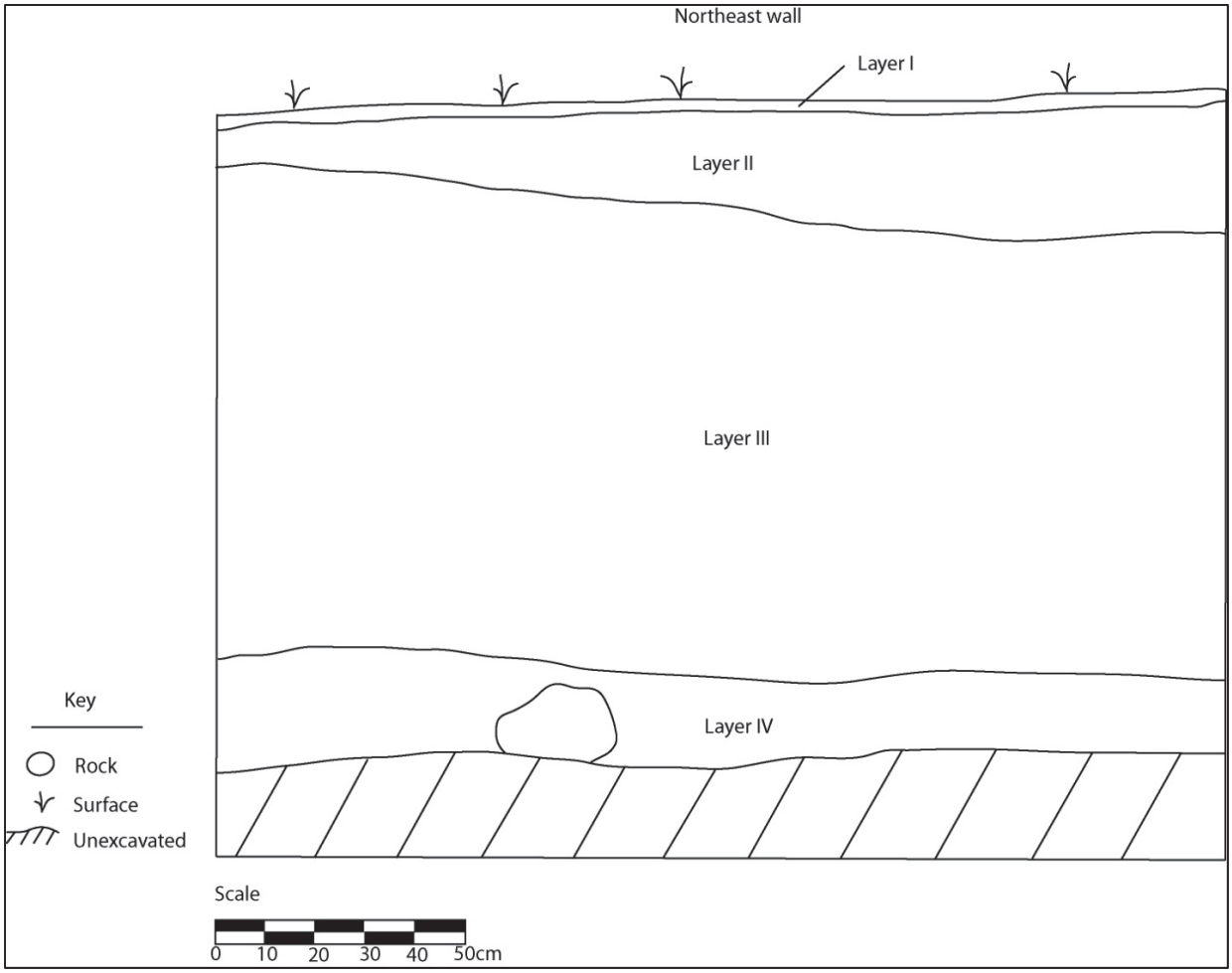
Trench 13, northwest wall profile.

Layer	Depth	Description
Layer I	0-6 cmbs (6 cm)	Very dark brown (7.5 YR 2.5/3) silty clay; moderate, coarse, crumb; friable, very sticky, very plastic; abrupt smooth boundary. Contains grass and recent organic material.
Layer II	4-72 cmbs (65 cm)	Very dark brown (7.5 YR 2.5/3) silty clay; weak, medium, subangular blocky; friable, very sticky, very plastic; abrupt smooth boundary. Contains chunks of charcoal towards the base of the layer. Charcoal sample 67cmbs.
Layer III	61-84 cmbs (24 cm)	Dark reddish brown (5 YR 3/4) silty clay; weak, medium, subangular blocky; firm, very sticky, very plastic; abrupt smooth boundary.
Layer IV	76-138 cmbs (62 cm)	Dark reddish brown (5 YR 3/3) silty clay; weak, fine, crumb; friable, very sticky, very plastic.

Trench 14

Trench 14 is located in the northwestern portion of the project area, on Department of Agriculture Land, within the proposed access road from Kamehameha Highway to Pad/Turbine #1 (Figure 19). Trench 14 is situated in an active agricultural field, in between several active agricultural fields (DOA). Trench 14 is oriented N/W-S/E (330°-150°) and measures c. 4 meters in length (N/W-S/E) by 0.65-0.80 meters in width (N/E-S/W) by 1.4 meters in depth. Trench 14 consists of Layer I, Layer II, Layer III, Layer IV.

Trench 14, northeast wall.



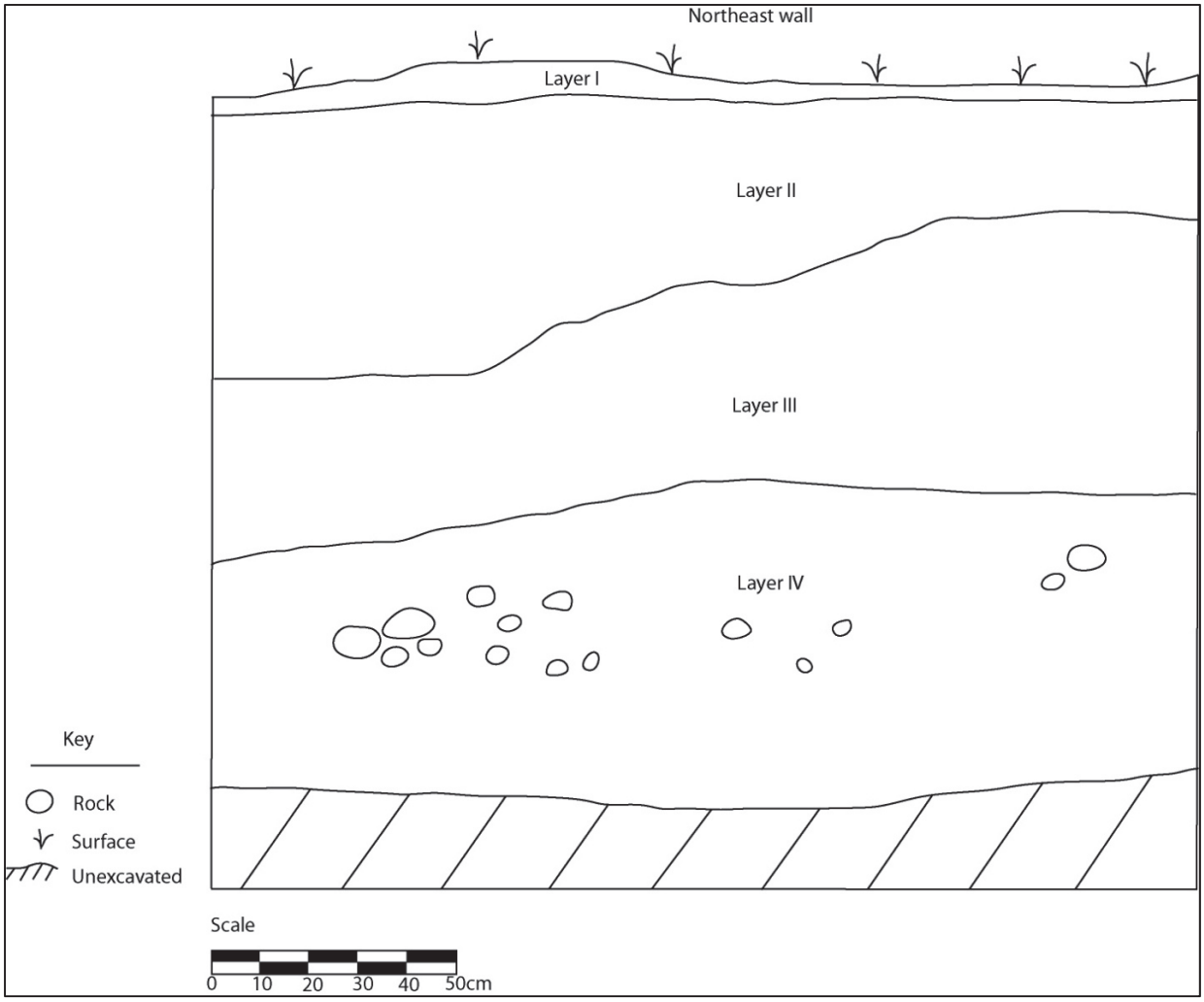
Trench 14, northeast wall profile.

Layer	Depth	Description
Layer I	0-8 cmbs (4 cm)	Dark reddish brown (5 YR 3/3) silty clay loam; moderate, medium, crumb; friable, sticky, plastic; abrupt smooth boundary. Contains grass and recent organic material.
Layer II	2-32 cmbs (26 cm)	Strong brown (7.5 YR 4/6) with dark reddish brown (5 YR 3/3) sandy loam with silty clay loam; weak, fine, granular with moderate, medium, crumb; friable slightly sticky, slightly plastic with friable, sticky, plastic; abrupt smooth boundary. Mottled.
Layer III	16-116 cmbs (100 cm)	Dark red (2.5 YR 3/6) silty clay; moderate, medium, crumb; friable, very sticky, very plastic; abrupt smooth boundary.
Layer IV	112-135 cmbs (22 cm)	Dusky red (10YR 3/4) silty clay with decomposing basalt rock; moderate, coarse, crumb; friable, very sticky, very plastic. Contains decomposing basalt rock.

Trench 15

Trench 15 is located in the northwestern portion of the project area, on DOA land, c. 20 meters S/W of Kamehameha Highway and c. 5 meters N/W of DOA road (Figure 19). Trench 15 is situated in a previously cleared area that is now overgrown with grass. Trench 15 is oriented N/W-S/E (300°-120°) and measures c. 3.6 meters in length (N/W-S/E) by 0.60-0.70 meters in width (N/E-S/W) by 1.51 meters in depth. Trench 15 consists of Layer I, Layer II, Layer III, Layer IV.

Trench 15, northeast wall.



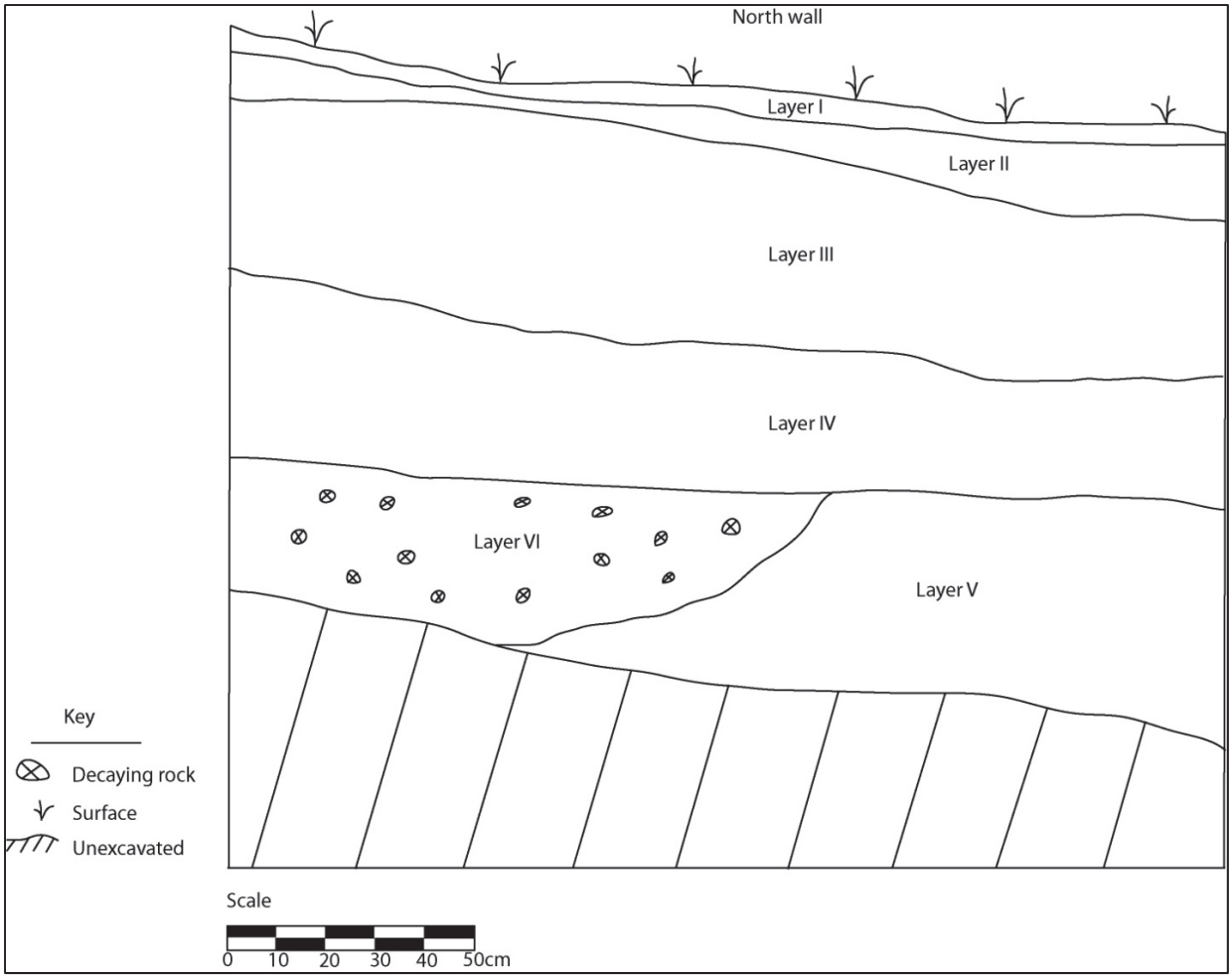
Trench 15, northeast wall profile.

Layer	Depth	Description
Layer I	0-12 cmbs (10 cm)	Very dark brown (7.5 YR 2.5/3) silty clay; strong, fine, subangular blocky; firm, sticky, plastic; abrupt smooth boundary. Contains grass and recent organic material. Also contains modern rubbish. Also contains fragments of charcoal.
Layer II	10-65 cmbs (57 cm)	Dark brown (7.5 YR 3/3) silty clay; moderate, medium, subangular blocky; firm, very sticky, very plastic; abrupt wavy boundary.
Layer III	30-103 cmbs (57 cm)	Dark brown (7.5 YR 3/3) silty clay; weak, medium, platy; firm, very sticky, very plastic; abrupt smooth boundary.
Layer IV	85-151 cmbs (65 cm)	Dark brown (7.5 YR 3/4) silty clay; moderate, medium, subangular blocky; friable, very sticky, very plastic. Contains roughly waterworn basalt cobbles and pebbles.

Trench 16

Trench 16 is located in the western portion of the project area, within the proposed access road to Pad/Turbine #1 (Figure 19). Trench 16 is situated on a previously cleared E/W dirt access road leading to a MET tower, east of Pad/Turbine #1. Trench 16 is oriented E/W (100°-280°) and measures c. 4 meters in length (E/W) by 0.70-1.2 meters in width (N/S) by 1.45 meters in depth. Trench 16 consists of Layer I, Layer II, Layer III, Layer IV, Layer v, Layer VI.

Trench 16, north wall.



Trench 16, north wall profile.

Layer	Depth	Description
Layer I	0-22 cmbs (2 cm)	Dark yellowish brown (10 YR 3/6) loam; moderate, medium, crumb; firm, slightly sticky, slightly plastic; abrupt smooth boundary. Contains grass and recent organic material.
Layer II	3-40 cmbs (18 cm)	Dark yellowish brown (10YR 3/6) loam; moderate, medium, crumb; firm, slightly sticky, slightly plastic; abrupt smooth boundary.
Layer III	16-70 cmbs (55 cm)	Very dark brown (10 YR 2/2) silty clay; moderate, fine, crumb; friable, very sticky, very plastic; abrupt smooth boundary. Contains basalt boulders and cobbles.
Layer IV	50-96 cmbs (37 cm)	Dark brown (10 YR 3/3) silty clay; moderate fine, crumb; friable, very sticky, very plastic; abrupt smooth boundary. Contains basalt boulders and cobbles.
Layer V	96-145 cmbs (50 cm)	Dark brown (10 YR 3/3) silty clay; moderate, thick, platy; friable, very sticky, very plastic
Layer VI	88-126 cmbs (35 cm)	Dark gray (2.5 Y 4/1) with yellowish red (5 YR 4/6) silty clay; moderate, coarse, subangular blocky; friable, very sticky, very plastic. Mottled. Contains decaying basalt rocks.

APPENDIX D

WOOD IDENTIFICATION

RADIOCARBON SAMPLE SCREENING FOR THE NA PUA MAKANI ARCHAEOLOGICAL INVENTORY SURVEY, PACIFIC LEGACY PROJECT 2780.04, KAHUKU, O'AHU

Gail M. Murakami
International Archaeological Research Institute, Inc.

January 7, 2015

INTRODUCTION

This report presents the results of taxa identification in charcoal samples from Pacific Legacy's Na Pua Makani Archaeological Inventory Survey (AIS) Project 2780.04 on O'ahu Island. Identification of charcoal found in archaeological context can give insight into the vegetation of the surrounding area at the time that the woods were burned. This information can then be used to interpret the environment as well as possible cultural use of specific plants. In this way charcoal samples may be viewed as partial records of the environmental and cultural history of an area.

METHODS

The freshly fractured transverse and tangential facets of the charcoal pieces were viewed under magnification of a dissecting microscope. Taxa identifications were made by comparing the anatomical characteristics seen during examination against those of known woods in the Pacific Islands Wood Collection at the Department of Botany, University of Hawai'i, and published descriptions.

RESULTS

Two charcoal samples collected from a small shelter during the Na Pua Makani project were examined for taxa identification. One taxon was identified in each of the samples, totaling two taxa for the assemblage. The results are summarized in Table 1. Descriptions of the taxa identified are presented in the review below.

Table 1. Charcoal Taxa Identification in Samples from the Na Pua Makani Project, O'ahu Island.

WIDL #	Taxa	Common/ Hawaiian Name	Origin/Habit	Part	Count	Weight, g
Bag 11, T-72, TU 1, Layer I/Level 2, Sample #1						
1426-1	*Chamaesyce* sp.	*'Akoko*	Native/Shrub	Wood	1	0.07
Bag 28, T-72, TU 1, 37 cm bd, west wall post-ex, Sample #3						
1426-2	*Hibiscus tiliaceus*	*Hau*	Native/Shrub-Tree	Wood	3	0.09

TAXA REVIEW

Chamaesyce spp. (*'Akoko*)

The distribution of the 15 endemic shrubs and small trees in this genus range from coastal environments to upper forest zones on the main Hawaiian Islands. Nine of these native species are found on O'ahu (Wagner et al. 1990:602-617; Rock 1974:243-262). *'Akoko* was once valued for firewood by the Hawaiians (Hillebrand 1981:396). The milky sap was once considered a possible source for rubber (Rock 1974:261).

Hibiscus tiliaceus L. (*Hau*)

This indigenous plant is described by Handy and Handy (1972:232-233) as a "large-leaved shrublike tree" which was planted near houses and gardens. The straight-stemmed variety was once planted for bast fibers from which cords, ropes, and coarse *tapa* cloth were made. Its soft wood was used to make canoe outriggers, fishnet floats, and fire by rubbing a harder wood against it. The creeping variety was used for windbreaks. This species occurs primarily along coasts, streams, and other wet areas up to 1,220 m in elevation on all main islands although not documented from Ni'ihau and Kaho'olawe (Wagner et al. 1990:888).

REFERENCES CITED

Handy, E. S. Craighill and Elizabeth G. Handy
1972 *Native Planters of Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Hillebrand, William
1981 *Flora of the Hawaiian Islands: A Description of their Phanerograms and Vascular Cryptogams*. Lubrecht & Cramer, New York. Originally published in 1888.

Rock, Joseph F.
1974 *The Indigenous Trees of the Hawaiian Islands*. Charles E. Tuttle Company, Inc.

Wagner, Warren L., Derral R. Herbst, and S. H. Sohmer
1990 *Manual of the Flowering Plants of Hawai'i*. University of Hawaii and Bishop Museum Presses, Honolulu.

APPENDIX E

RADIOCARBON DATING RESULTS

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

February 5, 2015

Dr. Paul Cleghorn
Pacific Legacy, Incorporated
30 Aulike Street, #301
Kailua, HI 96734
USA

RE: Radiocarbon Dating Results For Samples NPM T72 CH3, NPM T72 CH1

Dear Dr. Cleghorn:

Enclosed are the radiocarbon dating results for two samples recently sent to us. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable. The Conventional Radiocarbon Ages have all been corrected for total fractionation effects and where applicable, calibration was performed using 2013 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

Reported results are accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 standards and all chemistry was performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 program participated in the analyses.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result.

When interpreting the results, please consider any communications you may have had with us regarding the samples. As always, your inquiries are most welcome. If you have any questions or would like further details of the analyses, please do not hesitate to contact us.

The cost of the analysis was charged to the VISA card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

Page 1 of 4

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Paul Cleghorn — Report Date: 2/5/2015

Pacific Legacy, Incorporated — Material Received: 1/23/2015

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 402614	100 +/- 30 BP	-24.2 o/oo	110 +/- 30 BP
SAMPLE : NPM T72 CH3			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT :	(charred material): acid/alkali/acid		
2 SIGMA CALIBRATION :	Cal AD 1680 to 1765 (Cal BP 270 to 185) and Cal AD 1800 to 1940 (Cal BP 150 to 10) and Post AD 1950 (Post BP 0)		
Beta - 402615	100.7 +/- 0.4 pMC	-10.3 o/oo	180 +/- 30 BP
SAMPLE : NPM T72 CH1			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT :	(charred material): acid/alkali/acid		
2 SIGMA CALIBRATION :	Cal AD 1655 to 1695 (Cal BP 295 to 255) and Cal AD 1725 to 1815 (Cal BP 225 to 135) and Cal AD 1835 to 1840 (Cal BP 115 to 110) and Cal AD 1855 to 1865 (Cal BP 95 to 85) and Cal AD 1920 to Post 1950 (Cal BP 30 to Post 0)		

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

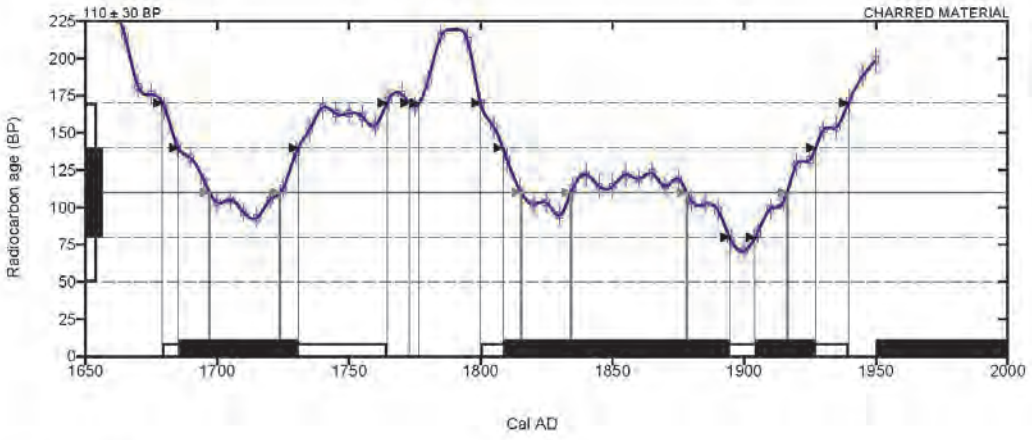
The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

Page 2 of 4

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -24.2 o/oo ; lab. mult = 1)

Laboratory number	**Beta-402614**
Conventional radiocarbon age	**110 ± 30 BP**
Calibrated Result (95% Probability)	**Cal AD 1680 to 1765 (Cal BP 270 to 185)** **Cal AD 1800 to 1940 (Cal BP 150 to 10)** **Post AD 1950 (Post BP 0)**
Intercept of radiocarbon age with calibration curve	Cal AD 1695 (Cal BP 255) Cal AD 1725 (Cal BP 225) Cal AD 1815 (Cal BP 135) Cal AD 1835 (Cal BP 115) Cal AD 1880 (Cal BP 70) Cal AD 1915 (Cal BP 35) Post AD 1950 (Post BP 0)
Calibrated Result (68% Probability)	Cal AD 1685 to 1730 (Cal BP 265 to 220) Cal AD 1810 to 1895 (Cal BP 140 to 55) Cal AD 1905 to 1925 (Cal BP 45 to 25) Post AD 1950 (Post BP 0)



Database used
INTCAL13

References
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322
References to INTCAL13 database
Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0– 50,000 years cal BP, Radiocarbon 55(4):1869– 1887, 2013

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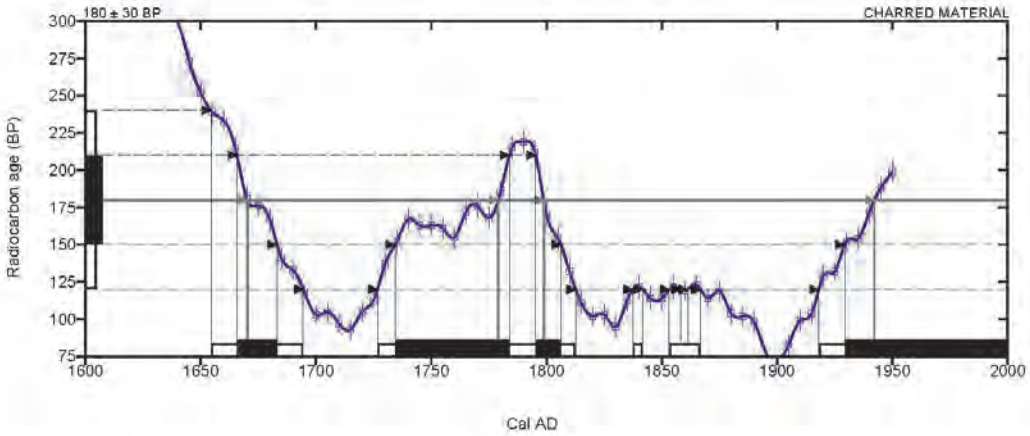
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -10.3 o/oo ; lab. mult = 1)

Laboratory number	**Beta-402615**
Conventional radiocarbon age	**180 ± 30 BP**
2 Sigma calibrated result **95% probability**	**Cal AD 1655 to 1695 (Cal BP 295 to 255)** **Cal AD 1725 to 1815 (Cal BP 225 to 135)** **Cal AD 1835 to 1840 (Cal BP 115 to 110)** **Cal AD 1855 to 1865 (Cal BP 95 to 85)** **Cal AD 1920 to Post 1950 (Cal BP 30 to Post 0)**
Intercept of radiocarbon age with calibration curve	Cal AD 1670 (Cal BP 280) Cal AD 1780 (Cal BP 170) Cal AD 1800 (Cal BP 150) Cal AD 1940 (Cal BP 10) Post AD 1950 (Post BP 0)
1 Sigma calibrated results 68% probability	Cal AD 1665 to 1685 (Cal BP 285 to 265) Cal AD 1735 to 1785 (Cal BP 215 to 165) Cal AD 1795 to 1805 (Cal BP 155 to 145) Cal AD 1930 to Post 1950 (Cal BP 20 to Post 0)



Database used
INTCAL13

References
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Page 4 of 4

APPENDIX G
CULTURAL IMPACTS ASSESSMENT (CIA)

Pacific Legacy

Historic Preservation

DRAFT

CULTURAL IMPACT ASSESSMENT FOR THE NĀ PUA MAKANI WIND PROJECT, KAHUKU, KEANA, AND MĀLAEKAHANA AHUPUAʻA, KOʻALAU LOA DISTRICT, ISLAND OF OʻAHU

[TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006]

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CULTURAL IMPACT ASSESSMENT FOR THE NĀ PUA MAKANI WIND PROJECT, KAHUKU, KEANA, AND MĀLAEKAHANA AHUPUA‘A, KO‘OLAU LOA DISTRICT, ISLAND OF O‘AHU

[TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006]

Prepared by:
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Prepared for:
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April 2015

ABSTRACT

As part of the Environmental Impact Statement process, Nā Pua Makani Power Partners, LLC, a subsidiary of Champlin Hawai‘i Wind Holdings, LLC, has requested a Cultural Impact Assessment (CIA) for the proposed Nā Pua Makani Wind Project, which is slated for a 464 acre parcel spanning the *kula* and *mauka* portions of Kahuku, Keana, and Mālaekahana Ahupua‘a, in Ko‘olau Loa District, O‘ahu [TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006]. This assessment is based upon archival research as well as ethnographic interviews. Under Act 50, the Hawai‘i State Department of Health "Guidelines for Cultural Impact Assessments" mandate that the subject property be studied as well as surrounding areas where construction or development have impact potential. These guidelines also recommend personal interviews with traditional cultural practitioners and knowledgeable informants on cultural practices. For this study, three interviews with four cultural informants were performed, while only two informant summaries are included as two were withdrawn.

The results of archival research indicate that the vicinity of Kahuku, Keana, and Mālaekahana Ahupua‘a has a long and rich cultural and legendary history. However, little is mentioned of the specific property in which the Nā Pua Makani Wind Project is to be built. Regardless, some traditional Hawaiian practices were found to be practiced in and around the project area, including pig hunting and plant gathering, according to the testimony of two of the four interviewees. Yet, neither informant expressed that the areas in which the cultural practices were occurring were exceptional, legal, or even ideal, as the lands are private and/or reserved for military use. Further, it is uncertain that the locations in which the activities occur are within the Area of Potential Effect (APE). Hence, the proposed development of the Nā Pua Makani Wind Project is not forecasted to significantly impact any ongoing cultural practices. It is reportedly a common belief that the area in general has a mystical past and retains some supernatural qualities. To respect the spiritual connections that people have with the ‘*āina*, as the general area is known as a *wahi pana* (legendary place), it is recommended that any major event or construction related activity be preceded with a traditional Hawaiian Blessing ceremony performed by a *kahuna* (priest or priestess) or *kahu pule* (minister/preacher).

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1.0 INTRODUCTION

Pacific Legacy, Inc., under contract to Nā Pua Makani Power Partners, LLC, a subsidiary of Champlin Hawaiʻi Wind Holdings, LLC, conducted a Cultural Impact Assessment (CIA) as part of the Environmental Impact Statement (EIS) for the proposed Nā Pua Makani Wind Project. The subject area is situated on approximately 464 acres of land spanning *kula* (plains) and *wao* (upland) portions of three *ahupuaʻa*: Kahuku, Keana and Mālaekahana [TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006], Koʻolau Loa District, Oʻahu (Figure 1).

The main objective of a CIA is to promote and protect cultural beliefs, practices, and resources of Native Hawaiians, other ethnic groups, as well as other collective groups associated with the subject area and surrounding areas (OEQC 2011:3-4).

1.1 PURPOSE

In keeping with Articles IX and XII of the state constitution, the goal of a CIA is to promote and protect cultural beliefs, practices, and resources of Native Hawaiians as well as other ethnic groups and collective groups (OEQC 2011: 3-4). The general purpose of this CIA is to protect and preserve all cultural practices and resources within the project area and surrounding areas that may be impacted by the proposed project. To do so, cultural practices, features, and practitioners must be identified and assessed for potential impacts by the Proposed Action and alternative options. Finally, recommendations are provided to mitigate the potential impacts.

In the State of Hawaiʻi, under Chapter 343 HRS, and Act 50, SLH 2000, a CIA is required as part of the EIS process, and has the stated purpose to:

1. require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and
2. amend the definition of "significant effect" to include adverse effects on cultural practices.

According to these guidelines, types of cultural practices and beliefs may include those relating to subsistence, commercial, residential, agricultural, access-related, recreational, as well as religion and spirituality. The guidelines further state that cultural resources subject to a CIA may include: "traditional cultural properties or other types of historic sites, both manmade and natural, including submerged cultural resources, which support such cultural practices and beliefs" (OEQC 2011:4). To determine the effects of the proposed development on cultural practices, resources, and beliefs, the following tasks are undertaken:

1. identify and consult with individuals and organizations knowledgeable about cultural practices that may have taken place in the area;
2. conduct archival research about traditional practices that may have been conducted in the area;
3. describe the cultural practices that took place within the potentially affected

area;
4. assess the impact of the proposed development on the cultural practices that may have taken place within the potentially affected area; and
5. prepare a report on the findings resulting from the above investigations.

Appendix A provides a copy of the Guidelines for Assessing Cultural Impacts, adopted by the State of Hawaiʻi Environmental Council in 1997 and amended in 2000 (OEQC 2011).

1.2 METHODS

According to the Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts (OEQC 2011), it is recommended that preparers of CIA implement the following protocol:

1. identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupuaʻa;
2. identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
3. receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
4. conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
6. assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

These methods were strictly adhered to in the subject assessment. A rigorous effort was made to identify and locate persons knowledgeable about traditional practices that took place in the past or that are currently taking place in project area and broader geographical area that could potentially be impacted by the expansion project. In addition to prior CIA reports written about the Kahuku, Keana, and Mālaekahana areas (Hammatt 2008; McGerty and Spear 2009; Voegler et al. 2011; Mooney and Cleghorn 2012), the State Office of Environmental Quality Control (OEQC) and Office of Hawaiian Affairs (OHA) were consulted for a listing of Cultural Assessment Providers. Various Neighborhood Boards and civic clubs, were also contacted to obtain cultural informants. Appendix B provides a listing of potential cultural informants and their detailed contact history. Contact information was found for 24 individuals and organizations, all of which were solicited for participation. While no response was received from 14 of those asked to participate, eight individuals responded; interviews were secured with four individuals; and two interview summaries are included. Transcripts of interviews were not attempted in this assessment; however, audio recordings of the interviews were obtained and are kept on file at Pacific Legacy office in Kailua, Hawaiʻi.

2.0 PROJECT AREA DESCRIPTIONS

The proposed Project is located in the Koʻolau Loa District, west of the town of Kahuku in the City and County of Honolulu and covers three *ahupuaʻa*: Kahuku, Keana, and Mālaekahana [TMK (1) 5-6-005:018; (1) 5-6-006:018, 047, 051, 055; and (1) 5-6-008:006]. It includes portions of two parcels which would be leased from the DLNR (approximately 234 acres [95 hectares]) and from the Mālaekahana Hui West, LLC (MHW) (approximately 452 acres [183 hectares]), as well as the use of non-leased State land for roadways into the project area. These lands are situated in the *kula* and *wao* portions of the following *ahupuaʻa*: Kahuku, Keana, and Mālaekahana in the District of Koʻolau Loa, Oʻahu Island, Hawaiʻi. According to the Nā Pua Makani Wind Project's Environmental Impact Statement Preparation Notice (EISPN), the environmental setting of the project area is as follows:

> The Project lies on a portion of . . . leased land in Kahuku, Oahu, of which approximately [464 acres] comprise the Project Area. The operational Kahuku Wind Power facility abuts the Project Area to the northwest... It is surrounded by agricultural farm lands to the north; residential housing, community infrastructure, and agricultural farm lands to the east; a mixture of agricultural farm lands and undeveloped forest lands to the south; and undeveloped forest lands to the west. James Campbell National Wildlife Refuge is approximately 0.75 miles (1.2 kilometers) to the north and Mālaekahana State Recreation area is 0.1 miles (0.2 kilometers) to the east (Tetra Tech Inc. 2014:9).

Within the larger project area is the Area of Potential Effect (APE), the area where all construction related activities will take place. The APE consists of approximately 464 acres and is composed of:

- Access Roads;
- Turbines;
- Laydown Area;
- O & M Facility;
- Collector Substation;
- Underground Collector Lines; and
- Underground Transmission Lines.

The APE also includes:

- 2-acre buffers around each turbine;
- 450-foot buffer around each project component (e.g., O & M Facility); and
- The existing Department of Agriculture road on the north side of the APE that provides access to the State-owned portion of the project.

Currently, the project area is largely used for modern agriculture by various farming entities under Keana Farms. Recently, a recreational zip line has been established, which meanders throughout the project area. The OEQC Guidelines recommend that the "broader geographical area" be the subject unit (OEQC 2011), thus this assessment will not be limited to the project area, but areas adjacent to it as well.

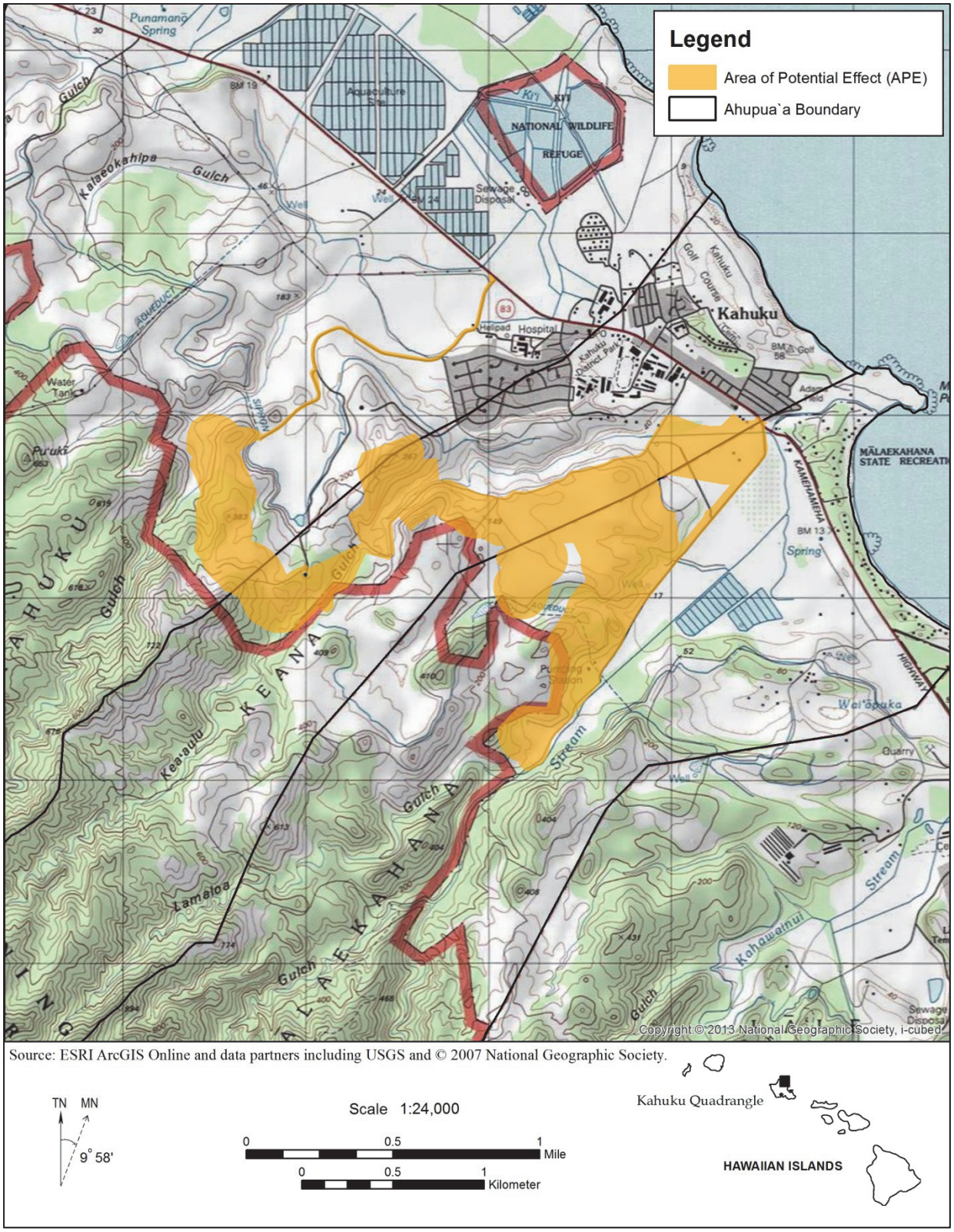

Figure 1. Project Area/APE on USGS map.

2.1 GEOLOGY, HYDROLOGY, AND SEDIMENTS

Several geological processes including shield-building volcanism, subsidence, weathering, erosion, sedimentation, followed by rejuvenated volcanism created the island of Oʻahu. Generally, the island is made up of heavily eroded remnants of the Pliocene era Waiʻanae and Koʻolau shield volcanoes. The project area is located at the foot of the Koʻolau Mountains, which were created by shield-building volcanism about 2.2 to 2.5 million years ago (Lau and Mink 2006). These mountains are mostly comprised of Koolau Basalt, a shield lava as well as basalt from later volcanic stages (Juvik and Juvik 1998).

Topography, stratigraphy, and hydrology of the general subject area result from a series of complex geological processes. Koolau Basalt lava flows ranging from 1.8 to 3 million year old underlie the majority of the vicinity. After these basalts were laid, they were subject to periods of erosion as well as periods of deposition of eroded upland sediment that occurred in the area. In the mid-to-late Quaternary period (ca 120,000 years ago), mean sea levels rose globally over seven meters higher than what they are today, permitting a coral reef system to build up along the coast in the area that now lies inland of the current coastline. After the sea level receded, these coral reefs were exposed and over time encapsulated in alluvium, becoming the karstic limestone of the Kahuku Plain (Ku et al. 1974; Stearns 1978; Gillespie et al. 2004). These deposits of terrestrial and marine sediments along the coast form a relatively impermeable wedge of sedimentary material known as caprock, which extends from Punaluʻu to Kahuku Point (Group 70 2009:2-7, 2-9). Generally, most high elevation water in Koʻolau Loa is controlled by volcanic dikes that prevent groundwater from flowing freely to coastal areas from the upper elevations of the watershed (ibid.:2-9). The Kahuku, Keana, and Mālaekahana area contains several large marshes, which are a result of seepage that arises at the caprock.

In the Nā Pua Makani Wind Project EISPN, Tetra Tech Inc. (2014) describe the geology and soils of the project as follows:

> The Project area consists of steep, dissected ridges surrounding gently sloping valleys...Elevations range from approximately 3 feet (1 meter) above mean sea level (amsl) on the northern edge to 614 feet (187 meters) amsl on the southern edge. The dominant soil types in the Project Area include Lahaina silty clay (3-15 percent slopes) soils and Paumalu-Badland complex soils (10-70 percent slopes), with coral outcrops at elevations below 100 feet (30 meters) amsl (Foote et al. 1972, NRCS 2013). Agricultural lands within the Malaekahana Hui West portion of the Project Area are classified as Prime Agricultural Lands under the ALISH system (Tetra Tech Inc. 2014:9).

2.2 CLIMATE

While seasonal variability is relatively mild, the climate of the Hawaiian Islands exhibits warm temperatures, dry conditions, and persistent trade winds that originate from the northeast during the summer season (May through September). Hawaiʻi's winter season (October through April) is typically characterized by cooler temperatures, elevated precipitation, and variable winds, including Kona (southerly) winds and storms (Juvik and Juvik 1998).

The climatic conditions of the subject area are characteristic of lowland and coastal areas of O‘ahu’s windward side, having relatively consistent temperatures as well as persistent northeast trade winds. While the annual average maximum temperature is 81 degrees Fahrenheit (ºF), the Kahuku area has daily maximum temperatures in the range from the high 70s (˚F) during the winter to the low-to-mid 80s (˚F) during the summer. Average temperature lows range from the mid-to-high 60s (˚F) during the winter to the low-to-mid 70s (˚F) during the summer, with an annual minimum temperature of 70 ºF (WRCC 2011).

In general, rainfall is heaviest in October and April for the entire state of Hawai‘i. However, rainfall averages are greatly affected by terrain. Further, great variation in rainfall can occur over small distances with extreme topographical changes. In the subject area, rainfall is relatively moderate, with a median annual rainfall of approximately 36 inches. Approximately two-thirds of the rainfall in the subject area occurs between October and April. Annual rainfall also varies significantly from year-to-year in the area (WRCC 2011).

2.3 VEGETATION

While the project area is dominated with active farms, growing a wide variety of non-native food crops, some areas exist where invasive exotics such as *koa haole* (*Leucaena glauca*), Christmas-berry (*Schinus teribinthifolius*), guava (*Psidium guajava*), as well as various grasses, weeds, ferns, shrubs, and vines dominate. Yet, some endemic species still persist in small pockets. According to Tetra Tech Inc. (2014:11), vegetation in the project is as follows:

> The vegetation within the Project area is dominated by a mixture of aggressive non-native weedy species that took over following the abandonment of sugar cane (*Saccharum officinarum*) cultivation. Several common native species occupy some of the ridge tops. The most abundant species in the Project area is the common ironwood (*Casuarina equisetifolia*). Native species are largely intermixed with non-native species with the exception of a few ridge tops where the native ‘*ulei* (*Osteomeles anthyllidifolia*), forms large monotypic patches. Other common native species include ‘*uhaloa* (*Waltheria indica*) and ‘*akia* (*Wikstroemia oahuensis*).

3.0 ARCHIVAL RESEARCH SUMMARY

This section is a synthesis of records documenting traditional and mythological accounts associated with the Nā Pua Makani Wind Project lands and surrounding areas as well as Historical documentation and archaeological record. The names and locations of *ahupuaʻa* used in this section of the report are largely derived from information in the *Oʻahu Pre-Māhele Moku and Ahupuaʻa* map created by Kamehameha School's Hawaiian Studies Institute in 1987 (Figure 2) and *Place Names of Hawaiʻi* (Pukui et al. 1974). According to this map, the project area spans an area that incorporates inland portions of three *ahupuaʻa*: Kahuku, Keana, and Mālaekahana.

The subject *ahupuaʻa* are located within the district, or *moku*, of Koʻolau Loa, within which the Nā Pua Makani Wind Project lands are located, extends from the *ahupuaʻa* of Kaʻaʻawa on the central east side of Oʻahu, rounding the northern tip of the island to Pūpūkea. In *Sites of Oʻahu* (Sterling and Summers 1978:142), writer for *Ka Nūpepa Kuokoa*, S. M. Kaui, holds that Koʻolau Loa District stretches from Keahu-o-Hapuʻu to the Point of Kaʻōʻio, which is between Kualoa and Kaʻaʻawa (Figure 3). The name of this district, spelt as "Koʻolau Loa" by Pukui et al. (1974:117), literally translates to "long Koʻolau" (ibid.), Koʻolau being the windward mountain range that runs along the entire eastern side of Oʻahu.

3.1 PRE-EUROPEAN CONTACT CULTURAL LANDSCAPE

In general, traditional and mythological accounts from pre-European contact Hawaiʻi represent a belief system explaining all aspects of the physical universe and spirit realm, the origin and nature of mankind, and the history of the community, as well as collectively remembering the heroic adventures, exceptional feats, and cautionary tales of their ancestors. These traditional accounts are contained in the hearts and minds of cultural practitioners and customarily passed on through oration. Throughout the passage of time, figures transcend earthly legends into the cosmic, divine, and fearsome realm of the gods that is only separated from the mundane world by a thin veil and has the power to interact with and cast influence on the mundane. To this day, a sense of respect, reverence, and fear is still held on to by cultural practitioners and those indoctrinated in these traditions, as it is believed that the very landscape is imbued with the *mana* (life force or supernatural energy) of the divine.

3.1.1 The Natural World

Conversely, the mundane, or lifeways and land use, of pre-European contact Hawaiians are also part of the cultural landscape and are interpreted through archaeological research in conjunction with oral histories and recorded traditional accounts. Handy and Handy (1991) provide some commentary on general land use patterns of ancient Hawaiians that are applicable to the general Kahuku area. As marine resources represent the main source of protein in the traditional Hawaiian diet, Handy and Handy (ibid.) suggest that upland agriculture was typically preceded by or correlated with the productiveness of an area's coastal fishing grounds. *Mauka* lands were intensively developed in areas where coastal fishing

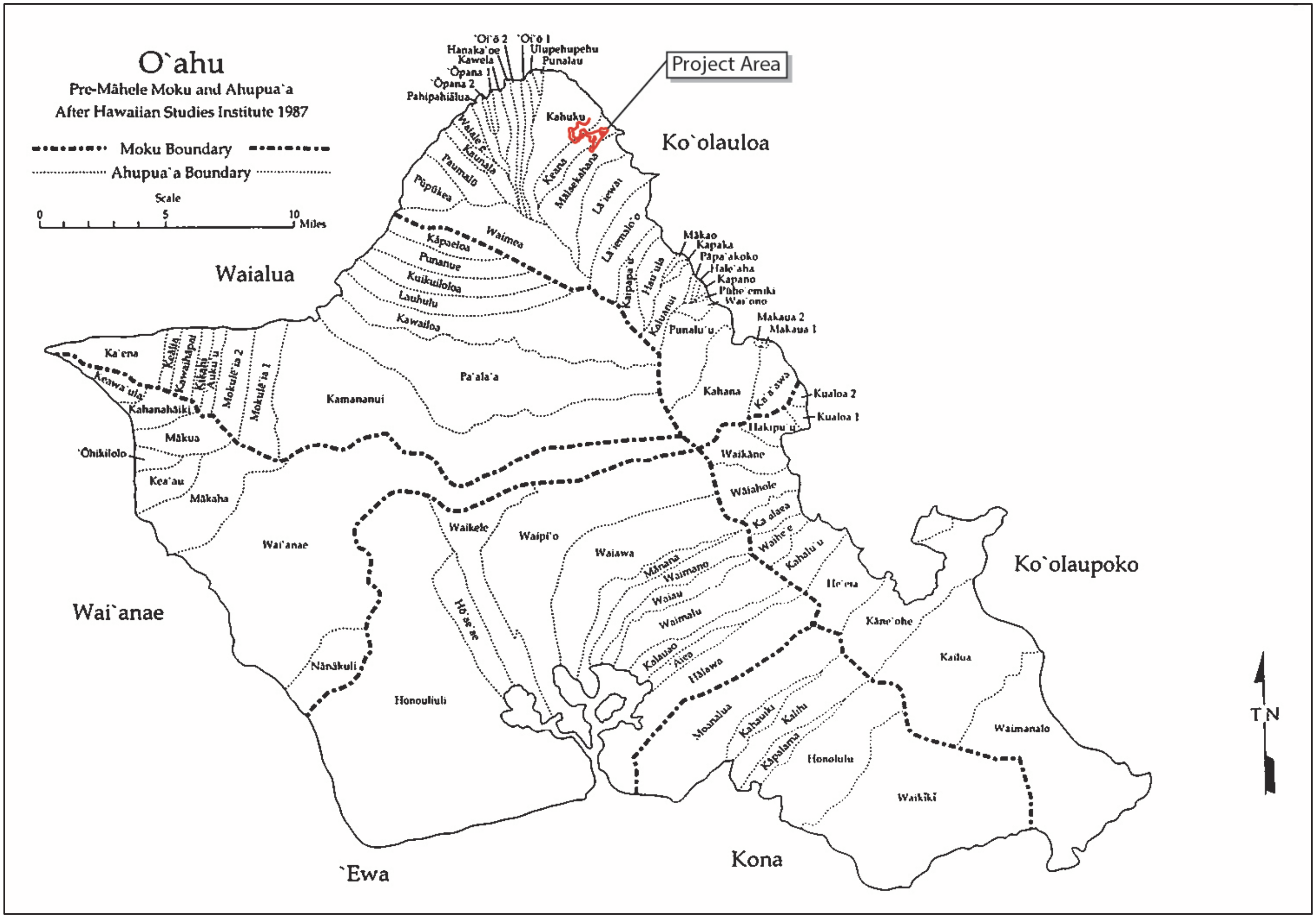

Figure 2. Map of O‘ahu, showing approximate location of project area in relation to pre-Māhele *moku* and *ahupua‘a* (courtesy of Hawaiian Studies Institute 1987).

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grounds were easily accessed. On Oʻahu, sweet potatoes were cultivated to supplement taro, the main starch of the Hawaiian diet, when soils were too sandy or dry to grow taro. Further, sweet potato cultivation, typically grown inland, appeared to correlate with high population densities in general.

Traditionally in Hawaiʻi, environmental zones were perceived and determined by various natural features and resource criteria (Handy and Handy 1991:54-56). . The following is a summary of Handy and Handy (1991:54-56) description of the terrestrial environmental zones:

1. *Ko Kaha Kai*: Land by the sea, or coastal region providing marine resources (fish and other marine animals, seaweed and salt). "Kaha was a special term applied to areas facing the shore but not favorable for planting.
2. *Kula*: The plains or sloping lands (without trees) above the coastal region.
   a) *Kula kai:* Seaward plains.
   b) *Kula uka*: Inland or upland slopes (towards the mountains).
3. *Kahawai:* The place (having) water. The area beyond or intersecting the *kula* lands. This upland zone provided suitable agricultural sites and abundant naturally occurring resources which were used for religious, domestic, and economic purposes.
4. *Wao:* Wilderness
   a) *Wao kanaka:* Region of man. Lower forest, providing hard wood (*koa*) for spears, utensils, and logs for canoes; *lau hala* (pandanus leaves) for thatch and mats; *māmaki* for bark cloth (*tapa*); *kukui* (candlenut) for oil; wild yams, roots, and sandalwood.
   b) *Wao akua*: Region of deities. …remote, awesome, seldom penetrated, source of supernatural influences, both evil and beneficent.
   c) *Wao maʻukele*: Rain forest. Here grew giant trees and tree ferns (*ʻamaʻu*) under almost perpetual cloud and rain.

The Nā Pua Makani Wind Project lands are predominantly located in the following environmental zones: *Kula uka* and *Wao kanaka*. Numerous traditional accounts, *moʻolelo*, and Land Claim Native Testimonies allude to the cultivation of lands, varying in intensity, from *kula* to *wao* (Hall 1839; Fornander 1917; Thrum 1919; Handy 1940; Handy and Handy 1991; Sterling and Summers 1978; Silva 1984; Maly and Maly 2003; Hammatt 2008; Vogeler et al. 2011).

3.1.2 Life in the Ahupuaʻa

With great variations of geological features, each *ahupuaʻa* had its own dynamic resource management system that was based on traditional customs upheld by the *kapu* system, or ancient religious law. The *ahupuaʻa* typically extended form the coast to the nearest mountain top or ridge and resources from the land and sea were equally distributed within the *ahupuaʻa*. Lyons (1875) describes the geographic nature of the *ahupuaʻa* as well as the movement of resources from mountain to sea and vice versa, stating:

> The Ahupuaa ran from the sea to the mountain, theoretically. That is to say the central idea of the Hawaiian division of land was emphatically central, or rather radial. Hawaiian life vibrated from *uka,* mountain, whence came wood, kapa, for clothing, olona, for fish line, ti-leaf for wrapping paper, *ie* for rattan lashing, wild birds for food, to the *kai,* sea, whence came *ia*, fish, and all connected therewith.

> Mauka and makai therefore fundamental ideas to the native of an island (Lyons 1875: 104).

The *ahupuaʻa* was also an important socio-political unit in the pre-Contact era, each unit with its own hierarchy. Kirch (1985) holds that *moku* were independent chiefdoms, divided into a number of radial land divisions, referred to as *ahupuaʻa,* with subdivisions of *ʻili* and *moʻo* within. According to Kirch (1985),

> Each ahupuaʻa was controlled by a lesser chief, who in turn appointed one or more stewards to oversee production, organize work parties, collect tribute, and in other ways represent the chief. Ahupuaʻa were economically self-sufficient to some degree, although differences in the local resource base (agricultural land, water resources, stone for tools, and so on) resulted in differences in the production patterns of individual land sections. Within the ahupuaʻa, there were yet smaller sections and divisions, especially the ʻili and moʻo, which were held and worked by extended households or groups of commoners.

According to Handy and Handy (1991), for the purpose of taxation, the chief political subdivision of the pre-Contact era was the *ahupuaʻa,* which was generally under the management of the *konohiki* (steward or caretaker). The term *ahupuaʻa* itself is derived from the fact that each coastal *ahupuaʻa* boundary was marked with an altar (*ahu*) which held a carved wooden effigy of a pig (*puaʻa*) head during the Makahiki festival, when harvest tributes (taxes) were offered to the god of rain. Handy and Handy (1991) refer to the lower chief who represented the *ahupuaʻa* as *aliʻi ʻai ahupuaʻa*, which translates to English as "chief who eats the ahupuaʻa" (1991:48). Yet, according to Malo (1951:142) the *konohiki* was tasked with collecting levies from the *makaʻāinana* (commoners; literally "people that attend the land") of the *ahupuaʻa* for the king and of the *aliʻi ʻai ahupuaʻa.* The word *konohiki* is defined by Pukui and Elbert (1986) as the, "Headman of an ahupuaʻa land division under the chief; land or fishing rights under control of the konohiki; such rights are sometimes called konohiki rights" (1986:166). Thrum (1924) wrote that the *konohiki* was a local representative or steward of the landlord owner whose privileges and duties were, "…practically those which go with that position in any land and in common with his brethren today in Russia or Ireland he had his failings and was not always popular among his fellows…" (1924:60).

Handy and Handy (1991) liken the *ahupuaʻa* tenure system to western share cropping, where "sharing between the chief and tenant was comprehensive and reciprocal in benefits" (1991:48). Kirch and Sahlins (1992) delve further into the social dynamics of the *ahupuaʻa* in their historical ethnography, *Anahulu: The Anthropology of History in the Kingdom of Hawaiʻi, Volume One*. Kirch and Sahlins (1992:17) state the following about variations in land use in the ancient *ahupuaʻa*:

> Economically more highly valued, the coastal areas were also generally preferred for chiefly residence. Here were the most extensive wet taro lands, offshore and onshore fish ponds, as well as access to the sea and the fishing and surfing that in Hawaii were sports of kings. Still, the uplands were also necessary for the Hawaiian existence. In addition, to things mentioned by Lyons, people were specifically dependent on the uplands for the timber and thatching of their houses; the materials for their canoes, bowls, weapons, images, agricultural tools, and other objects using hardwoods; rope, line, fishnetting; lighting (from

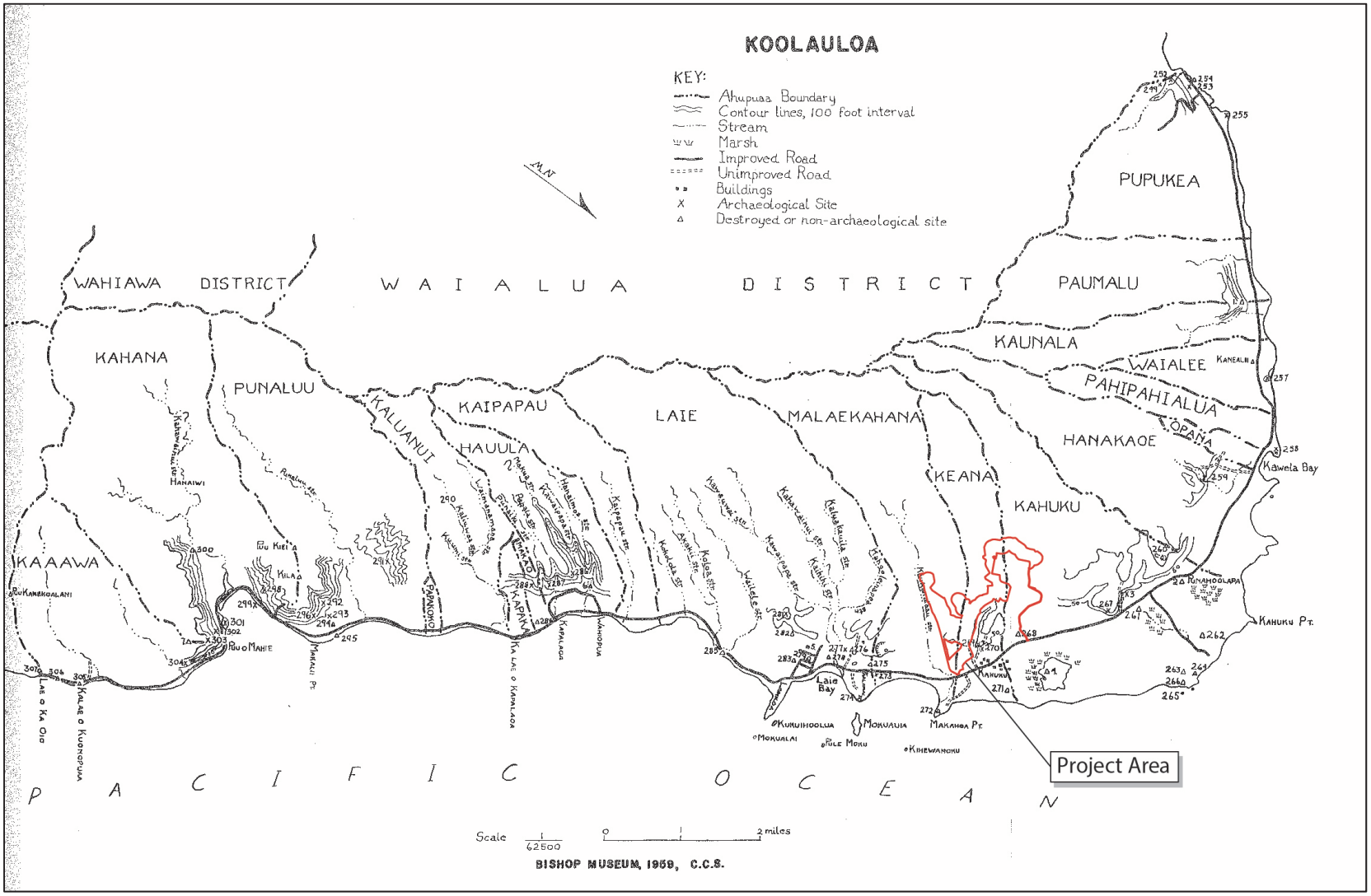

Figure 3. Sterling and Summers (1978) map of Koʻolau Loa showing approximate location of project area.

> candlenuts); pasture for domestic animals (in the nineteenth century); various fruit trees; and more (Kirch and Sahlins 1992:19).

Thus, resources needed for daily life were best grown in or collected from the habitats that they were best suited for and likely distributed, through trade, gifting, or taxes, from *mauka* to *makai* or vice versa within the *ahupuaʻa*. Further evidence of this is found in the archaeological record, where most upland habitation features in the area contain significant amounts of marine shell and fish bone in midden deposits, which suggests that people inhabiting the *mauka* areas of the *ahupuaʻa* had a steady diet of marine resources (Jensen 1989; Williams and Patolo 1998).

3.1.3 Traditional Hawaiian Land Divisions

The pre-Contact economy of the Hawaiian Islands was based upon agricultural production that worked within a tiered system of land divisions (Lyons 1875; Malo 1951; Handy and Handy 1991; Kirch 1985; AKAC 2010). In 1875, Curtis J. Lyons, the distinguished surveyor published an article in *The Islander* on land issues, which identified the *ahupuaʻa* as the principal subdivision in a *moku* (district). In this article, he states:

> ...Its name is derived from the *Ahu* or altar; (literally, pile, *kuahu* being the specific term for altar) which was erected at the point where the boundary of the land was intersected by the main road, *alaloa,* which circumferenced each of the islands. Upon this altar at the annual progress of the *akua makahiki* (year god) was deposited the tax paid by the land whose boundary it marked, and also an image of a hog, *puaa,* carved out of kukui wood and stained with red ochre. How long this was left on the altar, I do not know, but from this came the name, *ahupuaʻa,* of the pile of stones, which title was also given to the division of land marked thereby…(Lyons 1875:103-104).

The islands are divided into several sections called *moku* (districts), in which are particular subdivisions referred to as *ʻokana* (a portion) or *kalana* (a division) (Lyons 1868:67-68; Malo 1951:16-17). According to Curtis J. Lyons (1868) in *Nūpepa Kuakoa*, these units are further divided into *ahupuaʻa*, which are the main units of traditional Hawaiian land division. Within *ahupuaʻa* are *ʻili*, followed by *ʻili paʻa, ʻili kūpono, ʻili lele, lele, moʻo, moʻo ʻāina, paukū, kīhāpai, kōʻele,* and *kuleana* (Pukui and Elbert 1986). However, in some cases, the *ʻili kūpono* or *kū* were a type of sovereign *ʻili* within an *ahupuaʻa* that were not made to pay tribute to the chief (Thrum 1890:106). Within the *paukū* are dry land patches, referred to as *kōʻele*, *hakuone*, and *kuakua* (cultivated specifically for the chief; listed from smallest to largest). In general, high elevations or mountains are called *mauna,* but mountains or mountain summits located centrally on the island are termed *kuahiwi*, while the peaks or ridges on top of the *kuahiwi* are called *kualono*. In 1868, Lyons continues to describe the geography of the typical *ahupuaʻa* as well as the Hawaiian names for these geological features, stating:

> The place where trees are small below the fern belt is termed kuahea (hillock section); below it is the wao (wild place), also called waonahele (wilderness) and wao eiwa (ninth wilderness). The place where trees grew taller below the wao eiwa is the wao maukele, and a little below it again is the waoakua (spirit region) ; next below that is where voices increase and, hence, called wao kanaka (people's sphere), because there the people cultivate food. Below that is apaa,

> and next is ilima (where this plant of the Sida genus is found), and below it is pahu (stake or land mark). Below pahu is kula (open country) adjoining habitations, and seaward of the village is the shore, where it joins the sea. Such was the island divisions by the ancient people of Hawaii.
>
> …Places that stand high up in this and that locality are called puu (mounds or peaks) ; if they stand in a row they are a lalani puu, or pae puu (a line or range of peaks or hills)…High places of the earth lying narrow is a lapa (ridge), or kua lapa (shoulder ridge). If the ridges are many they are called olapalapa (rough protuberances). Deep places lying lengthwise are called kahawai, awawa, or owawa (streams, valleys or ditches). Lengthy, solitary places are called alanui (roads), and kuamoo (paths), and if it continues circuiting the island it is a highway. In places where the path is steep it is called piina or hoopiina (ascending path), kooku (hill slope), and auku (up hill road). Descending paths are termed ihona, alu, kalua, and hooihona, and the place where men would rest is oioina (a resting place). Places where water flows continually are streams (kahawai). Inland places are kumu (source) and seaward places are called nuku (point or outlet). Where water is led to places of cultivation, that is called an auwai (watercourse); where the water joins the sea is a muliwai (river) ; waters borne within the land are lokos (lakes or ponds) (C.J. Lyons 1868 as cited in Thrum 1921:67-68).

Perhaps the ancient Hawaiians created names for an array of topographical features and slight variations within the *ahupuaʻa* as a way to help keep the dynamic *mauka-makai* economic structure organized.

The names of the three *ahupuaʻa,* Kahuku, Keana, and Mālaekahana, in which the project area are located within each have traditional meanings. According to Pukui et al. (1974:67) Kahuku literally translates as "the projection" and is the name of a village, land division, northernmost point, golf course, ranch, schools, forest reserve, as well as surfing beach on Oʻahu. Keana literally translates into English as "the cave," according to Clark (2002:177), perhaps due to the fact that one of its most prominent sites is an ancient rock shelter (Site No. -270) known as Keana Cave (McAllister 1933:233; Sterling and Summers 1978:154). Mālaekahana Ahupuaʻa, which is named after the mother of legendary figure, Lāʻie-i-ka-wai, is also the name of the large bay and stream found within the land division (Pukui et al. 1974:143).

3.1.4 Traditional Names of Topographical Features

The Nā Pua Makani Wind Project lands are within Kahuku, Keana, and Mālaekahana Ahupuaʻa. The great majority of the project area is within the *kula* (plains/fields) and *wao* (upland) areas of Keana and Mālaekahana Ahupuaʻa. Several culturally significant landmarks and noted topographical are located in and around the Nā Pua Makani Wind Project lands. These landmarks possessed Hawaiian names in the pre-Contact era, which were based on distinguishing characteristics, *moʻolelo*, or traditional use of the area. These traditional names are seldom used to refer to these landmarks in the modern era.

Kahuku Ahupuaʻa covers the largest area and has a relatively large amount of noteworthy topographical features as well as an extensive mythological background. Due to the fact that only the northwest extreme of the project area is located in Kahuku Ahupuaʻa, noteworthy

Kahuku traditional landmarks within the southern half of the *ahupuaʻa* will be mentioned in this study. Only two landmarks within the southern half of Kahuku Ahupuaʻa were found to have traditional names. Punamanō, which translates as "shark spring," is a spring-fed wetland located a little more than one kilometer north of the project area (Clark 2002:310). Also within the southern portion of Kahuku Ahupuaʻa is Kaauhelemoa Fishpond (Site No. -268), which was an ancient fishpond named after its *moʻo* (guardian), named Kaauhelemoa. This fishpond was once located only several hundred meters west of Kahuku Village. According to legend, "Kaauhelemoa was half man and half chicken, a being of supernatural power who could change himself at will into a man or a chicken" (McAllister 1933 as cited in Sterling and Summers 1978:152). Before being destroyed for sugarcane cultivation, the pond was said to have been fed by a spring (ibid). McAllister (1933) holds that Kiʻi Wetlands, also referred to by some as Kahuku Fishponds, was always simply a swamp and never used as a fishpond (ibid.). Kiʻi Wetlands, now a National Wildlife Refuge, is located just under two kilometers north of the project area.

In Keana Ahupuaʻa, northwest of Makahoa Point is a noted fishing ground, referred to as Kaluahole, which translates as the "pit, or cavern of the ahole fish" (Clark 2002:155; Pukui et al. 1974:78). The *āhole* (Hawaiian Flagtail; *Kuhlia sandwicensis*), is described by Titcomb as "a common shore fish" that inhabits the coral and lava caverns of the reef when mature (1972:59). North of Kaluahole is Kaʻohana, or "the family," which is a calcareous sand beach near the Japanese Cemetery (Clark 2002:161). The coastline fronting the Kahuku Golf Course was traditionally referred to as Keoneʻōʻ io, or "the ʻoʻio sands," where *ʻōʻio* is the Hawaiian word for *Albula vulpes,* commonly known as bonefish (Clark 2002:137). This is also the traditional name for the channel that is most suitable for swimming in the area. Pōlou is the name of a pool of water that once existed *makai* of the Kahuku Mill, recorded by McAllister (1933) as Site No. -271 (as cited by Sterling and Summers 1978:154). This pool was said to have been the anchoring spot where the fabled "floating island" of Kahuku attaches to the rest of the island of Oʻahu (ibid.).

Mālaekahana has also been referred to in local mythology. Less than 800 meters *makai* (seaward) of the project area is Makahoa Point, which is located on the north coast of Mālaekahana Ahupuaʻa. The beach ends at the south end at Makahoa Point in Mālaekahana Ahupuaʻa. Makahoa translates to English as "friendly" or "a companion" according to Pukui et al. (1974:140) and Clark (2002:228). Where the mouth of Keaʻaulu Stream pours into Mālaekahana Bay marks the boundary Keana and Mālaekahana Ahupuaʻa. The name Keaʻaulu means "the growing root," (Pukui et al. 1974:100), which may indicate that traditional Hawaiian agricultural practices likely occurred along Keaʻaulu stream and gulch. Also in Mālaekahana Ahupuaʻa is Site No -275, referred to as Waiʻāpuka, which is a pool mentioned in the legendary story of Lāʻie-i-ka-wai and was said to be the opening of a subterranean cavern with fresh spring that a person could swim underwater for a great distance prior to it being filled in with sediment in the historic era (Sterling and Summers 1978:155). This site is located approximately 1.5 kilometers to the south of the project area.

3.1.5 Traditional Names of the Winds of Koʻolau Loa

Traditional Hawaiian stories and legends (*moʻolelo*) have been told and retold; shortened and changed; published in turn-of-the-century Hawaiian language newspapers; and collected for

books. In 1902, Moses Kuaea Nakuina published *Moolelo Hawaii o Pakaa a me Ku-a-Pakaa, na Kahu Iwikuamoo o Keawenuiauni, ke Alii o Hawaii, a o na Moopuna hoi a Laamaomao* wherein he retold a "traditional legend collected from various sources, edited, and expanded" (Nakuina 1992:vii) upon in order to preserve its knowledge. In 1992, an English version of Nakuina's *moʻolelo* was published as *The Wind Gourd of Laʻamaomao: The Hawaiian Story of Pākaʻa and Kūapākaʻa, Personal Attendants of Keawenuiaʻumi, Ruling Chief of Hawaiʻi and Descendants of Laʻamaomao*, with the translation done by Esther T. Mookini and Sarah Nākoa.

This moʻolelo retells the story of Pākaʻa and Kūapākaʻa, who were personal attendants to the ruling chief of Hawaiʻi, Keawenuiaʻumi. Pākaʻa was the son of a Hawaiʻi Island aliʻi, Kūanuʻuanu, and Laʻamaomao, a "cherished keiki, brought up with care and refinement" in a family of status on Kauaʻi (Nakuina 1992:2). Before the birth of his son, Kūanuʻuanu returned to Hawaiʻi Island and Laʻamaomao was shunned by most of her ʻohana and left to care for Pākaʻa alone in a cave by the beach. When Pākaʻa was a boy, he pestered his mother, always asking 'who is my father?' When Laʻamaomao finally answered she told him, "as for your real father, you must look for him. I'll tell you this: to find him, you must look to the east, where the sun rises and a certain local wind blows. Your father lives there." Pākaʻa determined that he would search for his father when he was "old enough to travel the seas between the islands" (Nakuina 1992:2).

As he grew up, Pākaʻa worked hard to help his mother and learned the ways of a fisherman. Pākaʻa was clever and determined and when he learned that an *aliʻi* of Kauaʻi would be touring the islands, he asked his mother's permission to join the traveling company. "'ʻAe, go,' said his mother. 'But go with humility and modesty;…and when you arrive in the presence of Keawenuiaʻumi, you'll know you've arrived at the place where your father lives'" (Nakuina 1992:14). Then:

> Laʻamaomao lifted the lid of a large calabash and took out a small, long, highly polished gourd in a woven bag. The gourd was covered securely. She turned to her keiki and said, "I'm giving you this gourd which belonged to your extraordinary kupunawahine for whom I was named. Her bones are inside the gourd. While she was alive, she controlled all the winds of the islands-she had them under a supernatural power. She gathered all the winds and put them into this gourd, where they're still kept. She memorized one by one the names of all the winds from Hawaiʻi to Kaʻula. On windless days, she could remove the cover and call out the name of a wind, and the wind in this gourd would blow. This gourd, called 'the wind gourd of Laʻamaomao,' was famous.
>
> Before she died, she entrusted me to put her bones inside this gourd and care for them until I had a child. Then I was to give the gourd to the child to watch over. You're my only child, so now I'm giving the gourd to you. You must look after it according to the wishes of your extraordinary kupunawahine.
>
> You must care for this gourd because it has been handed down from the kupuna. This gourd has great value-you may not think so now, but when you sail with the aliʻi and arrive at an area where no wind blows and the canoes are becalmed, say that the winds are at your command; all you have to do is call, and the winds will blow.

> When you're laughed at, remove the lid of the gourd and call for a wind. The wind will blow and bring the canoes to shore. The aliʻi will be grateful to you, and you'll be loved and valued by him.
>
> Before Pākaʻa sailed off, Laʻamaomao taught him the names of all the winds, along with the prayers, songs and chants concerning them, and when she was done, Pākaʻa had memorized everything. Then he took the wind gourd and tied it with a cord he had made, prepared his other things for the voyage, and left home (Nakuina 1992: 14-15).

The "grand traveling company" landed first at Waikīkī and from Oʻahu, then continued on to Molokaʻi, Maui, and eventually, Hawaiʻi Island, where he found his father in the chief's court (Nakuina 1992:15). He trained under his father, Kūanuʻuanu, to become a *kahu iwikuamoʻo* (personal attendant). When his father died, Pākaʻa took on the role of *kahu* for the old *aliʻi*. There were those jealous of Pākaʻa's position and skill and eventually, he fell out of favor with the old *aliʻi* and his court. Pākaʻa left Hawaiʻi Island, taking the wind gourd his mother had given him, and sailed to Molokaʻi where he met and married Hikauhi. They had a son named Kūapākaʻa, who was dutiful and learned all his father had to teach (Nakuina 1992).

Many years after Pākaʻa left Hawaiʻi Island, the old *aliʻi* became tired of the poor service and greedy manners of his *kahu* and went in search of Pākaʻa. Word traveled that Keawenuiaʻumi was searching for him, so Pākaʻa and Kūapākaʻa "gathered their supplies for catching uhu…took along with them the wind gourd of Laʻamaomao" (Nakuina 1992:30) and paddled out in their fishing canoe to await the entourage of his *haku* (master, lord). A fleet of canoes ladened with the people of Keawenuiaʻumi's court was approaching and each time they encountered a canoe, Kūapākaʻa would ask his father, 'Is this perhaps my haku?' and Pākaʻa would reply, 'It is not your haku' (Nakuina 1992:33). Kūapākaʻa asked that same question throughout the night and finally Pākaʻa said, 'When you see the first rays of the sun, you'll see your haku' (Nakuina 1992:33). At first light, Pākaʻa ordered Kūapākaʻa to call out to his *haku*, and the *keiki* began to chant:

> The canoe is yours,
> Great Hawaiʻi of Kāne,
> Great Hawaiʻi, land of the sun,
> The sun emerges, emerges,
> The sun emerges at Haʻehaʻe,
> With a strong affectionate love for my haku,
> Not my real haku,
> But a companion of the giddy sun,
> The Kona sun without food,
> Its loved one has arrived,
> Arrived along with Hilo of Kāne,
> Hilo of Kāneakapu,
> Hilo, land of Kanilehua,
> Beloved companion of Keawenuiaʻumi mā,
> There sits Keawenuiaʻumi,
> The canoe is yours
> (Nakuina 1992:37-38).

Once greetings were exchanged, the *keiki*, Kūapākaʻa, asked Kahikuokamoku, the Kuhina Nui, to bring the canoe fleet ashore, because, "'Tomorrow is a calm day for sailing; today will be stormy: there are thick cumulus clouds resting above Kawainui and the ridge of Wailau; when these clouds are blown with full force, a terrible storm will rage; when the clouds are at rest again, then good weather will follow'….There were no clouds yet-only the clouds in the wind gourd" (Nakuina 1992:38). The Kuhina Nui asked, "how is it a calm day like today can be a bad day for sailing? The sky is clear, the mountain tops are exposed, and the banks of clouds are asleep at the horizon" (Nakuina 1992:39). Kūapākaʻa responded, "This will be a stormy day, a windy day. You came here from Hawaiʻi with the winds from there; Hawaiʻi is a windy land and they blow here from behind you." The Kuhina Nui challenged Kūapākaʻa, a *keiki* of Molokaʻi, on his knowledge of the winds of Hawaiʻi Island. Kūapākaʻa chanted the names of the winds for the west side of the island; he chanted the names of the winds for the east side of the island. Kahikuokamoku asked his advisers if it would storm and they contradicted Kūapākaʻa. Encouraged by a look from his *haku*, Kūapākaʻa chanted the rest of the names of the winds of Hawaiʻi (Nakuina 1992). Kahikuokamoku answered:

> "The aliʻi's canoes won't go ashore with you, ē ke keiki. These winds you've called out belong to Hawaiʻi. They blow over the sea of ʻAlenuihāhā and die out there. The winds of Hawaiʻi won't reach here."
> Kūapākaʻa said, "Since you deny the winds of Hawaiʻi, here in front of you is Oʻahu, another windy land."
> Kahikuokamoku said, "Let's hear the names of the Oʻahu winds."
> Kūapākaʻa chanted the winds of Oʻahu:
>
> There are our clouds, my father's and mine,
> Covering the mountains;
> The clouds rise with a sudden shower,
> The whirling winds blow,
> The source of the storm of the keiki,
> Ku a ē-ho is at sea
> From the sea, the storm comes sweeping toward shore,
> The windward Kui-lua wind churns up the sea,
> While you're fishing and sailing,…
>
> …The sea wind blows hard,
> Mālualua comes from the northeast,
> Peapueo is of Kaunala,
> Ahamanu is of Kahuku,
> Lanakilia is of Hauʻula,
> Moaʻe is of Punaluʻu,
> ʻĀhiu is of Kahana,
> Holopali is of Kaʻaʻawa and Kualoa,…
>
> …The Kona winds turn, the Koʻolau winds turn,
> The winds will turn before you and find you,
> You will be overwhelmed, O deaf aliʻi,
> The winds will gather,
> The naʻenaʻe leaves will bend,
> You'll be swept ashore at ʻAwawamalu,
> Caught in the fishing net of the head fisherman,
> Your thigh bone and upper arm bone

Will be made into fishhooks,
To catch pāoʻo and ʻōpakapaka,
Your flesh will be without bones,
The black crab, the shearwater will eat your remains,
The life from the parents will be broken off,
Here I am, the ʻaumakua kanaka,
Listen to my life-giving words,
Keawenuiaʻumi, come ashore, a storm is coming,
When you sailed yesterday, it was calm.[1]
After the winds of Oʻahu had been named, the kānaka were uncertain: they didn't believe fully in the keiki's words, yet they were afraid that the words might be right and that some of them might die at sea... (Nakuina 1992:42-44).

The tale continues, Pākaʻa urging Kūapākaʻa to call out the names of the winds of Kauaʻi; chant of the destruction to be caused by the wind; call out the names of the winds of Maui and Molokaʻi; and chant of terrible storms and rough seas. Pākaʻa had a plan of revenge that required the *aliʻi*, who had blackened his name to Keawenuiaʻumi, go ashore. At that time, Pākaʻa would then be reunited with his *hānai* (provider). In the end, "Pākaʻa was victorious over his enemies who had come between him and his hānai. With the help of Kūapākaʻa, his keiki, Pākaʻa returned to enjoy the comforts and honors and carry out the responsibilities of an aliʻi of Hawaiʻi" (Nakuina 1992:106).

According to Handy and Handy (1991), the gourd is a personification (*kino lau*) of Lono, the Hawaiian god of agriculture and fertility. "Lono is the gourd; the cosmic gourd is the heavens whence some winds, clouds, and rain" (Handy and Handy 1991:220). In a rite called the "Gourd Prayer" (*Pule Ipu*), a male child was blessed in order that he grow with the vigor of the gourd vine. Lines in the *Pule Ipu* refer to the gourd Lono-kui-kui, Lono-the-punisher, and his wife, Ka-papa-ia-kea, who bore him 12 children. They "dwelt in an underground cavern (*lua*), in which grew famous gourds (his children)….One of these gourd-children…was undoubtedly the great wind-gourd named Laʻa-maʻo-maʻo. Laʻa-maʻo-maʻo (Distant-Laʻa), or Ka-ipu-makani-a-Laʻa-maʻo-maʻo (the-wind-gourd-of-the-far-away-heavens-of-Laʻa) was a name for the sky and its horizons whence come the winds and rains" (Handy and Handy 1991:219-220).

In consonance with the *moʻolelo* of the Wind Gourd of Laʻamaomao, there is only one named wind within the project area. It is the Ahumanu wind of Kahuku. "Ahu" (lit. to gather or collect) and "manu" (the general name for fowls or the feathered tribe) together literally mean bird gathering or gathering of birds (Andrews 1865; K. Cleghorn, personal communication 2015) suggesting that birds, and possibly bird hunting/gathering activities, were common in the area.

[1] One of the greatest fears of the *aliʻi* was the desecration of their bones by fishermen who used human bones to make fishhooks. The *mana* (spiritual power) of a person resided in the bones, and this *mana* could be passed on to descendants only if the bones were taken care of. (Thus Pākaʻa carries the bones of his grandmother Laʻamaomao with him in his gourd.) Fishermen preferred the thigh bone and upper-arm bone for making hooks. If they were lucky enough to find a corpse at sea or washed ashore, they baked it in an *imu* and stripped off the flesh. Sometimes the flesh was used as bait to catch *niuhi* (tiger shark); or it could be left to scavengers, such as crabs and sea birds.

3.1.6 Moʻolelo of Kahuku, Keana, and Mālaekahana Ahupuaʻa

Each *ahupuaʻa* in which the Nā Pua Makani Wind Project lands are located has a traditional background from the pre-Contact era. Ancient *moʻolelo* for each *ahupuaʻa* helps to explain their traditional names, what kinds of natural resources were found within, what stories and mythological figures are associated with them, as well as the chronicles and conflicts may have occurred there. These facets of the cultural landscape help to provide a connection for modern day cultural practitioners to the land and their ancestors who dwelt in these *ahupuaʻa*. In addition, traditional *moʻolelo* about each *ahupuaʻa* is integral to understanding the cultural, historic, and spiritual significance of these lands.

Kahuku Ahupuaʻa

The name Kahuku appears to be used not only as the name of an *ahupuaʻa* and village, but as a district or place name for the area roughly between ʻŌʻio and Keana Ahupuaʻa. Of the three *ahupuaʻa* represented in the project area, Kahuku has the most extensive traditional and mythological background.

Traditional accounts of natural resources and environmental conditions are relatively abundant for the *ahupuaʻa* of Kahuku. Traditional land use in Kahuku is also made apparent through legend. The landscape of Kahuku appears to have had several configurations, from the pre-European contact era to the present. During Hawaiian settlement prior to the arrival of Europeans, many parts of the landscape were used for traditional agriculture, habitation, and ceremony, varying from intense to moderate. In the early European Contact period, a good portion of the land lay fallow due to severe population decline and was overgrown in some areas with exotic plant species. Thus, there are several conflicting accounts of what the landscape was like and how it was used prior to European contact. Several themes are tied to Kahuku's landscape, including its abundance of *hala,* or pandanus, and its importance to ancient Kahuku's cultural identity.

Fresh water springs were mentioned in several traditional accounts of the Kahuku area. For instance, in the tale of Makanikeoe, the celebrated adventurer, Makanikeoe stopped at Punahoʻolapa, "a deep spring on the plain of Kahuku," where he found the spring that the legendary *kapa* anvil fell into and ended up in Waipahu, at ʻEwa (Maly and Maly 2003:91). Subsequently, Makanikeoe "crawled along another path" arriving at another Kahuku spring known as Punamanō (ibid.). A lone rock here, Kū's Rock Spring, was said to give forth pure spring water (Sterling and Summers 1978:153). Further, Handy (1940:88), disclosed that a spring, referred to as Kaainapele Spring, was located *mauka* of the Kahuku Ranch house.

Agricultural terraces were also said to exist in northern Kahuku in the pre-European contact era, which was made possible with the presence of natural springs (Handy 1940:88). There is some debate, however, on the origin of these terraces, where some informants claim that the terraces pre-date European contact and were used in the late 19th Century by the Chinese for rice paddies and some claim that the terraces were built by the Chinese for this purpose (ibid.). On the district of Koʻolau Loa in general, Hall (1839) states that, "…much taro land now lies waste, because the diminished population of the district does not require its cultivation," which upholds the abandonment of taro patches in various locations in Koʻolau Loa due to population decline (as cited in Sterling and Summers 1978:148).

The presence of fish and fishing practices of pre-Contact Kahuku are recalled in legends. In the legend of Kaneaukai, as told by Thrum (1976:254) from April through July, schools of mullet, or *ʻanae-holo*, and surgeonfish, or *āa,* move from Maui to Waimea, passing by Kahuku. Further, in the tale, *Two Fish from Tahiti*, Westervelt (1915:138-140) alludes to *kapu* being placed on the catching and eating of certain species of reef fish associated with the Tahitians that fell victim to cannibalism in this story. The story of Punamanō Spring in Kahuku eludes to locals net fishing at the beach at night, which is telling of traditional fishing methods used in Kahuku (Sterling and Summers 1978:150). The story of Kūkiʻo Pond holds that the pond was once much larger and had contained a variety of fish. This story suggests that these natural ponds were utilized as brackish water fish ponds in ancient times.

Numerous proverbs, prayers, and *mele* about Kahuku in general elude to its abundance of *hala*, or pandanus trees. Pukui (1983:248) recites the proverb, *Nani i ka hala ka ʻōiwi o Kahuku*, which translates to, "the body of Kahuku is beautified by hala trees." In Fornander's translation of the prayer of Kualiʻi, Kahuku is described as a *hala* tree (Fornander 1917:28). Thrum (1919) also associates pandanus with Kahuku in his translation of Comparison of Kualiʻi, in the following lines:

> …Not like the paua [clam or abalone] which cuts the pandanus,
> To weave its blossoms at the social gatherings,
> That was the knife to cut Kahuku's pandanus.
> [He is] Not like these.
> (Thrum 1919:459)

This *mele* compares Kualiʻi with a host of euphemisms that often call upon various localities and objects often associated with them. In a section titled: "Various Heathen Prayers," Fornander (1920:46-51) translates an untitled prayer with a line that states: "He hala o Kahuku…" which Fornander interprets as, "Full of pandanus is Kahuku…" (1920: 50). Intending to win back the affections of his wife, Halemano, composed a chant that referring to the *hala* trees of Kahuku, stating:

Ku au nana I laila,	I stood and gazed, then
Haloiloi Kuu waimaka e uwe,	Tears filled my eyes causing me to weep.
Nani na hala ka oiwi o Kahuku,	How beautiful are the hala, native trees of Kahuku.
I ka lawe a ka makani he mikioi	As they are being fanned by the Mikioi wind.
	(Elbert 1965:281)

Another tearful sentiment about the *hala* of Kahuku comes from the tragic tale of Kaopulupulu, who's failed prophecy sealed his death warrant in the time of Kahahana. According to Thrum (1912:210):

> …In the morning, ascending a hill, they turned and looked back over the sea-spray of Wailua to the swimming halas of Kahuku beyond. Love for the place of his birth so overcame Kaopulupulu for a time that his tears flowed for that he should see it no more (as cited in Silva 1984:C-4).

Further, Apuakehau wrote in the Hawaiian newspaper, *Kuokoa*, in 1922 that "the first Kahuku" was covered by a *hala* grove (as cited in Sterling and Summers 1978:149). The association of *hala* with Kahuku is even repeated in the traditional Hawaiian myth of Pele and Hiʻiaka (Silva 1984).

In this portion of the myth, while Hiʻiaka is in Kahuku (Kahipa), she rebukes two bad-mannered individuals, Puna-heʻe-lapa and Pahi-pahi-alua, who did not pay her the proper respects by stating:

> We enter the fragrant groves,
> Hala groves whose heads make a calm,
> Wild growths by the sea of Kahuku,
> But what, indeed are your halas?
> Shall their murmur forbid you speech?
> Make you dumb to my salutation?
> I make this kindly entreaty
> To you who sit in the grove
> (Emerson 1915:97-8 cited in Silva 1984:C-5).

Silva (1984) adds that Emerson (1915) gathered that there was some word play in the chant, where the word "*hala*" stood for the pandanus tree as well as a fault or a sin. As late as the late 1820s, Chamberlain holds that the Kahuku area was "beautified with lauhala and some other trees" in his manuscript, "Trip Around Oahu in 1826" (as cited in Sterling and Summers 1978:149).

The wearing of *hala*, in the form of plaited *lau* (leaves) *hala* or *leis* made of the *hala* fruit/seed was a way in which the people of Kahuku represented their homeland. In the tale of Kalelealuaka, the strong and brave young warrior who fought for King Kakuhihewa, went to Kahuku and fashioned wreaths of pandanus fruit and sugarcane to disguise himself. He then was able to convince the King's marshal, who was disabled, that he was from Kahuku and that he would carry the marshal to his destination. As a reward, the marshal granted Kalelealuaka the district of Koʻolau Loa for his services (Thrum 1976:100). Cummins (1913) also calls the Kahuku area as "land of the hala tree" and stated that people should not leave Kahuku for Waimea or Waialua without a wreath of Hala-fruit (as cited in Sterling and Summers 1978:149).

Kahuku was infamous for several other landmarks that stand out in Kahuku's cultural and physical landscape. Some legends explain the occurrence of these distinctive natural features, such as the tale relayed by Pukui et al. (1974:67) where, Lono-ka-ʻeho (Lono the stone), who is described as a chief with eight stone foreheads, severed Kahuku Point from the island. Emerson (1909) translates the verses of a *hula* that describes a few of these landmarks of Kahuku in a rather colorful way. He preludes the translation with the quip, "Whether there is any connection between the name of the hula—breast-beating—and the expression in the first verse of the following mele is more than the author can say." The verses for this *hula* are translated by Emerson into English as:

> ʻTis Kahipa, with pendulous breasts;
> How they swing to and fro, see-saw!
> The teeth of Lani-wahine gape—
> A truce to upper and lower jaw!
> From Lihue we look upon Ewa;
> There swam the monster, Miko-lo-lou,
> His bowels torn out by Pa-piʻ-o.
> The shark was caught in grip of the hand.
> Let each one stay himself with wild herbs,

> And for comfort, turn his hungry eyes
> To the rustling trees of Lei-walo.
> Hark! The whistling-plover—her old-time seat,
> As one climbs the hill from Echo-glen,
> And cools his brow in the breeze.
> (Emerson 1909:206)

Emerson goes on to say that, "The thread of interest that holds together the separate pictures composing this mele is slight. It will, perhaps, give to the whole a more definite meaning if we recognize that it is made up of snapshots at various objects and localities that presented themselves to one passing along the old road from Kahuku, on Oʻahu, to the high land which gave the tired traveler his first distant view of Honolulu before he entered the winding canyon of Moana-lua" (ibid.). He adds that Kahipa is the name of a fabled female character, which was then applied to a locality in Kahuku where the mountains resemble two female breasts. Further, he describes Lani-wahine as, "A benignant *moʻo*, or water-nymph, sometimes taking the form of a woman, that is said to have haunted the lagoon of ʻUkoʻa, Waialua, Oʻahu" (ibid.).

Another tale of the distinguished promontory, referred to as Kalaeokahipa is as follows:

> Nawai-o-lewa is on the northwest side of the rocky brow of Kalaeokahipa and now only one breast is left to move in the gusty winds of Kuhuku-lewa. The other was broken off by that supernatural son of Ku and Hina…Between Kalaeokahipa and Nawaiolewa, just above is a small round opening to a secret cave…The small secret cave belonged to Kaalae-huapi (Red head mud hen) and others in the first Kahuku that was covered by a hala grove (J.K. Apuakehau, Kuokoa, June 29, 1922 in Sterling and Summers 1978:152).

Sterling and Summers (1978:151-2) list numerous historic references to Kalaeokahipa, most enlisting the use of the word "breast(s)"to describe the peak(s).

Also of note are the harsh currents and surf of Kahuku's coasts, which are mentioned in *The Birth Chant of Princess Bernice Pauahi Bishop,* as translated by Ahuena Taylor, which follows:

> …Who builds the heat, the oven, until the long fires
> Become like a wild sea.
> From "Kama" to "Waialua."
> And comes close the head lands of "Kahuku,"
> And the hawk-like scratching sea of "Kahuku,"
> The night was spent at "Waialua,"
> For a voice was at the sea of "Ewa."
> Listening for the response.
> Respond! Oh Heavenly one…
> (Kanahele 2002: 223-226)

This chant lends a rather rough image to the coast of Kahuku.

Kamakau (1964) tells of a famous hiding cave, referred to as Pohukaina, thought to be a considerable distance *mauka* of the Turtle Bay Resort area. This cave, which had an entrance in Kahuku, is described by Kamakau:

> The mountain peak of Konahuanui was the highest point of the ridgepole of this burial cave "house," which sloped toward Kahuku. Within the cave are pools of water, streams, creeks, and decorations by the hand of man (*hana kinohinohʻia*), and in some places level land (Kamakau 1964:38).

The great cave of Pohukaina is also said have been the refuge and storage place of "much wealth" for Oʻahu's chiefs (ibid.).

Although Kahuku lacked physical evidence of taro terraces along Kahuku Stream, informants interviewed by Handy and Handy in 1991 claimed that there was taro cultivation in ancient times (Handy and Handy 1991).

Hawaiian legend holds that Kahuku was once a floating island blown here and there by the trade winds and is recounted by many sources in several different ways. Pukui (1983) writes of the traditional proverb, *Kahuku ʻāina lewa,* which translates as "Kahuku, an unstable land…" and later writes that, "Oʻahu, according to legend, was once two islands that grew together. Kahuku is the part that bridges the gap" (Pukui 1983:144). Yet, there are many variations to this legend. In one version, the people of Kahuku grew tired of the moving island bumping against Oʻahu, so they fastened Kahuku to Oʻahu with fishhooks. McAllister (1933:155) retells this story in great detail:

> A story is told that Kahuku was once a land afloat, wafted about by the winds, drifting over the ocean. Just how it came to Oahu is not told, but old Hawaiians point out to Polou, the place where Kahuku is fastened to Oahu. Formerly it was possible to dice into the pool and when a depth of 40 fathoms was reached, a shelf of rock was found upon which to rest. Forty fathoms deeper Punakea (white line from coral) was reached and on looking toward Malaekahana, the hook by which Kahuku was made fast could be seen. This hook was intricately fashioned of Kawila (Alphitonia excelsior). Seaward of the Waialee Industrial School, in another pool of water, known as Kalou, is the spot where Kahuku is attached to Waialee… (McAllister 1933:155).

In addition, when McAllister (1933) relays the story about Kāne and Kanaloa, one line repeats the common tale that Kahuku was not attached to Oʻahu in ancient times, stating that "Kane and Kanaloa lived in the vicinity of the ridge (Kalaiokahipa ridge); but that was at the time when the Kahuku plain was still under water, and the waves lapped about Kalaiokahipa" (as cited by Wong-Smith 1989:A-2).

Silva (1984) lists several stories of how Kahuku was reattached to Oʻahu. One colorful account holds that the floating island of Kahuku belonged to the *menehune*, stating as follows:

> Ka-hu-ku section of Oʻahu was once a separate island…It was an islet whose people were the Mene-hune, or Dwarfs as they are called today. Many stories are told about the miraculous feats performed by the Little People of ancient Hawaiʻi. It is known, that they always worked from just after sunset until just before dawn.
>
> Legend tells us that Kahuku was a floating island situated several miles out to sea. For a long time, the people of Oʻahu had planned to make the island part of

> their land, for they saw it come close to Oʻahu's shores. The floating island of the Menehune did not have any fresh water springs because there were no high mountains covered with verdure and trees to capture the rains. So, the Little Folk used to paddle their islet into the bays of Oʻahu at night to haul water from the springs of the large island.
>
> One day, a resident of Kahuku suggested that all the people gather together to make strong hooks of whalebone and attach them to a stout rope made of sacred olonā fibers. This was done.
>
> The Menehune came to take water as usual, then the residents of Oʻahu attached the large hooks to the floating isle while the Menehune started to paddle off again, but they could not move their islet or free it from the ivory hooks and olonā ropes.
>
> Today, many people who travel Kahuku section of Oʻahu and see the many islets seeming to float off shore, and hear the sea singing its songs, they say, 'Listen to the Menehune grumbling while they try to move their island that used to float!'
>
> The rumbling and grumbling is heard only at night, for that is the time for the Menehune to be working at Kahuku. (Paki 1972:53 as cited in Silva 1984:2-3)

Another account of Kahuku being an island was provided by Silva (1984), which also links the locality with a legendary princess, named Lāʻieikawai, and reads as follows:

> Kahuku District, according to legend, was once a floating island blown about by the winds. As it banged against Oʻahu, it made noises which disturbed the old women guarding the princess Laieikawai. The old women grappled the island with fishhooks and attached it securely to Oʻahu. Polou pool on the sea side of the Kahuku mill is one spot where the hook was fastened. The other end was fastened at Kūkiʻo pond 300 feet inland at Kahuku Point (Boswell 1958:68 as cited in Silva 1984:2).

Other versions provide a political motive for uniting the two islands. A portion of the tale of "The Hole of Kahipa and Nawaiuolewa" was told to Mary Pukui by a one-hundred and five year old woman named, Kanui, who described how two ruling chiefs united Kahuku with Oʻahu. In this tale, "the two were brother and sister. In order to make it one, the two sat down and hooked their fingers together and drew them together. The hole marks the place where they sat (Kamakau Part II, Moolelo o Hawaii, Note 4, Chap 12, as cited by Sterling and Summers 1978:151). Kamakau (1991:38-9) holds that Oʻahu was a floating island, rather than Kahuku. However there are some consistencies with the previously mentioned versions. He writes:

> According to traditions of some people, Oʻahu was said to have once been a floating land, *he ʻāina lewa o Oʻahu*. The Kahuku side was a wide open gap (*puka hāmama*) and this was called *Ka Puka o Kahipa a me Nawaiuolewa*, "The opening of Kahipa and Nawaiuolewa." The piece of land that closed it up was called Kahuku, and the hooks that made fast the piece of land and joined it to the island were called Kilou and Polou (Kamakau 1991:38-39).

Another variation of the story told holds that there was an underground canal or tunnel where the two islands joined. In 1828, Levi Chamberlain, a missionary accountant, tells of a 5-7 mile

long by 1-2 mile wide underground canal leading from the sea inland at the convergence of the two islands (Chamberlain 1957:35-36). He reiterated the following in regards to this legend:

> The natives tell a marvelous story respecting the origin of this destrict [sic], which they say floated in from the sea, and attached itself to the ancient shore of the island, that there was a subterranean communication between the sea and the ancient shore, by which a shark used to pass, and make depredations up on the land. The basis of the tract, which is from five to seven miles in length, and from one to two miles in breadth, appears to be of coral; and it was evidently redeemed from the sea, as a good deal of land, in many places along the shore around the whole circuit of the island, evidently has been (Chamberlain 1957:35-6).

McAllister (1933) relays a story about a secret underwater passage way marked by two stones off of Kahuku Point that led to another land referred to as Ulukaa or Kahuna Moku. The story is as follows:

> Two stones known as Kahoa in water about 250 ft. from the beach just opposite from Kalaehila heiau, Kahuku Point. Many years ago a woman who lived on this beach was frequently seen to swim to these stones and disappear. At times she would be gone for as much as a week. Sometimes she was seen to put her clothes in a watertight calabash and swim away. When she returned she usually wore a kou lei. It was finally discovered that this was the entrance to another land, known as Ulukaa or Kahuna Moku (as cited by Silva 1984:A-5).

The theme of an underground canal is echoed in Thrum's (1911) "Legend of the Tapa Log," which largely takes place in Punahoolapa Marsh, located in the southeast corner of the Turtle Bay Resort property and currently a wildlife preserve. Thrum's story is as follows:

> A kapa-beating log of peculiar sound, unlike any other known on the island, which was placed in its waters at the close of the kapa-making season to keep it smooth and free from cracks that would impart an impression to the cloth in its manufacture, was missed, and, believing it to have been stolen, search was made all through the Koolau, Waialua and other districts 'til at last it was found in use at Waipahu. Recognizing it by its resonant tone, it was claimed by the searching owner, and right thereto by those in possession was vigorously maintained. To test the truth of ownership as claimed, the 'Ewa people accompanied the claimant back to Kahuku to visit the scene and witness a test of the underground stream theory. A bundle of ti leaves were gathered, which was wrapped together and consigned to the waters of Punahoolapa. In the course of a few days they were lost to sight, whereupon the party set out for 'Ewa, and after careful watching, as predicted, the bundle of ti leaves came forth on the bosom of the waters of the Waipahu stream. The kapa log was thereupon recognized as the rightful property of the Kahuku claimant (Thrum 1911:130 as cited in Sterling and Summers 1978:149).

Associated with Kahuku's underground canal are several legends of man-eating sharks, where a shark once traversed to consume people (Chamberlain 1957:35-36). In Handy (1922:111), Manō-niho-kahi (shark with one tooth) is a man who had the power to shape-shift into a shark. This version of the tale presents him as normal looking, except for the shark mouth on his back

that he always covered with a cloak of *tapa*. When Manō-niho-kahi found out that people, specifically women, were going to the sea to fish or collect *limu*, he would rush out to where they were and bite them with his single shark tooth, killing them. When the killings became too regular, the chief of the region and his *kahuna* gathered all of his people and ordered them all to disrobe. When Manō-niho-kahi refused to take off his *tapa* cloak, he was stripped, revealing the shark mouth on his back. At once, he was put to death, ending the streak of deaths of women in those waters. Another, albeit less gruesome, tale about man-eating sharks associated with Kahuku is told by McAllister (1933), where a shark was caught and kept as a pet in Punamanō marsh, which is located just east of Turtle Bay Resort lands. The story, as reiterated from an informant's testimony is as follows:

> One time when the people of Kahuku were fishing they caught a small shark. Putting him in a calabash of water they carried him to their houses near the beach. Here he was cared for and put in larger and larger calabashes as he grew bigger. Finally haven outgrown even the largest calabash that could be found, it was decided to place him in one of the pools of brackish water which came to be known as Punamanō. A man and woman living near the pool became guardians. They had lived in their grass huts with a breadfruit tree near the pool and taro and potato patches near the mountains for several years when the brother of the woman came to live with them. Sometime after, the man and his wife went to the mountains to gather taro and potatoes. The brother, who was staying at home, thought that he would like to have some food prepared when the sister and her husband returned. He climbed the breadfruit tree and gathered several, throwing the fruit into the water instead of on the ground, where it would have been bruised in the fall. After picking enough for a few days he descended the tree and gathered most of the fruits from the bank. Two had floated to the middle of the pond and he could not reach them. Now this man knew of the shark that lived in the pool, but he had frequently bathed in the pool and no thought of fear crossed his mind as he swam to the breadfruit. He did not know, however, that his sister and her husband had warned the shark not to allow anyone to steal breadfruit when they were gone. When the sister and her husband returned they could not find brother. Neither was the shark to be found, but they saw the breadfruit floating in the pool and the reddish color to the water. They guessed what had occurred. For nearly a mile they followed the bloody trail until they came to a spring known as Punahoolapa. Not only was the brother never seen, but the shark has never been seen to this day (as cited in Wong-Smith 1989:A-7).

In this case, it appears that the shark was simply looking out for its keeper's interests. Kuapuu (1861) wrote a very similar account of the Punamanō man-eating shark in the *Ka Hae Hawaii* newspaper (as cited in Sterling and Summers 1978:151).

Other supernatural beings and demigods associated with Kahuku are mentioned in Beckwith (1940). On a quest to find his brother, Lono-ka-ehu brought his "great dog" or the dog-man, Kū-ʻīlio-loa (Kū long dog), to Oʻahu from Kahiki. In the search, Kū-ʻīlio-loa "pierced the hill Kāne-hoa-lani at Kualoa, cleft Kahuku and Kahipa apart, and broke Ka-pali-hoʻokuʻi at Kailua" according to Beckwith (1940:321). She later describes Kū-ʻīlio-loa as "a dog with a human body and supernatural power, 'a great soldier and famous warrior,' who terrorizes Kahiki" (Beckwith 1940:321).

Kahuku is also a place where the manifestation of ancient *kapu* law had become a permanent part of the landscape in the form of two stone outcrops. According to Beckwith (1970:48), Kamakau mentioned the story of two stones in the cave of Ke-ana at Kahuku that are said to be the bodies of two boys who disobeyed their mother's injunction to keep silence during a thunderstorm. Kāne-hekili, the god of thunder, is associated with several gods whose names are also suggestive of the phenomenon experienced during thunderstorms, such as Kāne-wawahi-lani (Kāne breaking through heaven) and Ka-uila-nui-maka-kehaʻi-i-ka-lani (Lightning flashing in the heavens). The gods in their humpbacked forms can be seen flying through the air during storms with Na-kolo-i-lani, who are the humpbacked brothers of Pele. According to the ancient *kapu* laws, all containers should be turned bottom side up and people should lie face down without any outcry, for silence is the law of Kāne-hekili (Beckwith 1970:48).

Another well known *moʻolelo* is the Legend of Kamapuaʻa, a supernatural being and a deity attributed to agriculture, rain, and fertility (Elbert 1965:200-1; Maly and Maly 2003:9). While he had the ability to shape-shift into multiple bodily forms (*kino lau*), Kamapuaʻa was most noted for his pig-like appearance. In one of his many exploits, Kamapuaʻa was caught stealing chickens from Olopana, the head chief of Oʻahu at the time. To catch Kamapuaʻa, Olopana enlisted the residents of Kahuku, who capture him, bind him to a pole, and carry him towards Punaluʻu. Upon seeing this, his grandmother, Kamaunuaniho, recited a chant that gave him the power to kill the captors from Kahuku.

In *The Hawaiian Romance of Laieikawai,* the people of Waianae on Oʻahu offered their version of the story, which mentions the high chief who ruled Kahuku named, Kahoʻaliʻi. In this account, Kahoʻaliʻi instructs his son to, "Fly about Oʻahu while I chew the *ʻawa;* before I have emptied it into the cup return to me and rehearse to me all that you have seen" (Beckwith 1918:30). The tale goes on to list the places his son passed on his journey. Further, Kahuku is mentioned in the chant of Kualiʻi as one of the major landmarks of Oʻahu for those travelling to the island from Kauaʻi (Beckwith 1918:30).

In the tale, *Two Fish from Tahiti*, Westervelt (1915:142-144) recounts two great canoes filled with men from Tahiti, referred to as two "fish," journeyed to Oʻahu. The purpose of the journey was to "find the wonderful fire-land of Hawaii about which they had been taught in the stories of returned travelers…" and "…find an appropriate location for a settlement. Possibly they planned to make a permanent home or hoped to meet some good community into which they might be absorbed" (Westervelt 1915:140). Upon their arrival on the shores of Makapuʻu, the travelers found an "unfriendly coast" and decided to separate and circle the island, with one canoe going north and one going south. Westervelt continues:

> The boat which sailed toward the north found no good resting-place until it came to the fishing-village of Hauula…Evidently there, was dissension and at last a battle. The whole story is summed up by the Hawaiian legend in the saying: "The fish from Tahiti was caught by the fishermen of Hauula. They killed it and cut it up into pieces for food." Thus the visitors found death instead of friendship, and cannibalism was thereby veiled by calling the victims "fish" and the victory a "catch…"
>
> …The second fish from Tahiti had gone on southward in its journey around the island of Oahu. It passed the rough and desolate craters of Koko Head on the

eastern end of the island. It swam by Diamond Head and the beautiful Waikiki Beach. Either the number of the inhabitants was so large that they were afraid to make any stay or else they preferred to make the complete circuit of the island before locating, for they evidently made only a very short stay wherever they landed, and then hurried on their journey. By the time they reached Kaena, the northwestern cape of Oahu, they were evidently anxious concerning their missing companions. Not a boat on the miles of water between Kaena and Kahuku, the most northerly point on the island. The legend says that the fish changed itself into a man and went inland to search the coast for its friend, but the search was unsuccessful. It was now a weary journey from point to point, watching the sea and exploring all the spots on the beach where it seemed as if there was any prospect of finding a trace of their expected friends. Where a break in the coral reef permitted their boat to approach the land they forced their way to shore. Then when the thorough search failed again, the boat was pushed out over the line of white in rolling breakers to the great sea until at last the Tahitians came to Kahuku.

Now they appeared no longer as "fish," but went to the village at Kahuku as men. They made themselves at home among the people and were invited to a great feast. They heard the story of a battle with a great fish at Hauula and the capture of the monster. They heard how it had been cut up and its fragments widely distributed among the villages on the northwest coast. Evidently provision had been made for several great feasts. The people of Kahuku, although several miles distant from Hauula, had received their portion. The friendly strangers must share this great gift with them. But the men from Tahiti with heavy hearts recognized the fragments as a part of their companion. They could not partake of the feast, but by kindliness and strategy they managed not only to decline the invitation, but also to secure some portions of the flesh to carry down to the sea. These were thrown into the water, and immediately came to life. They had the color of blood as a reminder of the death from which they had been reclaimed. Ever after they bore the name "Hilu-ula," or "the red Hilu."

Then the "fish" from Tahiti went on around to Hauula. They went up to the tabu land back of Hauula. They pulled up the tabu flags. Then they dammed up the waters of the valley above the village until there was sufficient for a mighty flood. The storms from the heavy clouds drove the people into their homes. Then the Tahitians opened the flood-gates of their mountain reservoir and let the irresistible waters down upon the village. The houses and their inhabitants were swept into the sea and destroyed. Thus vengeance came upon the cannibals.

The Tahitians were "fish," therefore they went back into the ocean to swim around the islands. Sometimes they came near enough to the haunts of fishermen to be taken for food. They bear the name "hilu." But there are two varieties. The red hilu is cooked and eaten, but never eaten without having felt the power of fire. The trace of the cannibal feast is always over its flesh. Therefore it has to be removed by purification of the flames over which it is prepared for food. The blue hilu, the natives say, is salted and eaten uncooked. Thus the legend says the two fish came from Tahiti, and thus they became the origin of some of the beautiful fish whose colors flash like the rainbow through the clear waters of Hawaii (ibid.:142-144).

This account calls attention to the political control of resources, *kapu* systems, variations in conduct with outsiders as well as warfare and cannibalism in pre-European contact Kahuku and Hauʻula.

Keana Ahupuaʻa

Few traditional legends mention Keana Ahupuaʻa specifically. One of which is the section of the Pele and Hiʻiaka legend, where Hiʻiaka passes through Lāʻie, Mālaekahana, and Keana to make her way to Kahauku (Emerson 1915:233). However, there are a number of traditional sites associated with legendary stories in the *ahupuaʻa.*

For example, two large stones in the Keana Cave or Rock Shelter (Site No. -270) are said to be the remains of two boys who failed to follow their mother's orders to stay silence during a thunderstorm, which was the *kapu* (law) of the god of thunder, Kane-hekili (Beckwith 1940:48). According to Beckwith (1940:48) "During such a storm all containers should be turned bottom side up; all persons should lie face down-ward and make no outcry." Emerson's (1915) rendition of this tale is as follows:

> In Kahuku, island of Oahu, at a place not far from the sugar-mill, is a cave, known as Keana. In former times this cave was the home where lived a mother and her two sons. One day, having occasion to journey to a distance, she left them with this injunction, "If during my absence you hear the sound of thunder, keep still, make no disturbance, don't utter a word. If you do it will be your death." During her absence, there sprang up a violent storm of thunder and lightning, and the young lads made an outcry of alarm. Thereupon a thunderbolt struck them dead, turning their bodies into stone. Two pillar-shaped stones standing at the mouth of the cave are to this day pointed out in confirmation of the truth of the legend (Emerson 1915:233).

Additionally, Pōlou (Site No. -271), which was described by McAllister (1933) as once being, "a pool of water, sea side of the Kahuku mill," was located in Keana Ahupuaʻa. This was said by some *kūpuna* to be the place where the "floating island" of Kahuku attached to the Island of Oʻahu. It was also said to be the location of a "stone" known as Kanaloa (ibid).

Mālaekahana Ahupuaʻa

Several legendary stories reference Mālaekahana as a locality, and the name itself is shared with a great heroin of ancient myth and the mother of Lāʻie-i-ka-wai and her twin sister, Lāʻielohelohe. In the story of Lāʻie-i-ka-wai, Beckwith (1940:526-527) describes the nature of the twin's birth, betrothals, and trials in finding the right suitor:

> Laie-i-ka-wai and her twin sister Laie-lohelohe are born at Laie on Oahu of Kahauokapaka the father, chief of the northern lands of the island, and Malaekahana the mother. Since the father has vowed to let no daughter born to his wife live until she bears him a son, the mother conceals the birth of the twins and gives them to her own relatives to rear, Laie-lohelohe to Ka-puka-i-haoa to bring up at the heiau at Ku-kani-loko, and Laie-i-ka-wai to Waka, who first hides her in a cave near Laie which can be reached only by diving into the pool which conceals the entrance, and then takes her to the uplands of Puna. Here she builds a tapu house for her ward thatched with bird feathers, and gives her birds to

wait upon her and mists to hide her from the sight of men until such time as a suitable lover shall appear to make her his wife.

The first whose suit seems acceptable is Kauakahi-aliʻi, ruling chief of Kauai and husband of Ka-ili-o-ka-lau-o-ke-koa (Skin like the leaf of the koa). The reappearance of his wife whom he had mourned for dead prevents the appointed meeting, but on his return to Kauai he relates the adventure and the young chiefs of that island are stirred by the story. Aiwohikupua meets her nightly in dream and goes to woo her, but even the presence of his four sweet-scented kupua sisters, named after the four varieties of maile vine whose scent they inherit, cannot shake her refusal. Enraged by the insult, he abandons the sisters in the forest. His fifth and favorite sister, Ka-hala-o-mapuana (The fragrant hala blossom) refuses to abandon them. Through her clever management she attracts the attention of Laie-i-ka-wai and the five are adopted as sisters and made the guardians of Paliuli. They drive off their brother upon his second attempt to win the chiefess, and a guardian moʻo named Kiha-nui-lulu-moku (Great moʻo shaking the island) completes his discomfiture. Another and more favored young chief from Kauai named Hauailike is also expelled by the watchful youngest sister.

Waka now arranges a match with Ke-kalukalu-o-ke-wa, younger brother of Ka-ili-o-ka-lau-o-ke-koa and successor with her to Kauakahi as ruling chief of Kauai. Just as the formal marriage (hoao) is about to be consummated, a young rascal from Puna named Hala-aniani, aided by his sorceress sister, carries her off on his surfboard in place of the legitimate lover. Waka finds them sleeping together and abandons the girl in a rage, stripping her of mist and bird guardians and of the house thatched with feathers whose protection her loose conduct has forfeited. The five sisters and the great moʻo, however, refuse to abandon their mistress. Since the Kauai chief has made her twin sister Laie-lohelohe his wife in place of their disgraced mistress, they determine to retrieve her fortunes by providing a more splendid match, and the clever youngest sister is despatched, with the great moʻo as carrier, to fetch their oldest brother who lives as a god in a tapu house in the very center of the sun in the highest heavens. While she is away on this errand the group leave Paliuli and travel about the island and, meeting an old family guardian and seer named Hulu-maniani, make their home with him as adopted daughters at Honopuwai-akua on Kauai. Throughout the course of the story this old seer (kaula) has been following around the islands after the rainbow sign which hovers over the place where Laie-i-ka-wai is hidden, determined to make this new divinity his chief and thus provide for his own old age.

Ka-onohi-o-ka-la (Eyeball of the sun) looks favorably upon his sister's proposal and, putting off his nature as a god, he descends to earth, strips the enemies of Laie-i-ka-wai of their lands and power and, leaving Ke-kalukalu-o-ke-wa and the twin sister rulers over Kauai, gives to each of the sisters rule over one of the other islands of the group and takes Laie-i-ka-wai up on a rainbow to live with him in Ka-hakaekaea. All goes well until, on one of his visits to earth to see that all goes well there, he notices the budding beauty of his sister-in-law. He presses his attentions and succeeds in securing her. His wife in the heavens wonders what important affairs keep him so long on earth. In the temple at Kahakaekaea stands the gourd Lau-ka-palili which reveals to one who looks within what is going on below. Laie-ika-wai discovers her husband's infidelity and reports him to his

> parents, who live with her in the heavens. They banish him to become a wandering spirit, the first lapu (ghost) in Hawaii. Laie-i-ka-wai returns to earth and lives like a god with her sister. Today she is worshiped as Ka-wahine-o-ka-liula (Lady of the twilight, mist, or mirage) (Beckwith 1940: 526-527).

Another fable that takes place in primarily in Mālaekahana Ahupuaʻa area is that of "Manuwahi: A Legend of Oahu" in *Hawaiian Legends* (Rice 1923), which is told as follows:

> At Laie lived Manuwahi, Free Gift, with his son, Ka haku loa, The-Lord-of-a-Long-Land; his grandson, Kaiawa, Bitter Sea, and his great-grandson Kauhale-kua The-Village-on-the-Ridge. These men were the keepers of the akua at Laie.
>
> Manuwahi and his children were hairless and were possessed of supernatural powers.
>
> Manuwahi planted black and white area far up in the mountains for the use of the akua. Every awa root planted was given one of these names, Kaluaka, The-Hole-That-Gives-a-Shadow; Kumumu, Blunt-Edged; Kahiwa, Best-Awa, or Kumilipo, The-Root-of-Unconsciousness. This was done so [that] Manuwahi, when sending one of his sons for a piece of awa could designate the exact one he wished.
>
> When the awa a was given to him, Manuwahi would prepare it, and then summon the akua from the North, South, East, and West, as well as from above and below, to drink of it. They prayed in this wise, before they drank:
>
> > Gods of the Morning,
> > Gods of the Night,
> > Look at your progeny:
> > Grant them health,
> > Grant them long life;
> > Amama ua noa - it is free!
>
> It happened that during this time Kamehameha I had come to conquer Oahu. He had succeeded in subduing all the island except Malae-kahana, between Laie and Kahuku. Determined to add this place to his conquests, the king sent one of his body guard, Ka-hala-iu, In-the-Shadow-of-the-Hala-Tree, with many of his bravest soldiers to subdue Malae-kahana.
>
> Ka-hala-iu marched as far as Hanapepe the first day, where he spent the night. Early the next morning he set out and meeting Manuwahi, whom he did not recognize, asked him where the powerful kahuna of Malae kahana lived.
>
> Manuwahi answered, "Pass over the river and you will see a spring and nearby a hut with trees about it. This is his home."
>
> Ka-hala-iu did as he was told and had soon surrounded the hut with his soldiers. When Manuwahi's son came out Ka-hala-iu asked him, "Where is your father?"
>
> "Did you meet a bald headed man?" asked the boy in turn.
>
> "Yes," replied Ka-hala-iu.
>
> "Well, that was my father. Why did you come here?"

"I came to kill your father by the orders of King Kamehameha," answered the King's man. Deciding it would profit them nothing to kill the son, the soldiers departed for Hanapepe by the makai side of the hill, and failed to meet Manuwahi, who had returned to his home by the mauka side.

The next morning the King's body-guard again surrounded with his soldiers the home of the kahuna. Manuwahi came out and asked, "What are you here for? Did you come for battle?"

"Yes," answered the fearless soldier, "We came to kill you."

Whereupon Manuwahi called to his assistance all the akua from the North, South, East and West as well as those from above and below. They came at once and gave battle to the soldiers of the king. The akua fought by biting and scratching their assailants and before long they had killed all but Ka-hala-iu.

Ka-hala-iu cried out, "Spare my life, kahuna of the gods, and I will stay with you."

"What can you do if you stay with me?" asked Manuwahi.

"I will plant awa for you. I came from Hawaii, where I lived by planting awa," answered Ka-hala-iu.

But Manuwahi said, "I do not need you. Go back and tell your king that even his bravest soldiers were not able to conquer Malae-kahana. Tell him that all but you were killed by the akua there."

When Kamehameha had heard these words he sent Ka-hala-iu back with another body of soldiers with orders that he must conquer Malae-kahana.

In the meantime, Manuwahi had moved with his sons up to the cave of Kaukana-leau, where the natives made their stone adzes. There the King's soldiers met them. As before, Manuwahi called all the akua to his aid. Again the soldiers were quickly put to death and only Ka-hala-iu was left. So Malae-kahana was not conquered.

Ka-hala-iu respected and admired Manuwahi so much that he was very anxious to remain with him, and so he asked again to be allowed to remain as an awa grower. Manuwahi consented this time and gave him one side of the valley to cultivate in awa.

One day as Ka-hala-iu was preparing the side hill for its cultivation. He noticed that on the opposite side of the valley, trees and bushes were falling in every direction, as if a whirlwind were uprooting them. This frightened him very much, as he could not understand the phenomenon, so he ran in great haste to Manuwahi, and asked what it meant. Manuwahi told him that his akua were helping in the clearing of the side hill, and that if he wished them to help him they would gladly do so. Ka-hala-iu was only too happy to have help so he called upon the akua, and in a short time both sides of the valley were cleared, and were growing luxuriantly with the most beautiful awa.

After the battle, between Ka-hala-iu and the akua for the possession of Malae-kahana, Manu-ka, Frightener-of-Birds, one of Manuwahi's sons, moved to Kaneohe, where he died some time later. He was buried makai of the present

> road. The natives dug a very large grave but before they could cover the body the akua brought red dirt from Ewa, in a cloud, which filled the grave, and made a red hill above it, which can be seen to this day. There is no other red dirt in that district (Rice 1923:113-115).

In Fornander's (1920) "Legend of Halemano," the hero, Halemano, passed through the area, mentioning Kahuku and Mālaekahana. In this story, Halemano's companion, Kumukahi, arrived at Hauula after they fled Hawaiʻi and so admired an upright image, named Mālaekahana, that he decided to stay in the area while the rest of his party continued on (Fornander 1920:236). It is possible that the statue was created in the likeness of its heroin namesake. The site of this statue may have been McAllister's Site No. -273, which is described as the *kauahale*, or house, foundation that once belonged to the *kahuna* (priest/sorcerer), Manuwahi, who was the keeper of the god of Mālaekahana (Sterling and Summers 1978:154). This site was located just within southern boundary of Mālaekahana Ahupuaʻa, near the present day entrance to the Mālaekahana State Recreation Area, which is approximately 1.5 kilometers southeast of the project area.

Mālaekahana is also associated with one of the many legends of shark gods. In this tale, Manō-niho-kahi (Shark with one tooth), resides near a spring in Mālaekahana located somewhere between Lāʻie and Kahuku, perhaps Waiʻāpuka (Site No. -275). When Manō-niho-kahi spies a woman going to gather fish or *limu* (seaweed) from the ocean, he tells her to be wary of sharks, before attacking and killing her himself (Beckwith 1940:142). Subsequently, the chief detected Manō-niho-kahi out of a line-up of villagers when his tapa cloak is removed, revealing the mark of the shark's mouth on his back.

Waiʻāpuka (Site No. -275), located in the *kula* of Mālaekahana, is noted in 1888 by King David Kalākaua in his book, *The Legends and Myths of Hawaii,* as a significant feature of Mālaekahana's landscape as well as an important locale in "The Story of Laieikawai." He iterates the acts of Waka, Laieikawai's grandmother, who provided the infant Laieikawai sanctuary from her father's wrath for not being born male, as follows:

> In his absence she was delivered of twin girls, who were named Laieikawai and Laielohelohe. They were surpassingly beautiful children, and, desirous of saving their lives, the mother consigned the first-named to the care of Waka, the child's grandmother, and the other to Kapukaihaoa, a priest of discretion and sanctity.
>
> On the return of the husband he was told that the expected child came into the world without life. He knew that a birth in his house had occurred during his absence, for he had heard two distinct claps of thunder.
>
> Waka took her foster-child to the cavern which opens into the pond of Waiapuka, and which can be entered only by diving. Laielohelohe was taken by her priestly protector to the sacred enclosure of Kukaniloko, on the western side of the island, and there tenderly cared for.
>
> The moment Waka entered the cavern of Waiapuka with Laieikawai a rainbow appeared over the place, and was constantly visible so long as the child remained there. Even when the sun was obscured by clouds the rainbow could be seen.

> At length the rainbow was observed by the great prophet Hulumaniani on the distant island of Kauai. For twenty days in succession he saw it, and knew its significance. He secured a canoe and fifteen men from Poloula, the chief of Wailua, provided himself with a black pig, white fowl and red fish for sacrifice, and, when the star Sirius rose, set sail for Oahu.
>
> Reaching that island he landed at Waianae, and, guided by the rainbow, in due time arrived at the pool of Waiapuka.
>
> Waka had just dived into the cave, and he noticed ripples on the water. During the day Waka started to leave the cavern, but caught a glimpse of the prophet sitting on the bank, and quickly returned, again ruffling the water.
>
> The prophet remained by the pool all night, and in the morning saw a rainbow over Kukaniloko. Traveling in that direction, he ascended Mount Kaala, when he saw the rainbow over the island of Molokai. Finding a canoe bound thither, he took passage and landed at Haleolono, near the western shore.
>
> In a dream Waka had been directed by Kapukaihaoa to remove Laieikawai to some securer place, and had accordingly taken her to Malelewaa, a secluded spot on the north side of Molokai (Kalākaua 1990:457-458).

Another mythical tale attributed to Mālaekahana Ahupuaʻa concerns Laniloa, which the name given to a point of land that extends *makai* from Lāʻie. According to Rice (1923) this legend, referred to as *Laniloa, The Moʻo*, this point was said to have been a *moʻo*, or a standing lizard in this case. Rice (1923) holds that this *moʻo* was ready at any time to kill passersby. In Rice's version of the legend, he states:

> After Kana and his brother had rescued their mother from Molokai and had taken her back to Hawaii, Kana set out on a journey around the islands to kill all the mo-o. In due time he reached Laie, where the mo-o was killing many people. Kana had no difficulty in destroying this monster. Taking its head, he cut it into five pieces and threw them into the sea, where they can be seen today as the five small islands lying off Malae-kahana: Malualai, Keauakaluapaaa, Pulemoku, Mokuaaniwa and Kihewamoku.
>
> At the spot where Kana severed the head of the mo-o is a deep hole which even to this day has never been fathomed (Rice 1923:112).

One might speculate that this "deep hole" is the legendary site, Waiʻāpuka (Site No. -275).

3.2 EUROPEAN CONTACT

At European Contact and shortly thereafter, the general Kahuku area was commented on by several maritime officials, with observations that point to a drastic change in land use from initial contact in the mid-1780s to the mid-1830s.

Approximately two weeks after the death of British Captain James Cook, Charles Clerke took over the helm of the H.M.S. Resolution. As the ship rounded the northern point of Oʻahu,

Captain Clerke provided the first post-Contact account of the Kahuku area. Clerke wrote on February 28, 1779:

> SUNDAY 28th. . . Winds Eterly [Easterly]. fresh breezes with open Cloudy Weather. Run round the Noern [Northern] Extreme of the Isle which terminates in a low Point rather projecting; off it lay a ledge of rocks extending a full Mile into the Sea, many of them above the surface of the Water; the Country in this neighborhood is exceedingly fine and fertile; here is a large Village, in the midst of it is run up a high Pyramid doubtlessly part of a Morai. I stood into a Bay just to the Westward of this point the Eastern Shore of which was far the most beautifull [sic] Country we have yet seen among these Isles, here was a fine expanse of Low Land bounteously cloath'd with Verdure, on which were situated many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sandy Beach. . . (Beaglehole 1967:I:572 in Silva 1984:C-10).

This description paints a pleasant picture of the Kahuku area, with a thriving community and large ceremonial structures. At about the same period, H.M.S. Resolution Lieutenant, James King, described this northern tip of Oʻahu, writing:

> WOAʻHOO. . . We saw this Island the beginning of last year, but only just as a high lump, We this Time sailed along its NE & NW sides but say nothing of its Soern [Southern] part. What we did see of this Island was by far the most beautiful country of any in the Groupe; particularly the Neck that Stretches to the No ward [Northward] and its NW side. Nothing could exceed the verdure of the hills, nor the Variety which the face of the Country display'd. It /s north-eastern/ parts were cliffy, & rugg'd to the Sea side, but the Valley look'd exceedingly pleasant, near the
>
> N point we were charmed with the narrow border full of Villages, & and Moderate hills that rose behind them (Beaglehole 1967:I:610 in Silva 1984:C-10-11).

This is yet another testimony to the beauty and lushness North Shore during the early Contact period. In contrast, Captain George Vancouver visited the northern tip of Oʻahu later in 1794, discovering that the Kahuku coast had significantly changed in terms of cultivation and population, writing:

> …In every other respect our examination confirmed the remark of Capt. King excepting that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to be so numerously inhabited, as he represented it to have been at that time, occasioned most probably by the constant hostilities that had existed since that period (Vancouver 1798, Vol.3:71).

Wong-Smith (1989) suggests that regular hostilities and the scourge of Western diseases caused the severe decline of the Hawaiian population in Kahuku. It was likely Captain Cook's 1778 expedition that brought venereal disease to Hawaiʻi and spread rapidly between the initial and secondary contact events (Kuykendall 1938; Beaglehole 1967; Lind 1968; Schmitt 1968, 1971). By the time the first missionaries conducted a census of the islands in the early 1820s, they estimated that the entire population had been reduced by nearly a third (Schmitt 1968:10 in

Wong-Smith 1989:A-10). This population crash created a wasteland out of the once verdant fields and lively villages of Kahuku.

3.3 HISTORIC ERA

The focus of this section will remain on events that greatly shaped the modern character of Kahuku, Keana, and Mālaekahana Ahupuaʻa as well as any occurrences that help paint a picture of what Hawaiian cultural practices were like during this period.

3.3.1 Western Observations

Many accounts of the Kahuku, Keana, and Mālaekahana area's early historic era were provided by missionaries. According to missionary censuses from the 1830s suggests that the area had severe declines during this time (Schmitt 1968). Koʻolau Loa's population in 1831 was 2,891 with 452 living in Lāʻie. Wong-Smith (1989:A-10) notes that "a population loss of 210 for the entire district occurred between 1831 and 1835." This population decline affected the extent of traditional agriculture in the area. In the early 1830s, E.O. Hall, of the American Board of Missions, stated in regards to Koʻolau Loa, "Much taro land now lies waste, because the diminished population of the district does not require its cultivation" (as cited in McAllister 1933: 153). The greatest factor in the tragic population decline during this period was the introduction of Western diseases, followed by warfare (Kuykendal 1938; Nakamura 1981; Wong-Smith 1989).

The Superintendent of Secular Affaires for the Mission in Hawaiʻi, Levi Chamberlain, gave an 1828 account of Mālaekahana during his second circuit of Oʻahu, where he evaluated the effectiveness of the island's education system, provides insight on the fecundity of lands in this area. Chamberlain states:

> Tuesday Feb. 5th. After breakfast I examined two schools, belonging to Laie & Malaekahana, and was pleased with the appearance of the scholars. At a quarter before 11 A.M. we set out for Kahuku, and after travelling about two hours over a level sandy country, arrived at the school house, where we found 83 scholars assembled, waiting to be examined … A good hog had been cooked for us & when the examination closed, dinner was waiting … my attendants made a heartly meal; and the remainder of the food was placed in the calabashes of our natives, and carried along to furnish food for us when we should be again in need (Chaimberlain 1957:35-6).

Another account of Koʻolau Loa and the project area vicinity from the late 1800s was provided by John Effinger, in an article titled, "A Tramp Around Oahu," for *Paradise of the Pacific* magazine, where he states:

> The sun had scarcely got its eyes open when I had pushed on several miles further along the grassy plain and shore through Kualoa ranch, past the ruins of the old Wilder mill, looking like an antiquated English castle, and past the Punaluu rice patches. The chimney of Kahuku mill was my guiding star this morning, and the miles seem to fly along so green is the verdure around us and so fresh the strong salt air. Sentinel cliffs, sheltering pleasant valleys where are

> many of the summer residences of Honolulu's "400" shoot into the sky on the left. Chief Justice Judd Hon. P.C. Jones, and Cecil Brown, Esq. have country places along here, and when the Oahu Railway is completed, there will be an exodus from Honolulu every Saturday afternoon for a Sunday's vacation to this favored spot. The air is cool and bracing. Mosquitoes are hardly a nuisance. From Kualoa to Laie is the prettiest, healthiest part of the island of Oahu. About noon I reached Laie, a Mormon settlement, with a small cane plantation and mill. The plantation railway runs down into Laie from Kahuku plantation and all the cane is ground at the big Kahuku mill. Laie Point shoots out into the blue ocean here and the surf banging up against it throws spray high in the air. It was a few hours after noon when Kahuku mill was reached, and I took a few moments rest before pushing out for Waialua. The Kahuku stock ranch takes up all the land of this district not occupied by cane (Effinger 1895:88).

One account, which was recorded by King Kalākaua in the late 1800s, provides a very detailed description of a significant landmark of Mālaekahana, Waiʻāpuka (Site No. -275). He reiterated the experiences of a group of travelers touring the area in 1885, as follows:

> Entering the district of Koolouloa, and approaching the coast over a broad stretch of grassy meadow but slightly above the level of the ocean, our party was suddenly brought to a halt beside a pool of clear water, nearly round, and perhaps a hundred feet in diameter. The surface of the pool was ten or twelve feet below the level of the surrounding plain, and its even banks of solid rock dropped almost perpendicularly into water of unknown depth. The volume of the pool is affected neither by rain nor drought, and the native belief is that it is fed by springs at the bottom, and has a subterranean drainage to the ocean, some two or three miles distant.
>
> This, we learned, was the celebrated pond of Waiapuka, around which so many strange legends have been woven. All of them speak of a cavern somewhere beyond the walls of the pool, and to be reached only by diving into the water and finding the narrow passage leading up into it.
>
> While listening to fragments of the story of Laieikawai and of other legends connected with the mysterious cavern, and seriously doubting the existence of the secret chamber so prominently referred to in early folk-lore of Oahu, an old native, who had joined the party at Kaneohe, quietly and without a word, dismounted, divested himself of his upper garments and plunged into the pool. Swimming to the northern wall, he clung for a moment to a slight projection, and then disappeared. It was suggested for the first time that he was in search of the cavern of Laieikawai, and all eyes were turned toward the point where he was last seen above the water.
>
> Three or four minutes elapsed, and fears for his safety began to be exchanged, when the salutation of "*aloha*!" greeted us from the opposite wall, and the next moment a pair of black eyes were seen glistening through a small opening into the cavern, not before observed, about four feet above the surface of the water.
>
> The swimmer then returned to the pool by the passage through which he had left it, and we were compelled to admit that the cavern of Laieikawai was a reality, however wild and visionary may have been the stories connected with it. Not a single person present, including the governor, had ever before seen the passage

> to the cavern attempted, and the natives were overjoyed at what they had witnessed.
>
> To the many questions with which he was asked the old man returned but brief answers on his return, and when importuned to explain the method of his entrance to the cavern, that the secret might not be lost, he pointed significantly to the sea, and declared that there would be found thee bodies of those who sought to solve the mystery of the passage and failed (Kalākaua 1990:455-456).

This description suggests that Waiʻāpuka was not only massive, being approximately 100-feet in diameter, but also a classic sinkhole in an area known to be *karstic*, which is a geological term for limestone terrain that has been subjected to complex acidic weathering. Typically, *karstic* topography is prone to exhibiting a variety of subterranean and surficial features, including caves, tunnels, caverns, underground rivers and bodies of water, as well as sinkholes and cenotes. Unfortunately, by the time of McAllister's (1933) island-wide survey, the site of this culturally and topographically significant feature was destroyed by being filled with sediment. Whether man or natural forces are responsible for this act has not been ascertained.

Just after the turn-of-the-Century, Andrew Adams of the Territory's Forestry Division, reported on the agricultural and horticultural developments of Koʻolau Loa, stating:

> Mr. Andrew Adams, District Forester for the Koolauloa District, desired that no formal report for him be published but in correspondence he stated that "The Plantation is constantly planting Ironwood trees, which are thriving, but no systematic effort has been made toward forest planting, in fact the little planting that has been done could scarcely be dignified by the term 'forestation.' There are no forest nurseries, except several boxes on the premises of the head luna and my own where Iron wood trees are started from seeds.
>
> The native forest in the mountains is in good condition, and the Koa, of which there is a good belt between Malaekahana and Kaipapau valleys, is vigorous and thriving. The insect usually preying upon the Koa is not so much in evidence in this forest, it appears to me, as formerly, and there are many young Koas springing up; some of this is sizeable timber, but I doubt if it could ever be lumbered without great destruction to the surrounding forest, and especially the undergrowth, because of the almost inaccessible ridges on which the Koa stands (Adams 1905:90-91).

3.3.2 Cultural Practices

Although the spread of Western ideals and lifestyles was rampant at this time, there are several instances of Hawaiian traditional practices taking place in Kahuku. *Hula* and *mele* performances held in Kahuku in 1844 and 1849 were described by Emerson (1998). The first performance, a *hula*, called the Hula O-Niu, which took place in 1844 was described by Emerson (1998) as such:

> The so-called hula *o-niu* is not to be classed with the regular dances of the halau. It was rather a popular sport, in which men and women capered about in an informal dance while the players engaged in a competitive game of top-spinning. The instrument of sport was made from the lower pointed half of an oval coconut shell, or from the corresponding part of a small gourd. The sport was

> conducted in the presence of a mixed gathering of people amid the enthusiasm and boisterous effervescence which betting always greatly stimulated in Hawaii.
>
> The players were divided into two sides of equal number, and each player had before him a plank, slightly hollowed in the center—like the board on which the Hawaiians pounded their poi—to be used as the bed for spinning his top. The naked hand, unaided by whip or string, was used to impart to the rude top a spinning motion and at the same time the necessary projectile force—a balancing of forces that called for nice adjustment, lest the whirling thing reel too far to one side or run wild and fly its smooth bed. Victory was declared and the wager given to the player whose top spun the longest.
>
> The feature that most interests us is the singing, or cantillation, of the oli. In a dance and game of this sort, which the author's informant witnessed at Kahuku, Oahu, in 1844, one contestant on each side, in turn, cantillated an oli during the performance of the game and the dance (Emerson 1998:248).

The later performance, a *mele* about Kāne, recorded by Emerson (1998) took place in 1849 was viewed by King Kamehameha III's during his circuit around the island of Oʻahu. Emerson (1998) wrote:

> The author has already hinted at the form and character of the entertainments with which hula-folk sometimes beguiled their professional interludes. Fortunately the author is able to illustrate by means of song the very form of entertainment they provided for themselves on such an occasion. The following mele, cantillated with an accompaniment of expressive gesture, is one that was actually given at an awa-drinking bout indulged in by hula-folk. The author has an account of its recital at Kahuku, island of Oahu, so late as the year 1849, during a circuit of that island made by King Kamehameha III. This mele is reckoned as belonging to the ordinary repertory of the hula; but to which particular form of the dance it was devoted has not been learned…(Emerson 1998:129-130).

The fact that this performance was part of King Kamehameha III's circuit and recorded with such detail and contemplation by Emerson (1998), suggests that this unnamed *hula hālau* was no ordinary one. It is possible that this Kahuku *halau* has a long, but unrecorded history.

In terms of traditional agricultural practices, Handy (1940; as cited by Barrera 1981) maintain that Kahuku had a few areas that traditional Hawaiian farming methods may have taken place. They state the following about agriculture in Kahuku Ahupuaʻa:

> Inland from the Kahuku ranch house is Kaainapele Spring. Terrace symbols are shown south of the ranch house (U.S.G.S. topographic map, 1917), but Judge Rathburn says that these flats were built by Chinese before 1890 for rice paddies. They were irrigated with artesian water, but the water turned brackish and the paddies were abandoned. They were never used for taro. The 1917 map shows extensive terrace areas in the swampland seaward of the Oahu Railway, stretching l 5 miles south of Kukio Pond. These were originally terraces, were later planted to rice, and are now under sugar cane. According to John Kaleo, there is a small group of terraces, south of this swampland, named Kaukana. North of Kukio Pond was also a small area. It is reported that there were no

terraces up Kahuku Stream or Kaohiaae, its upland branch. Kaleo names 11 localities where terraces were formerly cultivated (as cited in Barrera 1981:13-14).

However, Handy and Handy (1940) stated that there were no terraces in Keana's stream or on the lowland plains. They also hold that, Kaleo, their informant for the area, knew of agricultural terraces in Kaukanalaau Stream.

3.3.3 Land Court Awards

Private land ownership was established in Hawai'i with the Māhele 'Āina, also known as the Great Māhele of 1848. Crown and *ali'i* lands were awarded in 1848 and *kuleana* titles were awarded to the general populace in 1850 (Chinen 1958). Awarded lands in this process are referred to as Land Commission Awards (LCAs). Over time, government lands were sold off to pay government expenses. The purchasers of these lands were awarded Grants or Royal Patent Grants (Chinen 1958). LCA's offer the native and foreign testimonies recorded during the claiming process, which shed light on what the land use of the area was in the early historic period. This information can be used to predict the types of resources may still be present in the project area.

In total, 86 LCAs and one Grant were identified within an approximate two kilometer radius around the Nā Pua Makani Project lands. A list of these properties by *ahupua'a* is provided in Table 1. Figure 4 and Figure 5 show the project area on TMK maps. The LCAs are described in Native Register (NR) comments and Foreign Testimonies (FT) submitted during the Māhele 'Āina and provide a narrative on traditional use of land within each *ahupua'a*.

Table 1. Land Court Awards (LCA) in or Near the Nā Pua Makani Wind Project Area

LCA	Ahupua`a	Claimant	Testimony	Book	TMK Map
2691:1 & 2	Kahuku	Laumea	8 *lo'i*, 2 watercourses (*'auwai*?), *kula* lands and shore area, *wauke* gardens, banana plantation (a mountain land), 3 *koa* trees, 2 *hala* trees, 1 *kukui* tree, houselot	NR v. 3, 592 FT v. 10, 169	5-6-004
2702:1	Kahuku	Waiaulaa	*Kula* lands planted with melons, spring, houselot with wooden fence	NR v.3, 598 FT v.10, 188	5-6-002
2704	Kahuku	Haui	1 *wiliwili* tree	-	-
2723:3	Kahuku	Puu	6 *lo'i*, *kula* land, houselot	NR v. 3, 607 FT v. 10, 166	5-6-002
2729:1	Kahuku	Polena	2 *'awa* gardens, 1 breadfruit garden, 1 *'ōhi'a* garden	-	5-6-004
2732	Kahuku	Pukawale	2 *wauke* gardens, 2 *koa* canoe trees	-	-
2785	Kahuku	Makakiekie	1 'awa, 5 *koa* canoe trees	-	-
2787	Kahuku	Makaokalai	1 *mala* of *'awa*	-	5-6-004
2880:1	Kahuku	Kupau	2 *mala noni*, 2 *mala* of *wauke*, 2 *koa* canoe trees	-	5-6-004
2872:1 & 2	Kahuku	Kaihikapu	18 *lo'i kalo*, *kula* lands, salt land, shore land, mountain land, *mala* of *wauke*, *mala* of sweet potato, houselot	NR v. 3, 672 FT v. 10, 154	5-6-004
2887:1 & 2	Kahuku	Keawe	3 *lo'i*, *kula* land, a *mala* of *'awa*, houselot	NR v. 3, 678 FT v. 10, 171	5-6-002 5-6-004
2916:1 & 2	Kahuku	Kaluau	5 *lo'i kalo*, watercourse (*'auwai*?), *mala* of *wauke*, *mala* of *'olena*, a *kuahiwi*, *kula* lands, houselot	NR v. 3, 692 FT v. 10, 168	5-6-004

LCA	Ahupua`a	Claimant	Testimony	Book	TMK Map
2918:1 & 2	Kahuku	Kawaa	1 *lo'i*, houselot	NR v. 3, 692 FT v.10, 182	5-6-002 5-6-004
3723:1	Kahuku	Male	9 *lo'i*, *kula* lands, houselot	NR v. 4, 156 FT v. 10, 171 NT v. 4, 368	5-6-002
4391:1 & 2	Kahuku and Keana	Kalawaiamanu	3 *'ili weuweu,* 1 *'ili* of sweet potato, 1 *'ili* of *wauke*, 1 *kula*, sugarcane and *wauke*, breadfruit, *noni*, *'awa* and banana, tobacco, houselot	NR v. 4, 292 FT v. 10, 184	5-6-006
4422:2	Kahuku	Kaumualii	10 *lo'i*, *kula* land with *wauke*, sweet potato, *hala*, salt land, a *mala* of *noni*, banana, watermelon, houselot	NR v. 4, 296 FT v. 10, 164	5-6-005
4458:1	Kahuku	Kaihupailani	5 *lo'i kalo*, *kula* lands, *kula* of *wauke*, wooded upland, *koa* tree, *kukui* tree, houselot	NR v. 4, 303 FT v. 10, 203	5-6-004
4558:1	Kahuku	-	Awarded on island of Kaua'i.	-	5-6-004
Grant 550	Kahuku and Keana	C. G. Hopkins	no specifics on land use	-	5-6-006
3712	Keana	Moku	1 houselot	NR v. 4,153 FT v. l0, 175 Not awarded to Moku, but awarded to Kinimaka	-
4392:1	Keana	Kalawaiamanu	no specifics on land use	-	5-5-002
7130	Keana	Kinimaka	As *Konohiki,* awarded entire *ahupua'a*; no specifics on land use	-	5-5-006
4631:3	Mālaekahana & Lā'iewai	Kii	2 *lo'i kalo*, 2 *lo'i*, 1 *kula*, 4 *'ili wauke*, 5 *'ili 'uala*, 1 *'ili* watermelon, 1 wooded upland, *pali 'uala* [sweet potato, cliff plantings], 1 *'apu'apu 'uala*, [sweet potato, pit plantings], 1 watercourse (*'auwai*?)	-	5-5-005
8452	Mālaekahana	A. Keohokalole	Entire *ahupua'a*	-	-
238-E:1	Lā'iewai	Pakolu	-	No testimony.	5-5-008
3696:1 & 2	Lā'iewai	Mahunalii	1 *lo'i*, *'ili* of *wauke*, 8 *'ili* of gourd, a *mala* of *wauke*, 2 *'ili* of *weuweu*, houselot	NR v. 4, 145 FT v.11, 281	5-5-005 5-5-008
3697:1, 2 & 3	Lā'iewai	Mahoe	3 *lo'i* and 1 *kula* land, houselot	NR v. 4, 146 FT v. 11, 281	5-5-008
3699:1, 2 & 3	Lā'iewai	Kahakea	3 *lo'i*, 1 steep patch sweet potato (*pali 'uala*),1 *kula*, 1 *'ili* of sweet potato, 2 *mala* of gourd, *'ili* of *wauke*, 2 *lo'i* and a houselot	NR v. 4, 146 FT v.11, 253	5-5-008
3699-B:1	Lā'iewai	Kainoahou	2 *lo'i kalo*, *kula* land and a houselot	FT v. 3, 531	5-5-008
3708:1	Lā'iewai	Moanauli	3 *lo'i* and 1 *kula* land	NR v. 14, 150 FT v. 11, 251	5-5-008
3714:2	Lā'iewai	Maii	7 *lo'i*, 3 *kula*, houselot, 2 *koa* trees	NR v. 4, 154 FT v. 11, 251	5-5-008
3731:1 & 3	Lā'iewai	Ihupuu	6 *lo'i*, houselot	FT v. 11, 247	5-5-008
3741:2	Lā'iewai	Waha	-	NR v. 4, 160 FT v. 11, 253	5-5-008
3743:1 & 2	Lā'iewai	Wi	5.5 *lo'i*, 9 *kula*, 3 mountain *kula*, 2 *hala* clumps, 1 gourd *kula*, 4 fallen *ko'a* trees, 1 *kula* houselot	- FT v. 11, 305	5-5-005 5-5-008
3773:1, 2 & 3	Lā'iewai	Amaka	8 *lo'i* and 16 *kula*	NR v. 4, 165 FT v. 11, 213	5-5-008

LCA	Ahupua`a	Claimant	Testimony	Book	TMK Map
3789:2 & 3	Lāʻiewai	Opala & Kaiimakuhi	1 *moʻo*, 3 *loʻi kalo*, 1 *loʻi*, *ʻili* of *wauke*, 2 *ʻili* of *weuweu*, houselot	- FT v. 11, 287	5-5-005
3807:1	Lāʻiewai	Laielohelohe	6 *loʻi*, 13 *kula* (1 planted in tobacco) and a houselot	NR v. 4, 173 FT v. 11, 249	5-5-008
3859:1	Lāʻiewai	Pahumoa	8 *loʻi*, 1 *kula*, 2 *ʻili* of sweet potato, 1 *mala* of *ʻawa*, houselot	NR v. 4, 179 FT v. 11, 261	5-5-008
3861:1, 2 & 3	Lāʻiewai	Pulehu	1 *moʻo*, 7 *loʻi*, 1 *ʻili* of *weuweu*, 1 *ʻili* of sweet potato, houselot	NR v. 4, 179 FT v. 11, 263	5-5-005 5-5-008
3864:1	Lāʻiewai	Paiakea	4 *loʻi*, 2 houselots, 3 *kula*	NR v. 4, 180 FT v. 11, 261	5-5-008
3873:1, 2 & 3	Lāʻiewai	Paakahi	9 *loʻi*, 7 *kula*, 1 fishery, 1 *koa* tree, houselot	NR v.4, 183 FT v. 11, 275	5-5-008
3930:1	Lāʻiewai	-	Awarded on Maui island.	-	5-5-008
3933:2	Lāʻiewai	Napaeka	Not awarded	NR v. 4, 189 FT v. 11, 257	5-5-008
3936:1, 2, 3 & 4	Lāʻiewai	Nakahili	5 *loʻi*, 3 *kula*, houselot	FT v. 11, 299	5-5-008
3938:3	Lāʻiewai	Puali	Not awarded	NR v. 4, 190 FT v. 11, 303	5-5-008
3945: 1 & 2	Lāʻiewai	Napahu	3 *loʻi*, 5 *kula*, houselot	NR v. 4, 196 FT v. 11, 285	5-5-008
4003:1, 2 & 3	Lāʻiewai	Hano	3 *loʻi*, 1 *kula*, 1 *kai* [fishery], 1 mtn. area; scattered claims: 6 *loʻi*, 10 *kula*, 1 houselot; in Kapuna: 1 *loʻi*, 2 *kula*	NR v. 4, 208 FT v. 44, 277	5-5-005 5-5-008
4039:1 & 2	Lāʻiewai	Kalawaiaholona	1 *loʻi*, 1 *kula* (planted in *wauke*)	NR v.4, 214 FT v.11, 306	5-5-008
4061:1, 2, 3 & 4	Lāʻiewai	Kuku	1 *kula*	-	5-5-008
4269:1	Lāʻiewai	Kala (testimony says "Kula")	1 *moʻo*, 3 *loʻi kalo*, 1 *ʻili* (Kakaiahui), 1 steep sweet potato planting, 2 sweet potato *loʻi* (dried out *loʻi*?), 2 *koa* canoe trees, houselot	NR v. 4, 235 FT v. 11, 311	5-5-008
4270:2	Lāʻiewai	Keao	5 *loʻi kalo*, 45 *moku weuweu*, 1 *moku moʻo*, 5 *koa* trees, houselot	NR v. 4, 235 FT v. 11, 308	5-5-008
4271:1, 2 & 3	Lāʻiewai	Kaleo	44 *loʻi*, 1 *kula*, 2 *ʻili* of *wauke*, houselot	NR v. 4, 235 FT v. 11, 265	5-5-008
4272:1	Lāʻiewai	Koi	7 *loʻi*, 3 *kula*, 1 *mala* of *ʻawa*, 2 *koa* trees, houselot	NR v. 4, 236 FT v.11, 269	5-5-008
4280:1	Lāʻiewai	Kauhane	1 *loʻi*, 1 *kula*	NR v. 4, 237 FT v. 11, 307	5-5-008
4283:1	Lāʻiewai	Koula	6 *loʻi*, 2 *kula*, 1 *moku* of *weuweu*, 1 *ʻili* planted in gourd, houselot	NR v. 4, 238 FT v. 11, 298	5-5-008
4288:1	Lāʻiewai	Kaonohi	7 *loʻi*, 2 dry *loʻi*, 1 clump of *hau*, 11 *moku* of *weuweu*, 1 *koa* tree	NR v. 4, 239 FT v. 11, 294	5-5-008
4290:1	Lāʻiewai	Kaiolohia	6 *loʻi*, 1 *ʻili* of *wauke*, 1 grass *kula*, 2 mala of *ʻawa*, 1 *mala* of *noni*, 3 *mala* of sweet potato, houselot	NR v. 4, 239 FT v. 11, 293	5-5-008
4291:1	Lāʻiewai	Kapule	4 *loʻi*, 1 *kula*, 1 *mala* of *ʻawa*, houselot, *kula wauke*, partly in Mālaekahana	NR v. 4, 240 FT v. 11, 296	5-5-008
4293:1	Lāʻiewai	Keawe	14 *loʻi*, 1 *kula*, 1 *ʻili* of sweet potato, 1 *ʻili* of *noni*, 1 *mala* of *wauke*, houselot	NR v. 4, 290 FT v. 11, 298	5-5-008
4297:1	Lāʻiewai	Kapuaokahala	4 *loʻi*, 3 *kula*, houselot	NR v. 4, 240 FT v. 11, 269	5-5-008
4298:1 & 2	Lāʻiewai	Kaualewa	2 *loʻi*, 1 *kula*, 3 *ʻili* of sweet potato, 2 *ʻili* of *wauke*, 1 *ʻili* of *noni*, 1 *mala* of sweet potato, 1 *mala* of *ʻawa*	NR v. 4, 241 FT v. 11, 297	5-5-005

LCA	Ahupua`a	Claimant	Testimony	Book	TMK Map
4300:1	Lāʻiewai	Kapule for Waikupulani	7 *ʻili* of sweet potato, 3 *loʻi kalo*, houselot	NR v. 4, 241 FT v. 11, 297	5-5-008
4301:1	Lāʻiewai	Kanakanui	7 *loʻi*, 1 *kula*, 1 *kula* of *wauke*, 4 *mala* of *noni*, 2 steep sweet potato plantings, 2 houselots	NR v. 4, 242 FT v. 11, 373	5-5-008
4302:1 & 2	Lāʻiewai	Kauaikaua	2 *koa* canoe trees	-	5-5-008
4325:1	Lāʻiewai	Kahoale	2 *loʻi*, 2 *kula*, houselot	NR v. 4, 259	5-5-008
4326:1, 2, 3 & 4	Lāʻiewai	Koalaukanu	8 *loʻi*, 5 *kula*, houselot	NR v. 4, 259 FT v. 11, 309	5-5-005 5-5-007 5-5-008
4329:1 & 2 (4329B)	Lāʻiewai	Kalua	5 *loʻi*, 7 *kula*, houselot	NR v. 4, 260 FT v. 11, 306	5-5-008
4331:1 & 2	Lāʻiewai	Kamano	7 *kalo loʻi*, 6 *kula*, 1 *kula* houselot, 1 fish pond	NR v. 4, 261 FT v.11, 310	5-5-007 5-5-0088
4333:1	Lāʻiewai	Kahoukua	6 *loʻi*, 17 *kula*, houselot	NR v. 4, 262 FT v. 11, 292	5-5-008
4334:1	Lāʻiewai	Kalou	2 *loʻi*, 17 *kula* (some planted in tobacco), houselot enclosed with a wooden fence	NR v. 4, 263 FT v. 11, 292	5-5-008
4336:1	Lāʻiewai	Kekui	-	-	5-5-008
4338:1 & 2	Lāʻiewai	Kahalelaau	1 *loʻi*, 1 *kula*, 3 *mala*, 1 *mala* of *wauke*, 1 shore area and a mountain land, houselot	NR v. 4, 265 FT v. 11, 293	5-5-008
4343:1 & 2	Lāʻiewai	Not found	10 *loʻi*, 7 *kula* (scattered claims)	NR v. 4, 267 FT v. 11, 298	5-5-005 5-5-008
4345:1	Lāʻiewai	Kaumiumi	1 *loʻi*, 3 *kula*, 3 fallen (shattered) *koa* trees, houselot	NR v. 4, 286 FT v. 11, 297	5-5-008
4361:1, 2 & 3	Lāʻiewai	-	no specifics on land use	NR v. 4, 271 FT v. 11, 300	5-5-005 5-5-008
4451:1, 2 & 3	Lāʻiewai	Kuapuu	16 *loʻi*, 5 *kula*, 3 *koa* trees, 4 *lua hānai* (holes where fish feed), houselot	NR v. 4, 301 FT v. 11, 301	5-5-008
4514:1, 4 & 5	Lāʻiewai	Pupuka	5 *kalo loʻi*, 5 *kula*, 1 houselot	NR v.4, 313 FT v. 11, 302	5-5-008
6989:2	Lāʻiewai	Kahuailua	5 *loʻi*, 11 *kula*, houselot	NR v. 5, 411 FT v. 11, 291	5-5-008
8355:3	Lāʻiewai	Kakau	2 *loʻi*, 1 *kula*, houselot	NR v. 5, 545 FT v. 10, 150	5-5-008
8440:1	Lāʻiewai	Kamamae	1 *loʻi*, 2 *wauke* patches, 2 sweet potato patches, one *mala* of *noni*, 2 *hala* trees, houselot	NR v. 5, 565 FT v. 11, 307	5-5-008
8443:1, 2 & 3	Lāʻiewai	Kauhalekua	5 *loʻi*, 2 *wauke* patches, 2 *kula*, 4 *weuweu* patchs, houselot	NR v. 5, 565 FT v. 11, 307	5-5-005
8559-B:35 & 36	Lāʻiewai	W.C. Lunalilo	Entire *ahupuaʻa* of Lāʻiewai (6,194 acres) awarded to King William C. Lunalilo. Several kuleana were awarded to those who improved the land (i.e., sweet potato, banana, and taro cultivation).	-	-
8580:1, 2, 3 & 6	Lāʻiewai	Kealiiwaiwaiole	5 *loʻi*, 3 *ʻili* of *kula*, 1 *mala* of *maiapia*, houselot	NR v. 4, 355 FT v. 11, 321	5-5-005 5-5-008
8580-B:1, 2 & 3	Lāʻiewai	Palii	5 *loʻi*, 1 *mala*	FT v. 11, 322	5-5-008
8580-C:1 R.P. 1307	Lāʻiewai	Kaioe	-	-	5-5-008
10619	Lāʻiewai	Poouahi	*kula* land	-	5-5-008

LCA	Ahupua`a	Claimant	Testimony	Book	TMK Map
10748:2 & 3	Lāʻiewai	Puhibaka	3 *loʻi*, 1 watercourse (ʻ*auwai*?), 1 *kula,* 1 *mala* of *noni*, 2 *koa* trees, 1 *mala* of sweet potato, 2 pools for fish	NR v. 4, 584 FT v. 11, 302	5-5-008
10763:1	Lāʻiewai	Puni	5 *loʻi*, 4 *kula*, houselot	NR v. 4, 584 FT v. 11, 304	5-5-008
10822:1, 2, 3 & 4	Lāʻiewai	Peka	4 *loʻi*, 1 kula patch, coconut tree and sweet potato patches, 10 *moʻo*, 1 *mala* of ʻ*awa*, the *pali* of Kaukauulua, the beach of Laiemaloo, 1 *kula* of mountain area	NR v. 4, 602 FT v. 11, 324	5-5-008
10928:1	Lāʻiewai	Ulukou	4 *kalo loʻi*, 1 sweet potato patch, houselot	NR v. 4, 614 FT v. 11, 304	5-5-008

LCA Awards in Kahuku Ahupuaʻa

While King Kamehameha III, under the name of Victoria Kamamalu, retained the entire *ahupuaʻa* of Kahuku as part of Crown Lands, the land rights of its tenants amounted to 4,752 acres (Indices 1929:27-8 as cited by Wong-Smith 1989:A-11). According to Rechtman (2009:15), "…eighty-five claims for Land Commission Award (LCAw.) parcels were made within the *ahupuaʻa* of Kahuku, but only seventy-two *kuleana* lots were awarded to native tenants. Nearly all of awards were located makai of the present day highway…" A total of 18 LCA claims were located within two kilometers of the Nā Pua Makani Project lands.

The following are claims for lands either within or partially within Kahuku Ahupuaʻa. These claims provide a narrative on traditional use of *kula* and *wao* lands.

No. 2887: Keawe (claimant), Kahuku, Oahu
January 5, 1848

> To the Land Commissioners, Respectful Greetings: I, Keawe, hereby state my claim for land at Kahuku. The name of the *moʻo* is Luahime. There are three *loʻi*, bounded on the north by Kawaa's [land] on the east by Kaluau's [land], on the south by *loʻi ko ʻele*, on the west by Paukoa's [land]. A *mala* of sweet potato is at Ahamau, and at Keana I have a *mala* of ʻ*awa*. My houselot is Kahuku, and is surrounded by *kula*. My right of occupancy is from the time of Kamehameha I. KEAWE x his mark

No. 2729: Polena (claimant), Kahuku, Oahu
January 4, 1848

> To the Land Commissioners, respectful greetings: I, Polena, hereby state my claim for land at Kahuku. The name of the *moʻo* is Luahine. There are seventeen *loʻi* bounded on the north by the *kula*, on the east by Kaihikapu's land, on the south by Kaluau's land, on the west by Maui's land. Three are cultivated *kulas* named Uwalapahupahu, Mamakaloa and Luahine. There is a sea shore land, named Puhikaawe. At Keana are two ʻ*awa* gardens, and a garden of breadfruit and ʻ*ōhiʻa*. My houselot is at Kahuku and is bounded on the north east and west by a *kula*, on the south by a salt bed. My right of occupancy is from the time of Kamehameha I. POLENA X his mark

No. 2704: Haui (claimant), Kahuku, Oahu
January 4, 1848

> To the Land Commissioners, respectful greeting: I, Haui, hereby state my claim for land at Kahuku. The name of the *moʻo* is Kuapuu; there are six *loʻi* and the watercourse, bounded on the north by a *kula*, on the east by Kekipi's, on the south by Makiloʻo, on the west by Kueulu's. There is a *kula* land, Ahamau, a fish pond named Kuhiwa, and a *loʻi* at Kii. At Keana I have a *wiliwili* tree. My right of occupancy was from the time of Kamehameha I. HAUI X his mark

No. 2732: Pukawale (claimant), Kahuku, Oahu
January 4, 1848

> To the Land Commissioners, respectful Greetings: I, Pukawale, hereby state my claim for land at Kahuku, a *moʻo* named Kuha. There are five *loʻi,* bounded on the north by those of Makakiekie, on the east by a *kula*, on the south by Maui's [*loʻi*], on the west by Kupaikia's [*loʻi*]. There is a shore area-the name of the sea [fishery] is Keekee, [and] a mountain area. At Makapala are two *loʻi*, bounded on the north by Umeume's, on the east by Kupau's, on the south by a *kula*, on the west by a *koʻele loʻi*. There is a cultivated *kula* named Makapala, another *kula* is Mauiloa, and there is another valley or [gulch]. At Keana are two *wauke* gardens and two *koa* canoe trees. My houselot is at Kahuku and it is surrounded by *kula*. I have had the right of occupancy since the time of Kamehameha I. PUKAWAKE X his mark

No. 2785: Makakiekie (claimant), Kahuku, Oahu
January 1, 1848

> To the Land Commissioners, Respectful Greetings: I, Makakiekie, herby state my claim for land at Kahuku. The name of the *moʻo* is Puulu. There are seven *loʻi*, bounded on the north by those of Keakaokawai, on the east by a *kula,* on the south by Pukawale's [land], on the west by Kupaihea's [land]. One *loʻi* and the watercourse adjoins those of Maui and Kuapuhi and *kula*. There is *kula* land at Kawelohale and Kii, two clusters of *hala* trees. At Ahamau are some gardens of sweet potato and gourd. There is a shore area called Kaohana. In the upland are some gardens of *wauke*, *ʻawa* and *noni*, and seven *koa* canoe trees. In another place is a watercourse adjoining Maui's. At Keana are one *ʻawa* garden, and five *koa* canoe trees. There is a mountain land, Kalapaweo. My house claim is at Kahuku, bounded on all sides by the *kula*. There is a fish pond for me, close to my house. My right of occupancy is from the time of Kamehameha I. MAKAKIEKIE X his mark

No. 2787: Makaokalai (claimant), Kahuku, Oahu
January 4, 1848

> To the Land Commissioners, Respectful Greetings: I, Makaokalai, hereby state my claim for land at Kahuku. At Luahine is one *loʻi* and two watercourses bounded on the north by Kawaa's [land], on the east by a *loʻi koʻele*, on the south by Keino's [land], on the west by Kawaa's (land]. There is also another *loʻi*, adjoining that at Akaihupiilani. There is a fishpond named Kumuhakane. There is also another area, Hanumoha. There are two gardens of sweet potato and *wauke*. There are two *ʻawa* gardens. There are four *koa* canoe trees. At Keana are

> two ʻ*awa* garden and three *koa* trees. My houselot is at Kahuku bounded on all sides by the *kula*. My right of occupancy is from the time of Kamehameha.
> MAKAOKALAI X his mark

LCA Awards in Keana Ahupuaʻa

A total of ten LCA claims were recorded for Keana Ahupuaʻa, either totally within or partially within the *ahupuaʻa*. Of these claims, two LCA were awarded. The *ahupuaʻa konohiki* (overseer), Kinimaka was closely affiliated with Kamehameha III, which may have helped secure his claim to the entire *ahupuaʻa*. According to O'Hare et al. 2008, "He was a *makua hanai* (adopted parent) to David Kalākaua, sixth king of Hawaiʻi. Kinimaka retained one-half of the *ahupuaʻa*, giving back the other half to pay his commutation fees for the properties that he retained. This second half became part of the government lands" (O'Hare et al. 2008:19).

Environmental conditions would partly explain for the dearth of claims for this *ahupuaʻa*, as these lands were not suited for most traditional methods of farming. While the coastal areas of Keana appeared to be largely brackish water swamp and/or sand with outcrops of limestone, the uplands were relatively dry and rocky - not suitable for terrace farming. This was expressed by the sentiments of Kaleo, E. C. Handy's trusted informant, as they recorded traditional land use on Oʻahu in the 1940s. He maintained that he knew of no agricultural terraces up the stream, nor of any on the plains of Keana (Handy 1940). This was later upheld in Handy and Handy (1991:462), who stated the following about Mālaekahana and Keana:

> These two small ahupuaʻa intervening between Laʻie and Kahuku (the northernmost tip of Oahu) show much the same pattern, in miniature, of dune coasts, elevated coral, and broken level land seaward from the hills. Each has a small stream. There were formerly some irrigated terraces in Malaekahana (Wayclear-for-work), but not in Keana (The-cave) (as cited by O'Hare et al. 2008:19).

A total of four LCA claims were located within two kilometers of the Nā Pua Makani Project lands. The following are claims for lands either within or partially within Keana Ahupuaʻa. These claims provide a narrative on traditional use of Keana's *kula* and *wao* lands.

No. 4329B: Kuapuhi (claimant), Keana, Oʻahu
January 1, 1847
N.R. 277v4 [Listed as 4392]

> To the Land Commissioners, Greetings: I, Kuapuhi, am a claimant at Konikaa, of three ʻ*ili* of sweet potatoes, bounded on the north and south by pali, on the east by Kahulihana; on the west by Maii; My house and the kula are in my *moʻo*. My right of occupancy is from the time of Kamehameha I.
> KUAPUHI X, his mark

F.T. 185vl0
No. 4392: Kuapuhi [should be 4329B]

> Kalawaiamanu, sworn says he knows the land of Kuapuhi in Keana. It consists of a piece of cultivated *kula* land, planted with potatoes. This piece may contain a quarter of an acre and is bounded:

On Hauula side by a *pali*
Mauka and Waialua side[s] by the *konohiki*
Makai by Kalawaiamanu's land.

Claimant's house lot is *makai* of his land and is enclosed with a stone wall. He has held the land for over 20 years. The konohiki consented to the claim for the piece of *kula* and house site.

[Award 4329B; R.P. 6247; Keana Koolauloa; 2 ap.; .71 Ac.; Award 4392 contains the documents for this award]

No. 4391: Kalawaiamanu (claimant), Keana, Oahu
January 3, 1848

To the Land Commissioners, Greetings: I, Kalawaiamanu, am a claimant in the *ʻili* in Louana. There are three *ʻili weuweu*, one *ʻili* of sweet potato, one *ʻili* of *wauke*, bounded on the north by the *kula*, on the east and west by sugarcane, on the south by the *pali*. Here are the jump lands: At Halulu is sugarcane, *wauke*. At Kahalau is breadfruit and *noni*. At Keaaulu is a breadfruit, and *noni*. At Kapuou is *noni*. At Kealahaka is *ʻawa*, sugar cane, and banana. At Paos is *ʻawa*. At Uumhalu is a *kula* planted in sweet potato and watermelon. My house is at Nonoula. My right of occupancy is from the time of Kameharneha II. KALAWAIMANU

No. 3712: Moku (claimant), Keana, Oahu
January 10, 1848
N.R. 153v4

To the Land Commissioners, Greetings and Peace: I, Moku, hereby state my chum for land at Keana. One *mala* is at Paeloa. One *mala* is at Aahupalua. At Malekahana I have one *mala*. At Kawaiu is one *mala*. At Makanikeoloi, an upland, is a *mala* of *ʻawa* and *wauke*. One *mala* is at Paaulani. One *mala* is at Aewai. At Laie I have a portion of a *loʻi* adjoining Kahalelaau's. At Kahuku I have one *loʻi* at Mookini, adjoining Kiha's *loʻis* [sic]. A watercourse is at Luahine. My house claim is at Keana, surrounded by my *kula*. My right of occupancy was from Kamehameha III. MOKU

F.T. 175vl0
Claim 3712: Moku

Kiha, sworn, says Moku left this part of the country some 5 months ago and went to live on Hawaii. Witness knows the *kalo* patch claimed by Moku in Kahuku. It is not planted.

(It was stated by several present that Moku had given up the pieces of land in this Claim, and no one appeared to represent him).

The Konohiki claims this land.

[No. 3712 not awarded]

LCA Awards in Mālaekahana and Lāʻiewai Ahupuaʻa (in the Vicinity of Nā Pua Makani Project Area)

A total of 21 land claims were made for the *ahupuaʻa* of Mālaekahana, yet only six were awarded with one award being the entire *ahupuaʻa*. The LCA claims suggest that traditional agricultural practices occurred in Mālaekahana, but was limited to dryland cultivation as well as gathering of plant resources, while wetland agricultures was practicing in adjacent Lāʻie (Hammatt 1996). Land use as indicated in Mālaekahana LCA claims is described by Hammatt (1996) as follows:

> In 1850 the *ahupuaʻa* of Mālaekahana (3280 Acres) is claimed by A. Keohokalole, mother of King Kalākaua, Queen Liliuʻokalani, Miriam Likelike Cleghorn and Wm. Pitt Leleiohoku (II) and is awarded to her in 1854. Of 21 claims for land parcels (*apana*) in Mālaekahana only four *kuleana* claims are awarded. There are no claims for *loʻi* in Mālaekahana. The claims often state that the area jumps around and goes from sea to mountain and therefore boundaries can't be given. The claims for Mālaekahana mention 15 *kula*, 6 *mala* ,and 1 *moʻo* with no crop given, 12 *wauke* patches, 7 house sites, 6 banana patches, 3 potato patches, 5 koa trees for canoe making, and 1 *mala* each for *hala*, *noni*, *ti*, *hau,* breadfruit and tobacco. Two mountain areas are also claimed. Two house sites, 1 banana and potato land, and 1 *wauke* land are awarded. However, no present maps show where these awards were located. The old Mālaekahana maps at the State Survey office are missing (as reported by the survey office to Dr. V. Creed on 2/2/96). Tax maps do not show the location of these few awards (Hammatt 1996:4-5).

After exhausting all available historic maps for Mālaekahana during this documentary research, no maps were found depicting the Mālaekahana LCA locations. Other than the entire *ahupuaʻa* (awarded to Ane Keohokalole), only one LCA claim, partially in both the Mālaekahana and Lāʻiewai Ahupuaʻa, was located within two kilometers of the Nā Pua Makani Project lands.

A total of 63 land claims were located in the Lāʻiewai Ahupuaʻa within two kilometers of the Nā Pua Makani Project lands (Table 1). The LCA claims suggest that traditional wetland agricultures were practiced in Lāʻiewai (Hammatt 1996).

The succeeding sample of Mālaekahana and Lāʻiewai LCA claims provide insights on the area's traditional land use.

No. 8537: Kahawaii (claimant deceased), Mālaekahana, Oahu

> LCA 8537 AWARDEE Kahawaii (Deceased) – Kuhapa, sworn, says he knows the land claimed by Kahawaii in Malaekahana. Part of it is planted in wauke. This part is bounded on all sides by the Konohiki's lands. The house site of claimant is not enclosed. Claimant held land from his youth. He died last April (1840). His wife is his heir. Paakahi, sworn, says he knows of 3 kalo patches claimed by Kahawaii in Laie. The Konohiki took this land away because claimant did not got he [sic] poalima. The konohiki of Malaekahana consented to this claim.

No. 7727: Paukoa (claimant deceased), Mālaekahana, Oahu

> LCA 7727 AWARDEE Paukoa (Deceased) – Kuhapa, sworn, …in Malaekahana. Part of it has been given up to the Konohiki by claimant's widow. The portion

retained by her is planted with wauke. It is bounded on the Hauula side by Kahoowaha's land, Mauka by Kuhapa's land, Waialua side by Kananui's land, makai by Nawai's land. Paukoa died in the present year.

No. 8355: Kakau (claimant), Mālaekahana, Oahu

LCA 8355 AWARDEE Kakau - …is not presently cultivated. Part of it was planted last year with bananas, wauke (about half an acre). Claimant occupied these lands since the time of Kamehameha I…

No. 3861: 2&3: Pulehu (claimant), Lāʻie, Oahu
January 5, 1848

To the Land Commissioners, Greetings: I hereby state the claim for my land. Kahikiea is the *moʻo*. There are five taro *loʻi* at Kahikiea. One *loʻi* is at Kaholo, one *loʻi* is at Paakea. One *ʻili weawea* [grass or herbage], one *moʻo* is at Malaekahana. One *ʻili* of sweet potatoes is at Omao. The right of my *makuas* was from Liholiho.

Foreign Testimony V. 11:263
No. 386l Pulehu

Kauaikaua, sworn says, he knows the land claimed by Pulehu in Laie. It consists of 6 *kalo* patches, a piece of *kula* land and a House site. The 6 patches are bounded on Hauula side by Kahalelaau's land, Mauka and Waialua side by the Konohiki, Makai by Kii's land. The *kula* land is planted with *wauke* - contains about half an acre - surrounded by the Konohiki. The house site is not enclosed, there is one house on it. Claimant has held the land for 30 years. The Konohiki''s agent consented to this claim.

No. 4003:3: Hano (claimant), Lāʻie, Oahu
January 5, 1848

Native Register V. 4:208
January 5, 1848

To the Land Commissioners, Greetings: I, Hano am a claimant of land at Laie. In the *ʻili* of Paoo are three *loʻi*, one *kula*, one *kai* /fishery/ one mountain area. The boundaries are: on the north, *muliwai* land of Poouahi, on the east, land of Kaaipuaa, on the south, land of Kauwaiawa, on the west, land of Palii. Here are the scattered claims: In the *ʻili* or the *ahupuaʻa*, six *loʻi*, ten *kula*. Seaward of the mountain, one house lot. In the *ʻili* of Kapuna, one *loʻi*, two *kula*. Because these claims are so very scattered, therefore it is noc practical to describe their boundaries lo you, the Land Commissioners. My right of occupancy at these places is from the time of Kamehameha 1 until the reign of Kamehameha III at this time.

Foreign Testimony V. 11:277
No. 4003 Hano

Kauaiamanu, sworn says, he knows the land-claimed by Hano in Laie. It consists of 3 *kalo* patches, a piece of *kula* land, and a House lot. The 3 patches are bounded on Hauula side by Maii's land, Mauka by Hoanauli's land,- Waialua side by Kaluaiaawa's land. - Makai by Kauaiamanu's land. The *kula* land is planted with tobacco & bananas. It is bounded on Hauula side by Kauaiamanu's land, -

Mauka by Napahu's land, -Waialua and Makai by the Konohiki. The houselot is in another place. It is not enclosed. Claimant has held the land for 9 years. The konohiki's agent had no other objection to the claim ....

No. 4343:2: Kauaiomono (claimant), Lāʻie, Oahu
January 3, 1848

Native Register V. 4:267
January 3, 1848

To the Land Commissioners, Greetings: I, Kauaiomano, am a claimant at Laie for four *loʻi* and one *kula*. The boundaries are: north, the land of Pupukea, east, Kalakee's /land/, south, the land of Napaeko, west, the land of Hano. The scattered *loʻis* and *kulas* are as follows: Kalawa, one *loʻi*, no *kula*. Kapaakea, four *loʻi*, three *kula*. Kaholi, no *loʻi*, no *kula*. Kahikiea no *loʻi*, two *kula*. Kumupali, no *loʻi*, one *kula*. My right of occupancy is from my *kupunas* until the present.

Foreign Testimony V. 11:298
No. 4343 Kauaiomano

Kauaikaua, sworn says, he knows-the land of claimant in Laie. It consists of 12 *kalo* patches, 7 of which are planted, a piece of *kula* land and a house site. 5 of the patches have not been planted for two years. The 7 *kalo* patches which are planted are bounded on Hauula side by Kaleoʻs land, -Mauka by Elemakule's land, ·Waialua side by the Konohiki, -Makai by Kamamai's land. The *kula* land is bounded on Hauula side by Pulehu's land, - Mauka by Kaleo's land, Waialua side by the land of Malaekahana, - Makai by Kamamai's land. It is planted with *wauke*. The house site is separate- not enclosed. Claimant derived the land from his ancestors. The Konohiki's agent had no other objection to this claim ...

No. 4361:3: Kii (claimant), Lāʻie, Oahu
January 3, 1848

Native Register V. 4:271 Laie wai, Oahu
January 3, 1848

To the Land Commissioners, Greetings: I, Kii.am 1 claimant of land in the *ʻili* of Kahikea. There are two taro *loʻi*, a *kula* and a wooded upland named Omao. The boundaries are: north, Napilipili, east, Kaiwikkole, west, a stream, south, Kapaakea. Here are the scattered claims: At Puhahaka is one *ʻili* of *wauke*. At Namahana, is one *ʻili* of *wauke* and a *pali uala*; [steep planting of sweet potatoes]. At Keanahale is one *ʻili* of *wauke* and an *apuapuʻuala*. At Noholua are two *loʻi* and a watercourse. At Paakea is one *ʻili* of *wauke*, two *ʻili* of sweet potato, and, *ʻili* of watermelon. At Malaekahana is one *ʻili* of sweet potato. Malaekahana is a separate *ahupuaʻa*. Also, my house is at Paakea. My occupancy has been from the reign of Kamehameha 3 [sic]

Foreign Testimony V. 11:300
No. 4361 Kii

Kupehia, sworn says, he knows the land claimed by Kii in Laie. It consists of 2 *kalo* patches, a piece of *kula* land and a house site. The 3 patches are bounded on Hauula side by Kahalelaau's land, - Maauka by Pulehua's, - Waialua side by the Konohiki, - Makai by Mahoe's land. The *kula* land is bounded on Hauula side by

Kauaiomano's, - Mauka and Makai by the *konohiki*, - Waialua side by Kauikaua's land. The house site is distinct from the land – not enclosed. Claimant has held his land for over ten years. The land claimed in Malaekahana is *nahelehele*. The agent of the Konohiki of Laie had no objections to this claim.

No. 3789:2: Opala and Kaiimakuhi (claimants), Lāʻie, Oahu
January 4, 1848

To the Land Commissioners, Greetings: I hereby state my claim. Naueloii is the moʻo, with one taro loʻi and a portion of a loʻi. Two taro loʻi are at Kaholi and one ʻili of wauke is at Kaholii. One ʻili of weuweu is at Lilimano. Oneʻili of weuweu is at Kauamopuu and one house lot. The occupancy has been from the time of Kamehameha I.

I, Opala, hereby state my claim for one taro loʻi at Kaholi. My right was from my *makuas*.

Foreign Testimony V. 11:287
No. 3789 Opala

Kalimakuhi, sworn says he knows the *kalo* patch claimed by Opala in Laie. It has not been cultivated for 2 years. (This was confirmed by others present). The agent of the Konohiki claimed this land for Claimant.

No. 3743:4: Wi (claimant), Lāʻie, Oahu
January 3, 1848

To the Land Commissioners. At Laie in the ʻ*ili* of Naueloli are two *loʻi* and one *kula*. I, Wi, the one who makes this claim, give the boundaries as follows: on the north, the land of Kaualewa, on the east, the land of Palii, on the south, the land of Lakee, on the west, Kanaikawa's land. Here are the scattered claims: in the ʻ*ili* of Kamapuna, one *loʻi*, one *kula*, one mountain *kula*. In the ʻ*ili* of Keahupuaa, two *loʻi*, four *kula*, two *hala* clumps, one *kula* planted in gourd. In the ʻ*ili* of Lakee, one *kula* house lot. In the ʻ*ili* of Kaulua, one mountain *kula*. Because these claims of mine are so scattered, O Land Commssioners, it is not possible to describe their boundaries. My right of occupancy of these claims is from my kupunas to the present reign of Kamehameha III. One *koʻa* tree is in Pia's place.

Foreign Testimony V. 11:305
No. 3743 Wi (deceased)

Poouahi, sworn says, he knows the land claimed by Wi in Laie. It consists of 4 *kalo* patches in 2 pieces, 2 pieces of *kula* land and a house site. The first piece, of 3 patches, is bounded on Hauula side by Mahakea's, - Mauka by Poouahi's, - Waialua side the same, - Makai by Kalimakuhi's. The second piece, of one patch is bounded by Ihipu's, - Mauka and Waialua side by the Konohiki, - and planted with *wauke*, bananas, etc. The house site is distinct from the land – not enclosed. Claimant held the land for about 20 years. The Konohiki's agent had no other objections to this claim…

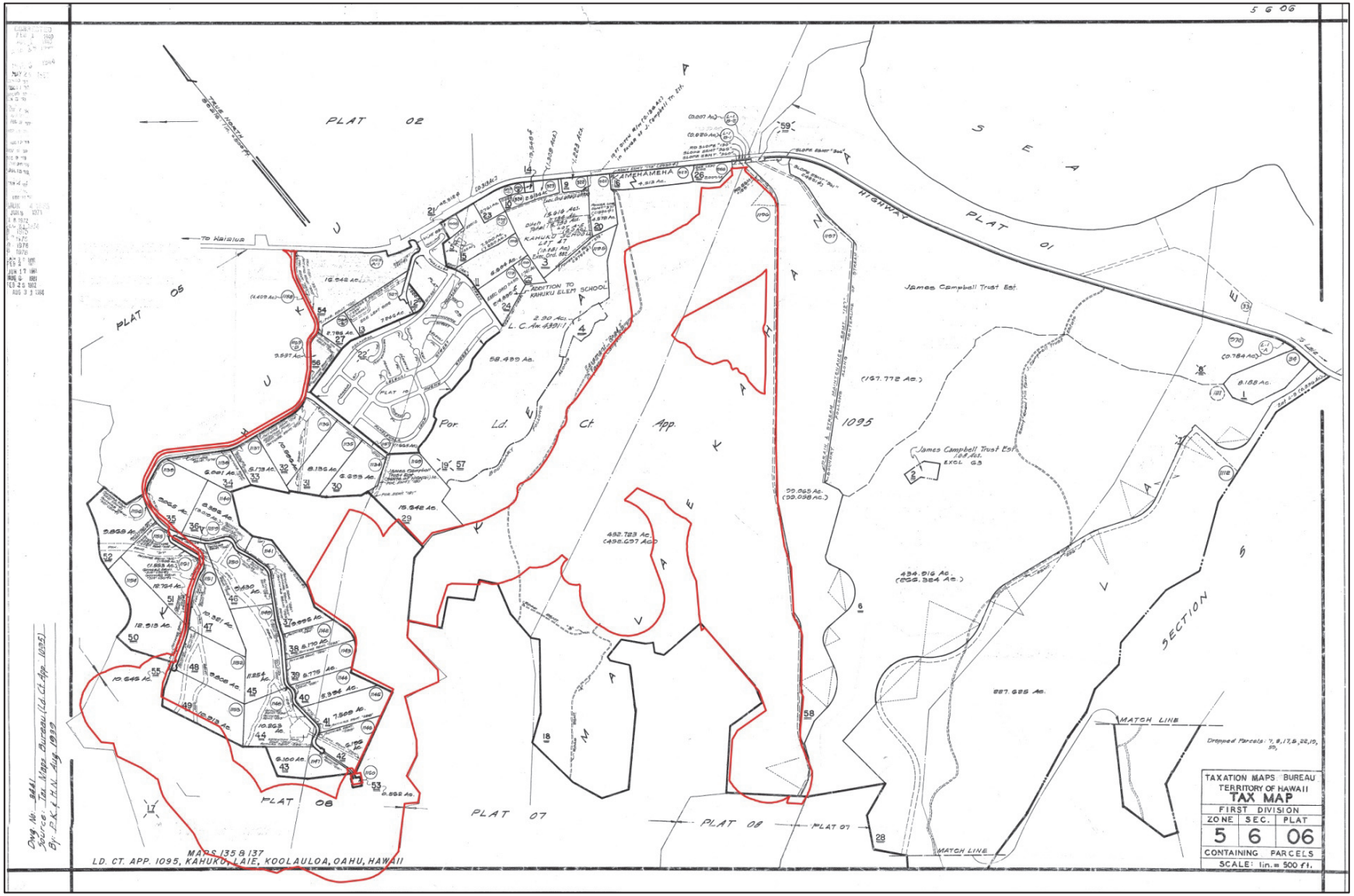

Figure 4. Project area depicted on TMK Map.

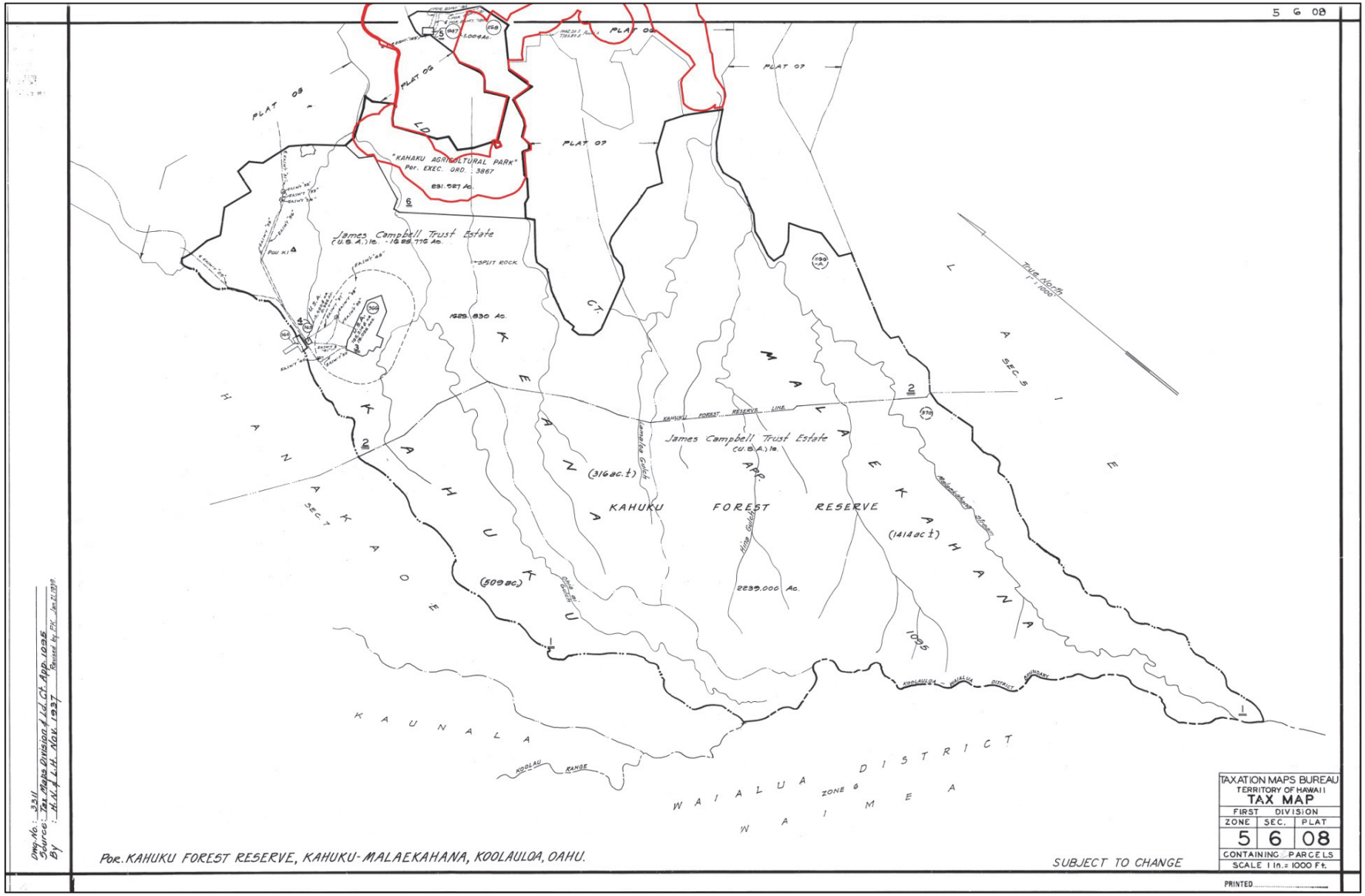

Figure 5. Project area depicted on TMK Map.

3.3.4 Historic Agriculture, Religion, Developments, and Military Land Use

The Kahuku Ranch

According to Rechtman (2009), prior to Campbell's ownership, Charles Gordon Hopkins obtained the *ahupuaʻa* of Kahuku in 1851 the as part of Grant No. 550 and founded a ranch at Kahuku.

The result of these developments were not all positive, as suggested by Emerson (1928), where he writes that the tyranny of the new land owners had caused the Native population of Kahuku to suffer, on which he elaborates:

> Kahuku had passed from control of its chief to that of an Englishman. The pastures of his big ranch extended along the shore for 12 miles, reaching inland to the mountain chain, and he was so autocratic that the natives could not own a dog, or pasture a cow or horse, without his consent. The depredations of herds and flocks on their small homesteads became unbearable, but they appealed in vain for their beloved *hala* trees and patches of vegetables. . . There was no redress, however, and with the fading of the forests the people also disappeared and the once populous district of Kahuku became a lonely sheep and cattle ranch (Emerson 1928:135-136 as cited in Rechtman 2009).

The 25,000 acre property in Kahuku that would become Kahuku Ranch had passed through a series of hands before it was purchased by James Campbell for $63,500 cash in the mid-1870s. Campbell then stocked this ranch with 3,000 head of cattle as well as a number of sheep and horses he hoped would reach 30,000 (Silva 1984:C-16).

The Kahuku Plantation

By the late 1890s, Campbell had leased a large portion of his ranch lands to James B. Castle, which would become the Kahuku Plantation. The plantation proved to be innovative both socially and economically. In the early 1900s, the Hawaiian Sugar Planters' Association became a recognized organization that aimed to improve general working and living conditions of plantation workers. Kahuku Plantation became a pioneer in the movement, providing a day-care center for the working mothers beginning in 1905 (Thrum 1921:116). The plantation had also developed a new fuel-saving device that burnt waste molasses, creating an ash that was then used as a high grade fertilizer (ibid.). By the mid-1930s, the plantation was cultivating nearly 4,500 acres and had 1,137 people under its employ (O'Hare and Hammatt 2006:21). With its heyday long over, the Kahuku Plantation shut its doors in 1971, causing the greater Kahuku area to experience economic instability for years.

During the plantation's operation, water was an extremely valued resource in the Kahuku and Keana area. Prior to the plantation, traditional agricultural methods relied on seasonal rains, the area's few springs, and intermittent streams. Thus, the plantation began pumping spring water, stream water, and rain to irrigate the sugarcane, but "…these sources were found to be insufficient. Thereafter, the company resorted to artesian wells, which came to be the main source of water" (Kuykendall 1967:69).

Religion and Religious Developments in Kahuku, Keana, and Mālaekahana Ahupuaʻa

Western religions in Kahuku during the late 1800s were jostling to gain the loyalty of the community. In the 1878 *Annual Report of the Hawaiian Evangelical Association*, Kahuku Church, which eventually merged with Hauʻula Church, was one of the last Hawaiian speaking Evangelical churches on the island (Hawaiian Evangelical Association 1878:2). This church is later described in this report as "one of the feeble churches," to the point that, "its pastor has been called to Waianae, and installed over that church…It would be well for this church to unite with some stronger one…" (Hawaiian Evangelical Association 1878:10).

The Church of Jesus Christ of Latter Day Saints gained the majority of Lāʻie and Mālaekahana's faith in as early as 1850, when Mormon missionaries initially settled in the area. According to Ahlo and Hommon (1981), the Mormon Church purchased approximately 6,000 acres in the area for farming. Of these lands, approximately 1,500 acres of which were ideal for agriculture. Crops that were initially cultivated on these lands, but by the end of the 19th century pineapple and sugar cane dominated. This is upheld in Vogeler et al. (2011), who largely cite Britsch (1989), holding that Brigham Young sent the first eight Mormon missionaries to the Hawaiian Islands in 1850. This initial mission yielded a significant religious, economic, and infrastructural foothold for the Mormon Church, as is evident in Voegler et al. (2011):

> They arrived on December 12 in Honolulu, and then split up, traveling in groups of two or three to the other islands. Their original mission to convert the mainly foreign-born (*haole*) population proved to be difficult. The missionaries were discouraged and discussed returning home, but they instead decided to stay, to learn the Hawaiian language, and to preach to the native Hawaiians...The number of Hawaiian converts quickly grew, and in 1853, they decided to buy land on Lānaʻi to start a colony, where all the brethren could live and work.
>
> The Lānaʻi colony was not a success, for a wide variety of reasons, and in 1864, the mission decided to found a new gathering place. In 1864, two Latter-day Saints Mission presidents, Francis A. Hammond and George Nebecker, traveled to Hawaiʻi to purchase land for a new Mormon settlement. Land was fairly cheap at this time in Hawaiʻi as the end of the Civil War in the U.S. had led to a depression in the sugar market, leading to an eagerness to sell land by sugar planters… In 1865, Hammond purchased a six-thousand acre plantation called "Lāʻie" from Thomas T. Dougherty. By 1865, the Church had 6,000 acres, probably all the land in Lāʻiemaloʻo and a portion of the land in Lāʻiewai (minus the 298.5 acres owned by the Kahuku Ranch and Kahuku Sugar Company).
>
> On this land was 600 head of cattle, 500 sheep, 250 goats, 20 horses, a large frame house, five native houses, and five acres of cotton…The first order of business for the new owners was to establish a cash crop that would sustain the settlement. Although corn and cotton were grown for the first two years, it soon became evident that sugar would be the salvation of the growing community. A mill was purchased and set up in Lāʻie in 1868...The problem of insufficient water in some years was solved in the early 1880s, when a flume was built to bring water down from the Koʻolau Mountains. A new, more efficient mill was built in 1879…
>
> By 1866, about two hundred Hawaiians, mostly members of the Church, were living at the Lāʻie mission settlement…Growth of the community was slow through the 1870s, due to most Hawaiians wishing to stay near their own homes.

> In 1874, only about 377 members lived near the mission... However, church membership as a whole did increase during this time; in 1865, the island-wide membership of the Hawaiian mission was recorded as 500; by 1906, it was 7,212 strong… (Voegler et al. 2011:41-42).

In 1920, the Mormon Temple was erected in Lāʻie, with a price tag of $250,000, which was intended to resemble a tabernacle in Salt Lake (Elder 1922:194).

Transportation in Kahuku, Keana, and Mālaekahana Ahupuaʻa

The entire northern portion of Oʻahu was greatly isolated from the Western urban sprawl of Honolulu until paved roadways and rail were implemented. While this area remained "country," the new transportation infrastructure forever changed the landscape Kahuku, Keana, and Mālaekahana Ahupuaʻa. According to Kuykendall (1953),

> On Oahu, what came to be called the "round-the-island road" --ancestor of Kamehameha Highway--extended from Honolulu to Ewa, thence across the central plateau to Waialua; from that place it ran along the coast past Kahuku and Kualoa to Kaneohe, where it joined the road which came over the Nuuanu pali from Honolulu. In 1856, for the first time, a four-wheeled carriage drawn by a pair of horses was driven over the portion of this road between Honolulu and Kahuku. Three years later, a Captain Coffin is reported to have driven with a carriage and span of horses from Honolulu to Kahuku one day in ten hours and to have returned the following day in eight hours (Kuykendall 1953:25).

In the late 1800s, the Oʻahu Railway and Land Co. ran a line up to Kahuku from Honolulu via the Pali – with the terminus of the line running from Waiʻanae (Honolulu Star-Bulletin 1941:155). This line was lauded for opening up new economic opportunities to windward districts of Oʻahu (ibid.:158). Wong-Smith (1989) summarizes this as follows:

> For its first nine years Kahuku Plantation Co. relied on little coastal vessels which anchored offshore from Kahuku Landing to bring supplies and return raw sugar to Honolulu. Five miles of 36-inch gauge railway, some of it portable, had been laid in 1890 to haul the cane through the plantation fields to the Kahuku mill and thence to the landing. The plantation track extended south opposite Laie and the Mormon settlement, which sent its cane to be ground at Kahuku… In 1899. the Oahu Railway finally laid track to a terminal at Kahuku. It hauled sugar and the agricultural freight products back and forth across the windward part of Oahu. The Koolau Railway Co. laid tracks from Kahana to Kahuku and served as a common carrier until 1931. From then until the 1950s, its sole function was to carry cane from the northeastern field of the island (Wong-Smith 1989:A-15-16).

Military Presence in Kahuku, Keana, and Mālaekahana Ahupuaʻa

Prior to the construction of any U.S. military bases in Hawaiʻi, the American Marconi Company set up a wireless operation in Hawaiʻi in 1902, building their transpacific receiving station at Kahuku in 1915. This site is located less than 3 kilometers north of the Nā Pua Makani Wind Project area.

According to O'Hare et al. (2008), Kahuku Golf Course, which is less than one kilometer east of the project area, also played a part in World War II, stating:

> It was during the attack on Pearl Harbor on December 7, 1941 that the Kahuku Golf Course was first used as an emergency landing field. On December 6, twelve B-17s had left California on route to the Philippines, with a stopover for refueling at Oʻahu. They flew into Oʻahu completely unaware of the Japanese attack and had to quickly dodge strafing by the Japanese Zeros. Amazingly, they all managed to make emergency landings, seven at Hickam Air Field, one at Wheeler Airfield, one at Bellows Airfield, one at the tiny Haleʻiwa Airport, and one on the grass and sand surface of the Kahuku Golf Course…The Army Air Force on Oʻahu had planned to build an emergency strip at the golf course, but it had not been completed by the time of Pearl Harbor attack (O'Hare 2008:28).

In 1942, the Kahuku Airfield was constructed as an auxiliary airfield, with several runways, ancillary bunkers, and emplacements (O'Hare and Hammatt 2006:21). Pilots from Wheeler Air Force Base were trained to fly a variety of aircraft on this airfield. By the late 1940s, Kahuku Field was abandoned and the lands once leased by the military were returned to the landowner. This former airfield was located near the present day Turtle Bay Resort.

According to Nakamura (1981), the *wao/mauka* areas of Kahuku and Keana Ahupuaʻa were also leased to the U. S. Military for training purposes in the mid-1950s. These lands, referred to as the Kahuku Training Area (KTA), have continuously been utilized by various branches of the United States Department of Defense and have not been easily accessible to the general public since. KTA makes up most of the western boundary of the Nā Pua Makani project area.

4.0 PREVIOUS ARCHAEOLOGY

A total of 39 archaeological studies have been conducted in various locations within a 2.5 kilometer radius around the proposed Nā Pua Makani Wind Project lands. Presented in the following section is a summary of the findings for these reports. A list of the reports and their locations in chronological order is provided in Table 2 and map of the project area with all of the study areas and known archaeological sites is provided in Figure 6.

Table 2. Previous Archaeological Investigations in the Vicinity of Nā Pua Makani Wind Project

Authors	Year	Report Title and Publisher	Project Location	Findings
McAllister	1933	*Archaeology of Oahu.* Bishop Museum: Honolulu.	Island-wide survey.	Sites 50-80-02-0268 through -0272 near Nā Pua Makani Wind Project area.
Cox and Stasack	1970	Hawaiian Petroglyphs. Bishop Museum Press, Honolulu.	Island-wide survey.	Located a petroglyph on a beach boulder in either Keana or Kahuku Ahupuaʻa.
Rosendahl	1977	*Archaeological Inventory and Evaluation Report for U.S. Army Support Command, Hawaii (USASCH). Parts I Report Text and II Tables.* Department of Anthropology, Bishop Museum, Honolulu.	Kahuku Training Area, selected portions totaling 1,044 acres.	Relocation of 3 sites and discovery of 6 new sites (No. 50-80-02-9506 through -9509); Site -9506 (historic stone faced irrigation ditch) is less than 0.5 km southwest of project area.
Barerra	1979	*Kahuku Archaeological Survey*. Chiniago Inc. Honolulu.	Described in Barrera (1981) as located "…inland of the post office at Kahuku."	Discovery of 5 sites (No. 50-80-02-1425 through -1429), largely traditional.
Clark	1979	*Preliminary Archaeological Reconnaissance Report for Koolau Loa Housing Project and Park Expansion, Kahuku, Island of Oahu.* Kualoa Archaeological Research Project, Department of Parks and Recreation, City and County of Honolulu.	57.3-acres in the proposed Koolau Loa Housing Project area and Park Expansion Area, Kahuku.	Relocation of Site -0269, A "sacred way," (described as a Hawaiian sacred area having no structural features.
Schilt	1979	*Archaeological Reconnaissance Survey of Proposed Extension, Kahuku Elementary School, Kahuku, Oʻahu*. Department of Anthropology., Bernice P. Bishop Museum, Honolulu.	4-acres in the Proposed Extension of Kahuku Elementary School.	Relocated a rock shelter and platform previously recorded by McAllister (1933). Two new sites (a mound and overhang shelter were also found.
Yent & Estioko-Griffin	1980	*Archaeological Investigations at Mālaekahana (50-80-02-2801), Windward Oʻahu.* DLNR, Honolulu.	Mālaekahana State Park, Phase I (south portion)	Site No. -2801; 3-year project; performed mapping, testing, excavation, and analysis; 3 major occupational layers found (ca. AD 1600-1780).

Authors	Year	Report Title and Publisher	Project Location	Findings
Barrera	1981	*Cultural Resources Reconnaissance of the Kahuku Agricultural Park Project Area*. Chiniago Inc. Honolulu.	Four separate parcels totaling 3,000 acres in *mauka* Kahuku, Keana, & Mālaekahana Ahupuaʻa.	Three new sites: (1) a surface scatter of historic and traditional artifacts; (2) a single cowrie shell; and (3) a surface scatter of historic artifacts. Sites 2 and 3 are located near a prominent limestone outcrop.
Davis	1981	*Archaeological Reconnaissance Survey of Hawaiian Wind Farm Project area at Kahuku Oʻahu, Hawaiʻi.* MS 060481. Department of Anthropology, Bishop Museum, Honolulu.	Kahuku Training Area, selected portions (proposed windmill sites).	Discovery of 4 additional sites, including a historic stone wall remnant, a habitation complex, agricultural terraces, and stone platform.
Sinoto	1981	*Archaeological Reconnaissance Survey of Kiʻi and Punamanō Wetland Refuge Units, Kahuku, Oʻahu, TMK 5-6-002 & 003*, Bishop Museum.	Kiʻi and Punamanō Wetland Refuge Units in Kahuku.	Relocation of 2 sites found by McAllister (1933): Puumano Spring and Kiʻi Fishpond.
Yent & Ota	1982	*Mālaekahana Phase II Initial Testing Results*. DLNR, Honolulu.	Mālaekahana State Park, Phase II (central portion).	22 cores; cultural materials encountered only in coastal cores; No new sites found.
Rogers-Jourdane	1982	*Archaeological Reconnaissance Survey of Marine Culture Enterprises Lands in Kahuku, Oʻahu Island*.	45 acres in Kahuku Golf Course area.	No sites found.
Yent & Ota	1983	*Eroding Archaeological Site at Mālaekahana Phase III, Mālaekahana Bay, Windward Oʻahu.*	Mālaekahana State Park; Dune area of Phase III.	In eroding dune face, a human burial, *imu*, and two hearths were recorded (Site No. -1038).
Yent & Estioko-Griffin	1986	*Results of Auger Coring Conducted at Mālaekahana State Recreation Area, Phase II, Koolau Loa, Oahu.*	Mālaekahana State Park, Phase II (northern portion).	11 cores excavated; no sites found.
Sinoto	1986	*Perimeter Flagging for Proposed Fencing Around Two Archaeological Site Areas, Kahuku Elementary School, Kahuku, Oʻahu.* Letter Report. Department of Anthropology, Bernice P. Bishop Museum, Honolulu.	Kahuku Elementary School, Keana Ahupuaʻa.	No new sites found; flagging of McAllister (1933) Sites -0269 and -0270.
Jensen	1989 a & b	*Archaeological Inventory Survey Punamanō and Mālaekahana Golf Courses Lands of Ulupehupehu. Punaluu. Kahuku, Mālaekahana, and Laie, Koolau Loa District, Island of Oahu.*	Non-contiguous project area, totaling 866-acres of inland Kahuku. Punamanō Golf Courses is within Ulupehupehu, Punalau and Kahuku Ahupuaʻa. Mālaekahana Golf Course is in Lāʻie and Mālaekahana Ahupuaʻa.	Twenty-six sites containing 45 component features were identified. Traditional site types: caves, overhangs, walls, terraces, platforms, enclosures, isolated midden deposits. Historic site types: WWII II emplacements, dumps, roads, and agricultural ditches.
Kennedy	1989a	*Archaeological Inventory Survey for the Proposed Mālaekahana Golf Course, A Portion of the Country Courses at Kahuku.*	200 acres inland of Mālaekahana Bay and Kalanai Point, ca. 100 meters southeast of project area. Was location of Site -0275, Waiʻāpuka, a legendary sinkhole with spring.	Thirteen new sites found (11 traditional habitation and agricultural sites and 2 historic plantation and military sites). Also, 6 sand dunes recommended for testing. Letter report lists only temporary site numbers. Site -0275 not relocated.

Authors	Year	Report Title and Publisher	Project Location	Findings
Kennedy	1989b	*Archaeological Assessment and Reevaluation Report Concerning the Recently surveyed, Proposed Punamanō Golf Course; A Portion of the Country Courses at Kahuku.*	Inland Ulupehupehu, Punalau and Kahuku Ahupuaʻa.	Two new Historic sites to the Jensen's (1989 a&b) findings with a total of 14 additional features. Also recommends preservation of Site -4070 (possible burial).
Kennedy	1989c	*Archaeological Reconnaissance Survey at TMK: 5-6-002:025, Located at Kahuku, Oʻahu.* Archaeological Consultants of Hawaiʻi, Haleʻiwa, Hawaiʻi.	Across Kamehameha Hwy. to the north of Hospital (Kahuku Medical Center).	No sites found.
Kennedy	1990	*Kahuku Sand Mining Project: Archaeological Subsurface Testing Results*. Archaeological Consultants of Hawaiʻi, Haleʻiwa, Hawaiʻi.	Immediately southwest of Kahuku Golf Course.	No burials or cultural layers were found during testing.
Pfeffer & Hammatt	1992	*Waialua to Kahuku Power Line*. Cultural Surveys Hawaiʻi, Kailua, Hawaiʻi.	Uplands of Ahupuaʻa spanning from Waialua to Kahuku.	-
Hammatt & Pfeffer	1992	*Archaeological Reconnaissance of Kahuku Agricultural Park*. Cultural Surveys Hawaiʻi, Kailua, Hawaiʻi.	Upland Keana Ahupuaʻa.	One day reconnaissance survey yielded no new sites.
Stride et al.	1993 & 2003	*Archaeological Inventory Survey of the Proposed 785-Acre Kahuku Agricultural Park.* Cultural Surveys Hawaiʻi, Haleʻiwa, Hawaiʻi.	Original 1993 project area was 1666 acres, later in 2003 reduced to 785 acres in upland Kahuku and Keana Ahupuaʻa (single report submitted in 2003).	In all, 21 sites were located in original project area. However, 7 sites were recorded (50-80-02-4510 through -4516) in the revised area. Site types: wall sections, overhang shelters, terraces, and enclosures. Most appear to function as habitation sites from pre-Contact into historic times.
Dagher	1993	*Inadvertent Discovery of a Human Burial at Makahoa Point, Mālaekahana, Koʻolau Loa, Oʻahu*. State Historic Preservation Division, Kapolei, Hawaiʻi.	Makahoa Point.	A single pre-Contact era human burial of Hawaiian ancestry was inadvertently discovered.
Jourdane	1994	*The Inadvertent Discovery of Human Remains near Kahuku Golf Course, Kahuku, O`ahu*. Historic Preservation Division, Kapolei, Hawaiʻi.	Near Kahuku Golf Course.	A single pre-Contact era juvenile human burial was inadvertently discovered.
Hammatt	1996	*Archaeological Reconnaissance for Proposed Mālaekahana Exploratory Wells, Mālaekahana, Oʻahu.*	Just mauka of the southern mauka end of the NPM APE.	Archival research and archaeological background performed. No sites recorded.
Hibbard	1997	*Inadvertent Discovery of Human Remains, Japanese Cemetery, Kahuku Golf Course, TMK 5-6-002:010*. Memo in Burial Files, State Historic Preservation Division, Kapolei, Hawaiʻi.	Japanese Cemetery near Kahuku Golf Course.	A single pre-Contact era human bone was inadvertently discovered.
Collins	1999	*Recovery of Human Remains From Kahuku Golf Course*. State Historic Preservation Division, Kapolei, Hawaiʻi.	Kahuku Golf Course (*makai*).	Pre-Contact era human remains were inadvertently discovered (site -5773).

Authors	Year	Report Title and Publisher	Project Location	Findings
Perzinski & Hammatt	2001	*Archaeological Inventory Survey Report for Hospital Ditch and Kiʻi Bridge in the Ahupuaʻa of Kahuku, District of Koʻolau Loa, Island of Oʻahu (TMK: 5-6-002, 005 & 006).* Cultural Surveys Hawaiʻi, Kailua, Hawaiʻi.	Kamehameha Hwy., Kahuku near detour roads.	No sites recorded.
Calis & Tome	2002	*An Archaeological Monitoring Report for the Force Main Sewer Replacement Project, Kahuku Ahupuaʻa, Koʻolau Loa District, Oʻahu Island, Hawaiʻi*. Scientific Consultant Services, Inc., Honolulu.	Force Main Sewer, *makai* of Kamehameha Hwy., Kahuku.	No sites recorded.
O'Hare et al.	2004	*Documentation of the Kahuku Sugar Mill, Kahuku Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu*. Cultural Surveys Hawaiʻi, Inc. Submitted to Tetra Tech Inc.	Kahuku Mill Complex.	Documentation report of remaining Plantation structures.
O'Hare et al.	2008	*Archaeological Inventory Survey Plan for the Kahuku Subdivision Project, Kahuku, Keana, and Mālaekahana Ahupuaʻa, Koʻolau Loa District, Oʻahu Island. TMK: (1) 5-6-002; 003, 010, 012, 016, and 027.* Cultural Surveys Hawaiʻi, Kailua.	200 acres of *makai* Kahuku, Keana, and Mālaekahana Ahupuaʻa. Bound by the coast, Makahoa Point, Kaluahole, and Kamehameha Hwy.	No sites recorded. Extensive background research performed on area.
Morrison	2009	*Archaeological Background Report for the Proposed Nā Pua Makani Windfarm Project, Kahuku, Oʻahu (TMK 5-6-008:006)*. IARII, Honolulu.	231.9 acres of Kahuku and Keana Ahupuaʻa, *mauka* of Kahuku Hospital.	No sites recorded. Background research performed on area.
Rechtman	2009	*A Comprehensive Archaeological Survey of the First Wind Kahuku Wind Power Project Area (TMKs: 1-5-6-05:007 & 014).* Rechtman Consulting, LLC, Hilo.	230 acres west of Kahuku Village and 2.5 kilometers inland of coast.	SIHP Site 4707, which was described as sugarcane field infrastructure.
Dagher & Spear	2010	*Literature Search and Field Inspection of The Kahuku Storm Damage Reduction Project Kahuku Ahupuaʻa, Koʻolau Loa District, Oʻahu Island, Hawaiʻi*. SCS, Honolulu.	Kahuku Intermediate and High School grounds and park adjacent to the west.	No sites recorded. Background research performed on area.
Dagher & Spear	2014a	*Archaeological Inventory Survey Report for the Kahuku Village Subdivision Project, Keana and Mālaekahana Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu, Hawai`i [TMK (1) 5-6-002:027].* SCS, Honolulu.	Portion of 50 acres between Kahuku Golf Course and Kamehameha Hwy.	A single site was found (site No. -7508), consisting of 10 features (9 plantation era and 1 pre-Contact to early-Contact era).
Dagher & Spear	2014b	*An Archaeological Monitoring Report for the Kahuku Village Subdivision Project, Keana and Mālaekahana Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu, Hawaiʻi [TMK (1) 5-6-002:013, 014]*. SCS, Honolulu.	Portion of 50 acres between Kahuku Golf Course and Kamehameha Hwy.	Five archaeological sites found: site -7398 (historic cesspools); -7399 (Burial); -7400 (-7401, and -7511); -7398
Lyman & Spear	2014	*Archaeological Inventory Survey for the Kahuku Village Subdivision Project Keana Ahupuaʻa, Koʻolau Loa District, Island of Oʻahu, Hawaiʻi [TMK: (1) 5-6-002:047 por].* SCS, Honolulu.	Kahuku Village immediately *makai* of Kamehameha Hwy. and *mauka* of Kahuku Golf Course.	Site No. -7508, 8 features (historic existing plantation era homes) relocated.

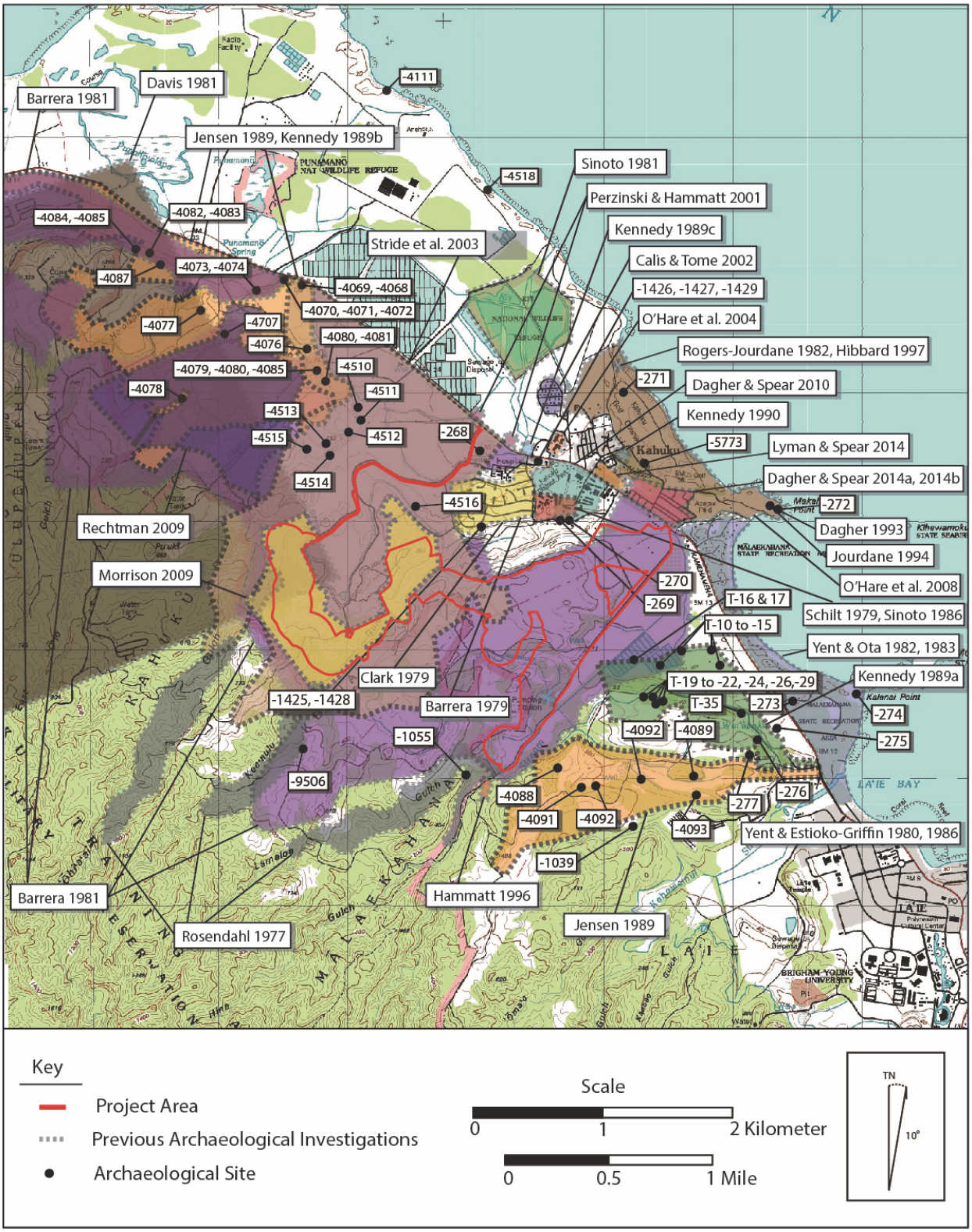

Figure 6. Previous archaeological studies and sites in vicinity of the project area (adapted from USGS Kahuku Quadrangle Map).

4.1 Early Archaeological Studies

The earliest systematic archaeological study performed in the vicinity of the Nā Pua Makani Wind Project is the 1930 island-wide survey conducted by Gilbert McAllister (1933). In *Archaeology of Oahu*, McAllister identifies several historic sites near the project area, including McAllister's Site 269 (traditional platform) and Site 270 (Keana Cave), located less than 300 meters north of the project area. In addition, Kaaulelemoa Fishpond (Site 268) is located less than a kilometer north of the project area, a traditional fishing shrine on Makahoa Point (Site 272) is less than a kilometer to the east, and Pōlou Pool (Site 271) is located just over a kilometer to the north.

Nearly 50 years later, a state-wide survey was performed by J. Halley Cox and Edward Stasack (1970), which focuses solely on petroglyphs. In this study, Cox and Stasack (1970:97) recorded a human figure petroglyph on a boulder at Kalaeuila Point, which is ca. 4 kilometers south of the Kahuku/Keana boundary.

4.2 Recent Archaeological Investigations

In 1977, Paul Rosendahl, performed an archaeological inventory survey on 1,044 acres (non-contiguous) of the 9,646-acre Kahuku Training Area (KTA), the eastern sections of which abut and overlap portions of the west-southwest boundaries of the current Nā Pua Makani Wind Project lands. During this reconnaissance undertaking, Rosendahl (1977) identified nine archaeological sites, including four previously recorded sites that were destroyed (-259, -260, -1043, and -9517), one previously recorded site that was intact and on the State of Hawai'i Register of Historic Places (-2501), and four newly discovered sites (-9506 through -9509). All sites found by Rosendahl (1977) are located in the *ahupua'a* of Hanakaoe and nearly 2 kilometers to the northwest of the project area. Only site -9506, Keaaulu Ditch, which is described as a Historic stone-faced irrigation ditch, is located in close proximity to the project area (ca. 500 meters southwest).

In 1978, the Kualoa Archaeological Research Project (City and County of Honolulu) was tasked with a reconnaissance survey of the 49.9-acre Ko'olau Loa Housing Project area and the 7.4-acre Kahuku District Park Expansion area (Clark 1979). These areas are located less than 500 meters north of the project area. During the survey, local informants led the archaeologists to a locality in the housing area that they referred to as a "sacred way," which was a cleared area with no visible man-made features, but held some spiritual significance to the community. Site -269 was relocated in the school expansion area and described as a stone platform containing a large coral slab that was interpreted as a possible *kū'ula* (stone image), or grindstone (*hoana*). Also revisited was Keana Cave (Site -270) where human skeletal remains were observed on the slope of the cave entrance. In addition, Clark (1979) found a second rock shelter located along a coral outcrop that contained skeletal remains, possibly human, and wood. Clark (1979) noted several other small crevices in outcrops and rock shelters with crude walls in the project area, but did not investigate further. A single Historic grave with a marker exhibiting a date of 1945 was also found during this investigation.

William Barrera (1979) revisited the Koʻolau Loa Housing project the following year, conducting a more thorough archaeological inventory survey and subsurface testing. Barrera (1979) suggested that two limestone knolls and the base of a limestone ledge had the potential to contain archaeological sites, and that the rest of the area had been impacted by sugarcane activities. These three areas were surveyed, yielding five archaeological sites. Site No. -1425 was comprised of two walls aligned at the base of the limestone cliff. Site No. -1426 was described as a rock-lined depression and a metal pipe located at the eastern knoll. Site No. -1427 consisted of a complex of three walls, three rock mounds, and one cave located on the eastern knoll. Site No. -1428 was described as a wall situated on top of a cliff. Site No. -1429 consisted of an earthen mound within an L-shaped wall. Although several of the features were tested, no cultural remains were observed. The conclusion was that most of these features, if not all, were historic and associated with sugar cane cultivation (Barrera 1979).

In 1979, a crew from the Bishop Museum recorded Sites No. -269 and -270 (Schilt 1979), during an archaeological reconnaissance survey for the 4-acre Kahuku School Expansion project. Although some collapse and disturbance was observed on the platform (Site No. -269), Schilt (1979) noted that one component of the platform was a large coral "block," which may indicate that the feature had a ceremonial component. Sketches were made of the platform as well as photographs to record the condition of the platform. Schilt (1979) also noted that the two stones at the entrance of Keana Cave (Site No. -270) were natural formations and that the cave floor was covered by scattered limestone fragments that were likely roof fall, but that midden could possibly lie below it. A roughly rectangular stone mound (Site No. -2478) and a small overhang located within a large outcrop (Site No. -2479) were also recorded (Schilt 1979).

A reconnaissance survey was performed in 1981 by Barrera for the 2,500-acre Kahuku Agricultural Park, which was separated into four parcels. This study area nearly encompasses the current Nā Pua Makani Wind Project area. Barrera (1981) brief survey was performed in three of these parcels and a more thorough survey was performed in one 500-acre parcel. The current project area lies largely in the 500-acre parcel intensively surveyed and the eastern most parcel Barrera (1981) surveyed. In his background research, Barrera (1981:19) listed sites on file at the SHPD office at that time, stating that Site -1055, described as a "Shelter Cave," was outside of his project area and mapped it approximately 200 meters west of the southernmost projection of the project area. However, no source was cited in Barrera's 1981 report. Three archaeological "locations" were identified in the westernmost parcels, which did not include any structural features, but consisted of solely of possibly pre-Contact and Historic surficial remains. These three locations were all within Kahuku Ahupuaʻa, just under a kilometer north of the project area. Location 1 consisted of a marine shell, coral fragments, and basalt flakes. Location 2 was comprised of one cowry shell. Location 3 was a concentration of glass bottle fragments.

Subsequently, Bertel Davis (1981) performed a reconnaissance-level survey in selected areas of KTA for a proposed wind farm, which yielded four newly identified sites (Site No -2357 through -2360). Site No. -2357 consisted of a discontinuous segment of a stacked stone wall that supported a barbed-wire fence with milled wood posts. Sites No. -2358 through -2360, consisting of a house site, habitation terraces, and a terrace with ceremonial features (respectively), are suggested to be functionally and spatially related, being situated within a

swale in upland ʻŌpana Ahupuaʻa (Davis 1981). These findings are located over three kilometers to the northeast of the project area.

The same year, Aki Sinoto of the Bishop Museum performed a brief reconnaissance survey of the Kiʻi and Punamanō Wetland Refuge areas (Sinoto 1981), finding that the land had been extensively modified. He noted a single historic site, which was an old OR&L railroad track. The entire wetland site was designated 50-0a-F4-10/11. While Sinoto (1981) referred to this area as Kahuku Fishpond, one of McAllister's (1933:154) informants maintains that this area was always a swamp - not a fishpond.

Between the years 1980 and 1986, several archaeological investigations were performed in Mālaekahana State park, which had been divided into three phases. In 1980, Yent and Estioko-Griffin performed mapping, testing, excavation, and analysis at Site No. 50-80-02-2801, which was in Phase I located in the southern portion of the park. The three-year project yielded three major occupational layers dating from ca. AD 1600 to 1780. (Yent and Estioko-Griffin 1980:xxi-xxiv). Yent and Ota (1982) performed auger testing at Phase II of the park, which is the northern portion of the park. Of the 22 cores, cultural materials were encountered only in coastal areas. No new sites were found. The next year, Yent and Ota (1983) recorded a human burial, *imu*, and two hearths in an eroding dune face in Phase III, which is in the center of the bay's coast (Site No. 50-80-02-1038). In 1986, Yent and Estioko-Griffin excavated 11 cores in the southern extent of Phase I, which yielded no new sites (Yent and Estioko-Griffin 1986).

Also in 1982, Rogers-Jourdane performed a reconnaissance survey of approximately 45 acres of the Kahuku Golf Course as well as a 2,000-foot long by 100-foot wide corridor for an associated pipeline. This survey yielded no archaeological sites (Rogers-Jourdane 1982). This project area was located over 200 meters to the northeast of the current project area.

Four years later, Sinoto revisited Sites No. -269 and -270 to flag the perimeter for protective fencing to be installed prevent damage during the proposed Kahuku Elementary School extension construction activities (Sinoto 1986).

In 1989, Jensen performed an archaeological inventory survey of two separate areas for the proposed development of Punamanō and Mālaekahana Golf Courses project, totaling 866 acres. Twenty-six sites containing 45 component features were identified between the two separate project areas. These reports were initially released as a single report by Jensen (1989a). Later that year, they were released as separate reports with a change in project area for the Mālaekahana Golf Course and, thus, new survey area, released by Kennedy (1989b). A reevaluation of Jensen's (1989) Punamanō Golf Course survey was also released by Kennedy (1989a). The proposed 638-acre Punamanō Golf Course was located less than one kilometer north of the current project area. Twenty-six archaeological sites were recorded by Jensen (1989) in this portion of the project area (Sites No. -4076 through -4081, and -4085). Site No. -4076 is comprised of an overhang shelter complex of eight features (Features A-H) with visible midden and basalt flakes. Site No. -4077, also a complex (Features A-C), was described as a terrace with a wall and *ʻauwai* (modified crevasse). Site No. -4078 is a three feature complex (A-C) comprised of an overhang shelter with two stacked walls. Site No. -4079 consists of short wall segments. Site No. -4080 is described as a historic trash dump and bottle scatter. Site No. -4085

is a complex of two features (A and B), Feature A being an enclosure and Feature B being a low wall. Kennedy (1989b) reviewed and reevaluated Jensen's (1989) findings and added two new historic sites, including an enclosure complex and an irrigation ditch, as well as 14 new features associated with sites previously identified by Jensen (1989). SIHP numbers for newly identified sites were not provided. Further, Kennedy (1989b) suggested that Jensen's (1989) Site No. -4076 be preserved, as Kennedy maintained that it could possibly be a burial. Kennedy's (1989a) survey of 200 acres at the site of the proposed Mālaekahana Golf Course, which was not the same survey area as Jensen's (1989) Mālaekahana Golf Course project area, yielded 19 surface features. These sites included overhang shelters with evidence of previous human occupation, suspected agricultural terraces, low mounds, midden scatter areas, large, sandy dune formations with suspected cultural components, prehistoric surface artifacts, a historic gun emplacement, and an historic railroad bed. Kennedy (1989a) found thirteen new sites, consisting of 11 traditional habitation and agricultural sites and two historic plantation and military sites. Also, six sand dunes were recommended for testing. Sites in this report did not receive SIHP numbers, but were designated temporary site numbers. This portion of the project area is located less than 100 meters south of the current Nā Pua Makani Wind Project's southern boundary.

Later that year, Kennedy (1989c) performed a reconnaissance survey on a 14-acre parcel across Kamehameha Highway of Kahuku Hospital, which is roughly 1 kilometer north of the project area. While no archaeological sites were identified, Kennedy noted that Kiʻi Ditch ran through the parcel. Yet, it was not apparent if this plantation-era ditch followed an earlier *ʻauwai*, or traditional irrigation ditch.

In 1990, Kennedy performed archaeological subsurface testing in a parcel just northeast of the Kahuku Sugar Mill and approximately 500-meters north of the current project area. Although no archaeological materials were found in the 47 trenches, a single early modern trash pit and a few shallow irrigation channels associated with nearby small garden areas were observed. The stratigraphy of the trenches suggested that a sand deposit, which has been formed by gradual Aeolian processes over a lengthy time period, exists throughout the area. As such, human remains may potentially exist in the upper, penetrable sand deposit (Kennedy 1990).

Pfeffer and Hammatt (1992) of Cultural Surveys Hawaiʻi, performed an archaeological assessment of an area spanning from Waialua to Kahuku for a power line project. They noted that a multitude of archaeological sites may be present in the vicinity of the project area, with greater probability in coastal areas.

A one-day survey was performed by Hammatt and Pfeffer in 1992 on four parcels (lA, lB, 2, and 3) in *mauka* Keana Ahupuaʻa for the Kahuku Agricultural Park, limiting the survey to areas not under cultivation. No sites were recorded during the brief survey.

The grand majority of the 1666-acre Kahuku Agricultural Park (Parcels 1A, 1B, 2, and 3) was surveyed and tested in 1992 by Cultural Surveys Hawaiʻi, which covers the entire western side of the current project area (Stride et al. 2003). However, the 1666-acre project area was reduced to 785 acres (Parcels 2 and 3). Prior to the project area reduction, a total of 21 archaeological sites were recorded in the 1666 acres. Seven of the 21 sites found were within Parcels 2 and 3.

Only these sites are described in detail in the 1993 CSH report, consisting of: six temporary habitation overhang shelters (Site No. -4510, 4511, and 4515); a temporary habitation enclosure (Site No. -4512); a permanent habitation complex with walls, terraces, an enclosure, and an overhang (Site No. -4513); a temporary habitation terrace (site 4514); and a temporary habitation complex with an overhang and a wall (Site No. -4516). Three of the sites were tested, each sampled with a single test unit (Trenches 1, 2, and 3). A human burial was encountered in Test Trench 2 in Site No. -4515, Feature B (overhang shelter). This burial and others found in Keana and eastern Kahuku *ahupuaʻa* were reinterred at Site No. -4516 Feature C, which is a low wall adjacent to a limestone outcrop.

In 1993, a single pre-Contact era human burial of Hawaiian ancestry was inadvertently discovered at Makahoa Point (Dagher 1993), which is approximately 800 meters east of the current project area. The following year, Jourdane (1994) wrote a letter report for a single pre-Contact era juvenile human burial that was inadvertently discovered near the Kahuku Golf Course, ca. 800 meters east of the project area. In 1997, a single human bone, assumed to be pre-Contact era, was inadvertently discovered near the Kahuku Golf Course, approximately one kilometer north of the current project area (Hibbard 1997). Several years later, another set of pre-Contact era human remains were inadvertently discovered at the golf course (Site No. -5773), less than 500 meters north of the project area (Collins 1999).

An archaeological inventory survey was performed in 2001 for the Hospital Ditch and Kiʻi Bridge/Drainage (Perzinski and Hammatt 2001), which is located just over 1 kilometer north of the project area. No archaeological sites were noted.

Archaeological monitoring was performed in 2002 during excavations related to the 670-meter long force main sewer replacement *makai* of Kamehameha Hwy, which is a little over one kilometer north of the current project area (Calis and Tome 2002). Although no archaeological sites were encountered during ground disturbing activities, Calis and Tome (2002) recorded the stratigraphy of this area that appeared to be largely imported construction fills related to sugar cane cultivation and irrigation.

In 2004, O'Hare et al. conducted documentary research for the Kahuku Sugar Mill complex, in which HAER format recordation of the existing Kahuku Mill structure was performed. History of the mill as well as recordation of mill equipment (O'Hare et al. 2004) was undertaken. The mill is roughly 900 meters north of the current project area.

O'Hare et al. (2008) performed extensive background research for the Kahuku Subdivision Project area, which is comprised of 200 acres that are located less than 300 meters northeast of the current project area. No sites recorded.

In 2009, Morrison prepared an archaeological background report for the proposed 231.9-acre Nā Pua Makani Wind Project for West Wind Works LLC, Oregon, which covers a little less than the western half of the current project area (Morrison 2009). This study focused mostly on creating predictive models by using a series of historical USGS maps and aerial photographs of the project area, ranging from 1906 to 1968, that were geo-referenced and overlain.

Rechtman (2009) conducted an archaeological inventory survey of the 230-acre First Wind Kahuku Wind Power project area located less than 300 meters northwest of the Nā Pua Makani Wind Project. A single archaeological site was recorded within the project area (Site No. -4707), which is an existing site recorded by Kennedy (1989) with related plantation infrastructure features located just outside of the project area.

Another background research report was prepared in 2010 by Dagher and Spear for the Kahuku Storm Damage Reduction Project which is located approximately 500 meters north of the project area (Dagher and Spear 2010). No archaeological sites were recorded.

In 2014, Dagher and Spear performed an inventory survey on 50 acres between the Kahuku Golf Course and Kamehameha Highway for the Kahuku Village Subdivision Project, which is directly across Kamehameha Highway of the current project area (Dagher and Spear 2014a). During this survey, a single site was found (Site No. -7508), consisting of ten features (nine plantation era and one pre-Contact to early-Contact era). Subsequently, Dagher and Spear conducted archaeological monitoring for the same project, where five additional archaeological sites were found, including Site No. -7398 through -7401, and -7511. Site types include human burials and historic cesspools (Dagher and Spear 2014b). Later the same year, Lyman and Spear (2014) conducted an inventory survey for the same project, but the area immediately northwest of Dagher and Spear's (2014a and 2014b) project area. No new archaeological sites were found.

5.0 PREVIOUS ETHNOGRAPHIC INTERVIEWS

A total of four Cultural Impact Assessments (CIA) were found for the Nā Pua Makani Project vicinity (Hammatt 2008; McGerty and Spear 2009; Voegler et al. 2011; Mooney and Cleghorn 2012).

In 2008, Hallatt H. Hammatt conducted a provisional CIA for the Kahuku Village Subdivision Project, which spanned the coastal areas of Kahuku, Keana and Mālaekahana Ahupuaʻa. This project area is located a little less than one kilometer to the northeast of the Nā Pua Makani Wind Project. Hammatt (2008) consulted numerous organizations for informants, including the State Historic Preservation Division (SHPD), Office of Hawaiian Affairs (OHA), Oʻahu Island Burial Council (OIBC), Koʻolau Loa Hawaiian Civic Club, and Koʻolau Loa Neighborhood Board. A total of three organizations and three individuals participated in this assessment, which yielded information on cultural practices and resources in the area as well as shed light on community concerns. These findings are as follows:

- the area has long been used by *kanaka maoli* and Plantation *kamaʻāina,* particularly along the shoreline;
- a variety of cultural activities including plant-gathering, salt and *limu* collection, and fishing;
- concerns of disturbing subsurface cultural and human remains are held by the community (Hammatt's 2009 archival evidence upholds this sentiment); and
- concerns of restricted beach access to cultural practitioners are also held.

McGerty and Spear (2009) conducted a CIA for the Kahuku Storm Drainage Reduction Project, which was located under Kahuku High School's football field, which is less than half of a kilometer north of the Nā Pua Makani Wind Project. According to McGerty and Spear (2009), letters were sent to various organizations, including SHPD, the Koʻolau Hawaiian Civic Club, and the Oʻahu Island Burial Committee, as well as knowledgeable individuals in the area. Additionally, three CIA Notices requesting community participation were published in *The Honolulu Advertiser* between 30 August and 3 September 2009 and also in *Ka Wai Ola,* OHA's official newspaper in the August and September issues. Despite McGerty and Spear's attempts, they hold that, "No responses were received from any of the above listed organizations or news periodical announcements" (McGerty and Spear 2009:16). Due to the lack of community interest in the matter, McGerty and Spear's assessment was that, "…pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by development activities. Because there were no cultural activities identified within the project area, there are no adverse effects" (2009:16).

In 2011, Vogeler et al. conducted a CIA for the Hawaiʻi Department of Transportation's (HDOT) Lāʻieloa Bridge Replacement Project in Lāʻie Ahupuaʻa, approximately 2.5 kilometers to the southeast of Nā Pua Makani Wind Project lands. Vogeler et al. (2011) contacted 14 individuals, out of which, four participants responded in writing. Of these four responses, one email interview and two interviews were achieved. Findings of these efforts shed light on the cultural significance and of Lāʻieloa Stream, including its cultural resources, colorful history, and

affiliation with the *ali'i*, or royalty. Cultural resources of the project area and its vicinity were found by Vogeler et al. (2011) as follows:

- various riparian faunal food sources, such as *'ōpae* (var. shrimp), *'o'opu*, (var. goby) in Lā'ieloa Stream;
- *limu 'ele'ele (Entermorpha prolifera)* at the mouth of Lā'ieloa Stream;
- *he'e* (squid or octopus), *līpe'epe'e* (red seaweed), and variety of reef fish in near shore waters; and
- *moi* or thread-fish (*Polydactylus sexfilis),* and *'ama'ama* or mullet (*Mugil cephalus*) were bountiful in deeper waters.

While a primary concern was flooding of lands surrounding the river, concerns were raised about the potential to encounter *iwi* (human remains) during project related ground disturbances.

Mooney and Cleghorn (2012) performed a CIA as part of the Supplemental Environmental Impact Statement (SEIS) for the proposed expansion of Turtle Bay Resort (TBR). The 767-acre project area spanned the *makai* portions of 'Ōpana, Kawela, Hanaka'oe, 'Ō'io, Ulupehupehu, Punalau, and Kahuku Ahupua'a, the eastern end of which is less than 2 kilometers north of the Nā Pua Makani Wind Project. According to Mooney and Cleghorn (2012), the aim of the CIA was to be as inclusive as possible, to fully capture the area's cultural significance to the entire community. This effort is summarized as follows:

> In recognition of the area's rich *mo'olelo* and traditional land uses, great lengths were taken to contact and invite as many local *kūpuna* (elders) and cultural informants as possible from varied backgrounds and interests on the subject of traditional, customary, and contemporary use of TBR SEIS Lands and surrounding areas. Concerted attempts were made to identify and locate persons knowledgeable about traditional practices that took place in the past or that are currently taking place on or near SEIS Lands, as recommended by the Office of Environmental Quality Control (OEQC) Guidelines. Earlier CIA reports written about the Kahuku area, OEQC list of Cultural Assessment Providers, Office of Hawaiian Affairs (OHA), Neighborhood Boards No. 27 & 28, numerous North Shore civic clubs, and other North Shore community associations were consulted for a listing of *kūpuna*, cultural practitioners, and cultural informants willing to share their *mana'o* (knowledge and opinion).
>
> A total of 16 interviews were conducted between 4 May and 11 April 2012. All interviewees had a personal association with TBR SEIS Lands and/or surrounding areas, many of whom were highly recommended by various sources in the community. Most informants are active in the local community and well respected for their leadership, expertise in Hawaiian cultural practices, and knowledge of the project area and its history. The results of all interviews, with the exception of one interview, are submitted in this CIA.
>
> As a result of archival research and community consultations, it was found that TBR SEIS Lands and surrounding areas contain an array of cultural resources that are currently being used for traditional cultural practices, including marine food sources, medicinal plants, plants used in crafts, wood for woodcarving, and salt for various uses. Further, the land and sea are currently used for a variety of

> traditional and non-traditional sports and recreational activities. The presence of *iwi kūpuna*, or human burials, as well as archaeological sites on the property has also been established, which continues to be a point of concern in the community in terms of past and/or potential disturbances related to the resort. Furthermore, supernatural and/or divine phenomenon in the project area experienced by a few informants and acknowledged by others, suggests that there is still cultural significance and spiritual connection for those with ancestral ties to the land (Mooney and Cleghorn 2012:i-ii).

The archival research revealed that, in general, the TBR vicinity has long and interesting history. From the archaeological record, traditional stories and myths, and historic documents attributed to this vast area, it was evident that these lands had been the stage of many significant acts in the long drama of Oʻahu's pre- and post-Contact history. Further, these lands have been the subject of numerous archaeological investigations between 1977 and 2006, resulting in 21 individual reports. These archaeological investigations have documented 19 archaeological sites providing data from 291 auger tests excavations, 121 controlled excavations, 78 radiocarbon dates, 50 pollen samples, and substantial midden and artifact collections.

Mooney and Cleghorn (2012) also maintained that ethnographical evidence obtained through community consultations upheld the archival research findings that TBR property was abundant in cultural resources and lore, though much has changed throughout time. These community consultations also verified the existence of cultural practices, such as the gathering of various traditional marine and terrestrial resources. Out of the sixteen interviews performed, information from 15 interviews was represented the CIA. A variety of cultural resources gathered by an array of Hawaiian cultural practitioners for a variety of traditional activities, including *lāʻau lapaʻau* (herbal healing), *kālai kiʻi* (wood carving), *lei* making, cordage making, and consumption, were identified, including a total of 40 species of flora and fauna as well as *paʻakai* (sea salt). Cultural resources in the TBR vicinity are as follows:

- TBR's coastline and coastal waters provide 32 marine species, including 17 species of fish, six crustacean, one mollusk, two gastropod, two sea urchin, and four sea weed species for cultural practitioners;
- six plant species and two tree species were said to be collected from inland areas of TBR;
- concerns of disturbing subsurface cultural and human remains are held by the community (the archival evidence upholds this sentiment); and
- concerns of restricted beach access to cultural practitioners are also held.

While none of the informants claimed that any of these cultural resources were the last of their kind or this was the only place to collect them, the majority of those interviewed shared that these resources had drastically declined in their lifetimes and are now found in diminutive numbers. Further, the locations of many resources are guarded secrets according to many informants who fear over-harvesting to the point of extinction.

In conclusion, several traditional resources and sentiments were found to be common between these CIA, including a wide spectrum of flora and fauna from the lowlands, streams, coasts, and seas, which are used for traditional subsistence, crafts, and medicine. Also shared were concerns over disturbing subsurface archaeological sites and *iwi kūpuna* during construction.

6.0 ETHNOGRAPHIC INTERVIEWS

The purpose of ethnographic interviews is to acquire information from *kūpuna* and local knowledgeable individuals about the background cultural use, if any, of the subject property that could be adversely affected by the proposed Nā Pua Makani Wind Project.

Concerted attempts were made to identify and locate persons knowledgeable about traditional practices that took place in the past, or are currently taking place in the project area, that could be potentially impacted by the expansion project. In addition to prior CIA reports written about the area spanning from Kahuku to Lāʻie Ahupuaʻa (Hammatt 2008; McGerty and Spear 2009; Voegler et al. 2011; Mooney and Cleghorn 2012), the State Office of Environmental Quality Control (OEQC) and Office of Hawaiian Affairs (OHA) were consulted for a listing of Cultural Assessment Providers. Various Neighborhood Boards, and civic clubs were also contacted to obtain cultural informants. Appendix B provides a listing of potential cultural informants and their detailed contact history. Contact information was found for 24 individuals, all of which were solicited for participation. While no response was received from 14 of those asked to participate, eight individuals responded and interviews were secured with four individuals. Two of the interviewees are *kūpuna* of the area and two are recognized cultural practicioners of the area. Many of those who responded to interview requests did not wish to be interviewed, but recommended other, more knowledgeable individuals or community groups to interview.

A total of three interviews with four informants were conducted between 31 March and 19 November 2014. However, only the information from two informants is included in this CIA. All interviewees had a personal association with the Nā Pua Makani Wind Project area and were recommended by various sources in the community. Most informants are active in the local community and well respected for their leadership and knowledge of the project area and its history. Table 3 provides a list of the consulted parties, their association with the Nā Pua Makani Wind Project area.

During the typical interview, a basic questionnaire (Appendix D) was used as a guide to solicit interviewees' knowledge of the area and biographical information. Maps of the Nā Pua Makani project area were used to further assist the interview process and gain specific information about locations of resources and/or cultural practices. After the interview, an interview summary was created. The interview summary was then shared with the interviewee for review, which allowed them the opportunity to correct, add, and/or delete information in their testimony. These interviews were occasionally supplemented with subsequent personal and telephone conversations with informants for clarification and additional information. When the interview summary met their approval, the interviewee was asked to sign an Oral History Release Form. Copies of release forms are provided in Appendix E. Summaries of the resulting interviews follow.

Table 3. List of Participating Cultural Informants

Name(s)/Title	Association	Form of Interview
Junior Primacio, Kupuna	Fourth Generation Kahuku Village resident; Former plantation worker; Koʻolau Loa Neighborhood Board, Chair on Agriculture and Parks and Recreation Committees	Person-to-person; interviewer: Elizabeth L. Kahahane
Raymond "Buddy" Ako, Kupuna	Former resident of Kahuku; educated in Kahuku; Former Community Liaison for Turtle Bay Resort Development	Person-to-person: interviewer: Kimberly M. Mooney
Kenneth M. Hee, Kahu & cultural practitioner	Native Hawaiian, area descendent; born and raised in Kahuku; trusted Kahu of Kahuku; traditional agriculturalist	Person-to-person; interviewer: Elizabeth L. Kahahane; joint with Germaine K. Halualani-Hee; withdrawn
Germaine K. Halualani-Hee, cultural practitioner	Native Hawaiian; long-time resident of Kahuku; traditional agriculturalist	Person-to-person; interviewer: Elizabeth L. Kahahane; joint with Kenneth M. Hee; withdrawn

6.1 KŪPUNA TESTIMONY

For the Nā Pua Makani Wind Project Cultural Impact Assessment, two *kūpuna* were interviewed. In this assessment, *kūpuna* refers to individuals who are respected as elders of the community.

6.1.1 Mr. John Primacio Jr.

John "Junior" Primacio is a life-long resident of Kahuku Village. Mr. Primacio worked at the Kahuku Plantation for nearly two decades, served in the U.S. Military in wartime Vietnam, and later took the position of General Manager with the Kahuku Housing Corporation. Mr. Primacio has given over 40 years of public service in the Koʻolau Loa District, dealing with land and resource management, community affairs, workers' rights, and planning. He has served on the Koʻolau Loa Neighborhood Board as a board member and as the Chair of the Committee on Agriculture. He was also a Unit Chairman for the International Longshore & Warehouse Union. Due to the many positions and long tenure he held at Kahuku Plantation as well as being born and raised in Kahuku, Mr. Primacio has a wealth of knowledge pertaining to the past and present land use as well as history of the Kahuku area. Mr. Primacio was interviewed by Elizabeth L. Kahahane of Pacific Legacy, Inc. on 25 June 2014.

Mr. John Primacio Jr. was born to John Primacio Sr. and Alice M. Moniz on January 23, 1932. His father was born in the Philippines and immigrated to Hawaiʻi as a young boy. His mother was the daughter of a sugar plantation worker in Waipahu. John Primacio Jr. was born and raised in Kahuku and graduated from Kahuku High School in 1952.

As an adult, Mr. Primacio joined the National Guard. He subsequently applied for work in the plantation. Mr. Primacio progressed rapidly through the ranks due to his openness to change and innovation. Later in 1960, the National Guard and Army Reserves were called into active duty in Vietnam. He, like many others, stopped work at the plantation to report to Schofield before heading to Vietnam. Mr. Primacio later returned from Vietnam to become the General

Manager for Kahuku Housing Corporation in 1971. He went from working in the laboratory to the mill, to operating heavy machinery, and on to being union boss. According to Mr. Primacio, it wasn't only his openness to new job opportunities that helped Mr. Primacio see the many aspects of the plantation, it was his eagerness to ask questions and listen to the advice of his elders. It didn't matter if they were Filipino, Japanese, Hawaiian, or Portuguese, he communicated with these *kūpuna* in pidgin or otherwise to learn.

Mr. Primacio described the plantation's "good days," as being in the mid-1900s, when the union had just formed and sugar workers had contracts, medical care, inexpensive housing, even kerosene for their stoves. People became more than their "bongo," or number, but individuals with responsibilities and job titles. He also described life on the plantation as being very unique because of its sustainability. For example, many of those living on the plantation thrived with the aid of supplemental activities such as fishing, gardening, hunting, raising bees, and by specializing in a trade. It was this interdependency on each other and the dependency on the land that helped many of these families with little money send their children to college. And it wasn't uncommon for families to combine funds to buy a cow. It was through bartering and the common hardships that plantation families shared that helped them coexist, despite cultural differences and language barriers.

However, as Mr. Primacio holds, eventually the sustainability of Kahuku Plantation declined with the increase of government imposed environmental regulations. According to Mr. Primacio, gradually more plantation activities were being regulated by the government, such as mill water discharge into the ocean. As these changes affected the plantation economically, Mr. Primacio believed that it was just too costly for plantation to keep up with the proper environmental techniques and that closure was inevitable. After nearly 75 years, the Kahuku Plantation closed its doors in 1970. The next year, Mr. Primacio became the General Manager for the Kahuku Housing Corporation, with 255 plantation homes to oversee. Mr. Primacio believes this position taught him to be a good leader. His responsibility within the plantation community grew substantially as the plantation's economy, political structure, and infrastructure dissolved. Mr. Primacio then decided to serve on neighborhood, city, and state boards. As a result, he became well connected and a pillar of the community, but he maintains that his goal to help Kahuku rebound after the plantation's closure kept him grounded. He believed that his most important responsibility was to bring the focus back to sustainability. Mr. Primacio likens this focus on sustainability to today's need to transition from fossil fuels to renewable energy.

In regards to the current Nā Pua Makani Wind Project area, Mr. Primacio refers to it as "Mālaekahana West" and describes it as mostly farm operation land historically used for sugar cane production. He also knew the land to be used for diversified agriculture, cattle, chicken, and pig farming. Mr. Primacio maintains that plantation infrastructure is still present in the project area, with as many as four water pumps and wells used for irrigation and to fill the plantation's reservoirs. According to Mr. Primacio, these hydrologic control features were necessary, as low lying areas tend to flood due to the close proximity of Mālaekahana Stream. He holds that lava tubes, some containing springs, were also located in the project area, but was unsure if they are caved in or still in existence. In addition, Mr. Primacio states that a train route ran through this property from Hauʻula to the Kahuku Sugar Mill during the plantation

era. Other historic infrastructure includes a road going through the property to get back to the military training area, first installed during the World War II. He added that the training area was not extensively used in those days.

In regards to traditional and non-traditional cultural resources available in the project area, Mr. Primacio recalls pigs occasionally being hunted in and around the property, but added that pigs tend to stay in higher elevations. He acknowledged that various bird species, pheasants, mongoose, and rats are present as well and potentially still hunted. Fruit trees, such as guava, are still present and may also be exploited by locals. Mr. Primacio stated that these lands are rich in coral, or limestone, that was mined for repairing the plantation roads.

As a member of the Kahuku Community Association and past chair of the Community Association's Renewable Energy Commitee, Mr. Primacio is positive that development, in the right way, can be beneficial to the community. From agriculture to animal husbandry, the land has supported families of Kahuku. He views the land, water, and wind as valuable resources to the community that need to be managed for the long run. But ultimately, the main focus of today has to be Kahuku's ability to become as sustainable as it was in the early plantation era.

6.1.2 Mr. Raymond "Buddy" A.H. Ako

Mr. Ako has spent most of his years living, receiving an education, and working in Kahuku and Hauʻula. Mr. Ako participated in an interview on 19 November 2014 with Kimberly Mooney of Pacific Legacy.

Raymond "Buddy" A.H. Ako was born 7 July 1938 to James and Lei Ako in Honolulu. Until the age of eight years old, he was raised by his Chinese grandfather, Lau Ako, in Kāneʻohe, after which a young Buddy Ako moved from Kāneʻohe to Hauʻula to be raised by his mother and step-father. As Hauʻula was a relatively close community, Mr. Ako recalls learning about the natural world and Hawaiian traditions from several Hawaiian "uncles", including ʻAina Kamakeeʻaina, Joe Aʻalona, and Joseph Kalili. Although he lived in Hauʻula, Buddy attended Kahuku Elementary and High School from grades three to twelve.

Between school and play, Mr. Ako spent most of his time in Kahuku, as the majority of his friends resided in Kahuku and he maintains that in those days there was much more for a kid to do in Kahuku than in Hauʻula. He fondly looks back on his many adventures in the mountains above Kahuku, including parts of the proposed Nā Pua Makani Wind Project area. During the weekends and holidays, Mr. Ako remembers hiking, picking wild pineapple from abandoned fields, swimming in reservoirs, as well as hunting doves and pheasant. Whatever they were able to catch, they would share with farmer friends and classmates. These tenant farmers, mostly of Japanese descent, grew "truck crops," such as cabbage, lettuce, and tomatoes in and around the project area. The produce of these farms were largely sold to local consumers.

According to Mr. Ako, the proposed project area was largely feral pineapple fields where sugar was not grown and that sugar was still grown up until the late 1960s. He also recalls that during his childhood, Mālaekahana Stream was mostly dry, due to the usage of water by the plantation. After the plantation closed its doors, the local streams and drainages were able to maintain some degree of flowing water intermittently.

While he has no knowledge of cultural practitioners gathering traditional Hawaiian plants or other resources in the proposed project area, he does recall that many people of Kahuku gathered flowers from a large area overgrown with bougainvillea (*Bougainvillea* sp.) near a limestone outcrop or cliff located just off of the main access road of the project area. He holds that it was common for folks to gather large amounts of these flowers for special occasions, decorating, and *lei* making. Mr. Ako is also aware of some degree of pig hunting that has taken place in the upland areas near to or within the project area and that hunting pig may still be occurring.

Mr. Ako has a positive view of the proposed Nā Pua Makani Wind Project. He feels as though this proposed project represents a needed transition to renewable energy from fossil fuels.

6.2 WITHDRAWN TESTIMONIES

While three interviews were performed, one of these interviews is not included in this draft report. Mr. and Mrs. Hee both participated in an interview, but they subsequently withdrew their testimony from the public document.

7.0 FINDINGS

Interviews with two noted *kūpuna* familiar with the Nā Pua Makani Wind Project area provided some additional insights into the area's history and cultural significance.

7.1 SUMMARY OF KŪPUNA TESTIMONY

Mr. Junior Primacio shared valuable information about the history of Kahuku Plantation, its transportation and irrigation infrastructure, as well as its use of lands in and around the Nā Pua Makani Wind Project area. His input regarding Kahuku's community, past and present, paints a picture of a colorful plantation culture shared by people of many different backgrounds and ethnicities. The area in question, he referred to as "Mālaekahana West," was largely used for Plantation agriculture - predominantly sugar cane. Since the closure of the plantation, these lands remained agricultural, but were used commercially for various food crops and small scale animal husbandry. Fruit trees, such as guava, are still present and may also be exploited by locals. Currently, Mr. Primacio holds that pigs are occasionally hunted in and around the project area, but added that pigs tend to stay in higher elevations. He added that various bird species, pheasants, mongoose, and rats are present as well and potentially still hunted. Another resource exploited in this area is coral, or limestone, that was mined for repairing the plantation roads. He also mentioned the presence of plantation-era structural features throughout the property and topographical features, such as "lava tubes," some of which had contained springs that may have been filled in.

Mr. Buddy Ako's testimony was similar to Mr. Primacio, regarding the project area. He agrees that these lands remained agricultural after the Kahuku Plantation closed. These tenant farmers, mostly of Japanese descent, grew "truck crops," such as cabbage, lettuce, and tomatoes in and around the project area. The produce of these farms were largely sold to local consumers. He recalls hunting doves and pheasant in the area when he was young, but this practice was not significant for anyone's subsistence. Mr. Ako added that some degree of pig hunting has taken place in the upland areas near to or within the project area and that this may still be occurring. While he has no knowledge of cultural practitioners gathering traditional Hawaiian plants or other resources in the proposed project area, he did recall that people of Kahuku gathered flowers from a large area overgrown with bougainvillea (*Bougainvillea* sp.) near a limestone outcrop or cliff located just off of the main access road of the project area. These flowers were used for special occasions, decorating, and *lei* making. He was not sure if this practice was still occurring.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The results of archival research indicate that the vicinity of Kahuku, Keana, and Mālaekahana Ahupuaʻa has a long and rich cultural and legendary past. However, little is mentioned of the specific property in which the Nā Pua Makani Wind Project is to be built. The archaeological background suggests that this area was heavily disturbed during the plantation era for sugar cane and pineapple cultivation, which significantly decreases the likelihood of cultural resources such as intact archaeological subsurface deposits and *iwi kūpuna* to exist.

Based upon two ethnographic interviews, some traditional Hawaiian practices were found to be practiced in and around the project area, including pig hunting and plant gathering. Yet, neither informant expressed that the areas in which the cultural practices were occurring were exceptional, legal, or even ideal, as the lands are private and/or reserved for military use. Further, it is not certain that the locations in which these activities occur are within the APE. Hence, the proposed development of the Nā Pua Makani Wind Project is not forecasted to significantly impact any ongoing cultural practices. However, as espoused by various *moʻolelo*, the area in general has a mystical past and retains some supernatural qualities, which is reportedly a common belief in the area. To respect the spiritual connections that people have with the *ʻāina*, as the general area is known as a *wahi pana* (legendary place), it is recommended that any major event or construction related activity be preceded with a traditional Hawaiian blessing ceremony performed by a *kahuna* (priest or priestess) or *kahu pule* (minister/preacher).

The results of the interviews conducted as part of this CIA indicate that there does not appear to be a need for traditional access to the project area for the collection of natural resources or performing traditional cultural practices. No traditional activities associated with gathering natural resources or conducting traditional cultural practices were identified within the APE. It appears that community access to this area was probably stopped during the plantation era and was not re-established. Nā Pua Makani Power Partners does not plan to change the current status of *mauka/makai* access in this area.

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9.1 HISTORIC MAPS

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APPENDIX A

Guidelines For Assessing Cultural Impacts
Obtained From
Office of Environmental Quality Control Website

Guidelines for Assessing Cultural Impacts

Adopted by the Environmental Council, State of Hawaii
November 19, 1997

1. INTRODUCTION

It is the policy of the State of Hawaii under Chapter 343, HRS, to alert decision makers, through the environmental assessment process, about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making.

Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

Background

Prior to the arrival of westerners and the ideas of private land ownership, Hawaiians freely accessed and gathered resources of the land and seas to fulfill their community responsibilities. During the Mahele of 1848, large tracts of land were divided and control was given to private individuals. When King Kamehameha the III was forced to set up this new system of land ownership, he reserved the right of access to privately owned lands for Native Hawaiian ahupua'a tenants. However, with the later emergence of the western concept of land ownership, many Hawaiians were denied access to previously available traditional resources.

In 1978, the Hawaii constitution was amended to protect and preserve traditional and customary rights of Native Hawaiians. Then in 1995 the Hawaii Supreme Court confirmed that Native Hawaiians have rights to access undeveloped and under-developed private lands. Recently, state lawmakers clarified that government agencies and private developers must assess the impacts of their development on the traditional practices of Native Hawaiians as well as the cultural resources of all people of Hawaii. These Hawaii laws, and the National Historic Preservation Act, clearly mandate federal agencies in Hawaii, including the military, to evaluate the impacts of their actions on traditional practices and cultural resources.

If you own or control undeveloped or under-developed lands in Hawaii, here are some hints as to whether traditional practices are occurring or may have occurred on your lands. If there is a trail on your property, that may be an indication of traditional practices or customary usage. Other clues include streams, caves and native plants. Another important point to remember is that, although traditional practices may have been interrupted for many years, these customary practices cannot be denied in the future.

These traditional practices of Native Hawaiians were primarily for subsistence, medicinal, religious, and cultural purposes. Examples of traditional subsistence practices include fishing, picking opihi and collecting limu or seaweed. The collection of herbs to cure the sick is an example of a traditional medicinal practice. The underlying purpose for conducting these traditional practices is to fulfill one's community responsibilities, such as feeding people or healing the sick.

As it is the responsibility of Native Hawaiians to conduct these traditional practices, government agencies and private developers also have a responsibility to follow the law and assess the impacts of their actions on traditional and cultural resources.

The State Environmental Council has prepared guidelines for assessing cultural resources and has compiled a directory of cultural consultants who can conduct such studies. The State Historic Preservation Division has drafted guidelines on how to conduct ethnographic inventory surveys. And the Office of Planning has recently completed a case study on traditional gathering rights on Kaua'i.

The most important element of preparing Cultural Impact Assessments is consulting with community groups, especially with expert and responsible cultural records and review of transcripts of previous ethnographic interviews. Once all the information has been collected, and verified by the community experts, the assessment can then be used to protect and preserve these valuable traditional practices.

Native Hawaiians performed these traditional and customary practices out of a sense of responsibility: to feed their families, cure the sick, nurture the land, and honor their ancestors. As stewards of this sacred land, we too have a responsibility to preserve, protect and restore these cultural resources for future generations.

TEXT OF ACT 50, SLH 2000

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS

UNOFFICIAL VERSION

HOUSE OF REPRESENTATIVES H.B. NO, 2895 H.D.1
TWENTIETH LEGISLATURE, 2000
STATE OF HAWAII

A BILL FOR AN ACT

RELATING TO ENVIRONMENTAL IMPACT STATEMENTS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. The legislature finds that there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawai'i's culture, and traditional and customary rights.

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit' in Hawaii. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

The purpose of this Act is to: (1) Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

SECTION 2. Section 343-2, Hawai`i Revised Statutes, is amended by amending the definitions of "environmental impact statement' or "statement" and "significant effect", to read as follows:

"'Environmental impact statement" or "statement" means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] <u>welfare</u>, social welfare, <u>and cultural practices</u> of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects.

The initial statement filed for public review shall be referred to as the draft statement and shall be distinguished from the final statement which is the document that has incorporated the public's comments and the responses to those comments. The final statement is the document that shall be evaluated for acceptability by the respective accepting authority.

"Significant effect" means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic [or] welfare, social welfare[.], or cultural practices of the community and State."

SECTION 3. Statutory material to be repealed is bracketed. New statutory material is underscored.

SECTION 4. This Act shall take effect upon its approval.

Approved by the Governor as Act 50 on April 26, 2000

2. CULTURAL IMPACT ASSESSMENT METHODOLOGY

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping, community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupuaʻa is usually the appropriate geographical unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupua'a and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural, including submerged cultural resources, which support such cultural practices and beliefs.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

1. identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupuaʻa;
2. identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
3. receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
4. conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
6. assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

3. CULTURAL IMPACT ASSESSMENT CONTENTS

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §§ 11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

1. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.
2. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.
3. Ethnographic and oral history interview procedures, including the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.
4. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.

5. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.
6. An explanation of confidential information that has been withheld from public disclosure in the assessment.
7. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.
8. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.
9. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call 586-4185.

APPENDIX B

Pacific Legacy Communication Log
- Organizations and Individuals Contacted

PACIFIC LEGACY –NĀ PUA MAKANI WIND PROJECT CIA - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Ahuna, Gladys Pualoa "Auntie Gladys"	Lāʻie Community Association; Koʻolau Loa Neighborhood Board; Hawaiian Civic Clubs; Lanihuli Hawaiian Civic Club, co-founder; family has lived in Lāʻie for seven generations	• letters sent: 6/10/14; 3/31/2014 • no response
Ako, Buddy	Former resident of Kahuku; educated in Kahuku; Former Community Liaison for Turtle Bay Resort Development	• letters sent: 6/10/14; 3/31/2014 • phone conversation: 11/13/14 • interview 11/19/14 (K. Mooney) • interview summary sent: 10/17/14 • phone conversation: 12/15/14 • oral history consent: 12/22/14
Anamizu, Carol	Cultural practitioner who lived and farmed ti in adjacent lands to east (Anamizu Farms); also knowledgeable on Japanese Cemetery;	• letters sent: 6/10/14; 3/31/2014 • no response • phone message left: 11/13/14 • no response
Awai-Lennox, Gladys "Honey"	Lifelong Kahuku resident; family goes back many generations in Waialua District; Waiʻalua Hawaiian Civic Club .	• letters sent: 6/10/14; 3/31/2014 • no response
Beirne-Keawe, Danielle Ululani	Koʻolau Loa Hawaiian Civic Club, President	• letters sent: 6/10/14; 4/14/2014 • no response
Benham, Roy	Kupuna, cultural practitioner; Raised in Kahuku	• letters sent: 6/10/14; 3/31/2014 • no response
Colburn, Pua	Kupuna; Kahuku Burial Committee	• letters sent: 6/10/14; 3/31/2014 • no response • phone conversation: 11/13/14 (not knowledgeable on area; refers Dawn Wasson & family)
Hee, Kenneth Makaʻio and Germaine K. Halualani-Hee	Mr. Hee: Kahuku North Shore Health Center, kahu & healer Mrs. Hulualani-Hee: cultural practitioner and longtime resident of Kahuku	• letters sent: 6/10/14; 5/3/2014 (to Mr. Hee) • interview: 6/25/14 (E.L. Kahahane) • interview summary sent: 1/7/15 • no response
Kaluhiokalani, Norman A.	Koʻolau Loa Neighborhood Board, member	• letters sent: 6/10/14; 3/31/2014 • no response
Lenchanko, Tom	Cultural practitioner and historian	• letters sent: 6/16/14 Resent letter; 6/16/14 letter returned with forwarding address; 6/10/14; 3/31/2014 • email: 11/13/14 • email response: 11/13/14 (states CIA & Ethnographic Inventory Survey are not sufficient, recommends a Traditional Cultural Property Analysis)
Logan, Roland Maiola "Ahi"	Lifelong Koʻolau Loa resident; Fisherman	• letters sent: 6/10/14; 3/31/2014 • no response
Lunasco, Ollie	Pig hunter's Association, president	• email: 11/13/14 • phone conversation: 11/13/14 • email response: 11/17/14 • letter sent: 11/18/14
Makaiau, Ralph	Lifelong Kahuku resident; Kahuku Community Association; Turtle Bay Resort, Sr. Proj. Manager	• letters sent: 6/10/14; 3/31/2014 • no response
Matsuda, Kylie	Kahuku Farms, 4th generation farmer in Kahuku	• letters sent: 6/10/14; 3/31/2014 • no response
McKenzie, Nova-Jean	Kupuna with long ancestral ties to Kahuku; Kumu of Hawaiian Studies; cultural practitioner	• letters sent: 6/10/14; 3/31/2014 • no response • found informant to be recently deceased
Napela, Jonathan	Referred by OHA	• letter sent: 6/10/14 • no response
Paglinawan, Richard	Cultural Advisor to the Kahuku Burial Committee	• letters sent: 4/1/14; 6/10/14; 3/31/2014 • no response

PACIFIC LEGACY –NĀ PUA MAKANI WIND PROJECT CIA - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Primacio, John Junior and Primacio, Margaret	Mr. Primacio: 5th Generation Kahuku Resident; former Kahuku Plantation worker; various community associations; Mrs. Primacio: Kahuku Villages Association fmr. Vice President; seven generations in Kahuku	• letters sent: 6/10/14; 3/31/2014 • interview: 6/25/14 (Mr. Primacio **only** with E.L. Kahahane) • interview summary letter sent: 10/17/14 • oral history consent: 1/1/15
Shirai, Thomas	Kawaihapai ʻOhana, Oʻahu Island Burial Council	• letter sent: 6/10/14 • email: 11/13/14 • email response: 12/5/14 (has health issues) • email 12/8/14 • no response
Wasson, Dawn Kahala Taotafa	Hauʻula Elementary - Kupuna; Koʻolau Loa Hawaiian Civic Club, Member; Koʻolau Loa Health & Wellness Center, Kupuna Council; Koʻolau Loa Neighborhood Board No. 28, Culture Committee, chair	• letters sent: 6/10/14; 3/31/2014 • phone conversations (with E.L. Kahahane): July-August 2014 • email: 11/13/14 • phone message: 11/13/14 • no response

APPENDIX C

Correspondence From OHA

From: Jerome K. Yasuhara [jeromey@oha.org]
Sent: Thursday, April 10, 2014 1:41 PM
To: mooney@pacificlegacy.com
Cc: Jerome K. Yasuhara
Subject: Pre-Consultation for the CIA and Ethnographic Inventory Survey for the proposed Nā Pua Makani Wind Farm [OHA ref: HRD14-7014]

Aloha e Kimberly M. Mooney/Pacific Legacy, Inc.:

This is commentary responding to your March 19, 2014 letter to Dr. Kamanaʻopono M. Crabbe of the Office of Hawaiian Affairs [OHA ref: HRD14-7014]. OHA appreciates this early pre-consultation in developing the Cultural Impact Assessment (CIA) and Ethnographic Inventory Survey pursuant to Act 50, Session Laws of Hawaii (2000), and Chapters 343 & 6E, HRS, the Environmental Impact Statement (EIS) and Historic Preservation review process.

OHA understands the importance of participating in the review process to foster better-informed decision-making and to bring balance to the various interests. As with any CIA, OHA values the views of the local communities being impacted in conjunction with the planning needs of developers, all of which must be weighed in view of the legally protected traditional and cultural rights of native practitioners and the historic/cultural/religious/subsistence resources.

OHA also points out the emphasis on integrity entrusted to all consulting firms, such as Pacific Legacy, Inc., in executing and presenting that which is pono. Even if one were to arrive at certain conclusions about Kahuku based on preliminary discussions and literary research, it is nearly always safe to anticipate the abundant layers of nuances upon nuances to one's analysis if only reasonable amounts of curiosity, diligence and inspection were fully employed.

Kahuku is multifaceted, dynamic, passionate, rustic and special. It is one of those rare places where linkages to the past are still vibrant even with the passage of time and introduced Western influences. We are aware of kūpuna who continue practicing and teaching lā`au lapa`au, we are aware of the resilience shown when concerning iwi kūpuna burials, we are aware of the interests of subsistence hunters, and so forth. Access, gathering, mālama and subsistence rights must be adequately understood if community support is sought.

Because of the many still engaged in such practices, but whose identities are not readily available, OHA encourages a broad grassroots approach in outreaching the Kahuku community. Therefore, the following is a preliminary list of referrals for this CIA (in no particular order) and from whom we hope other knowledgeable informants can be gained:

- Koʻolau Loa Hawaiian Civic Club
- Oʻahu Island Burial Council
- Kahuku Burial Committee
- Various Kūpuna Lāʻau Lapaʻau Practitioners
- D. Ululani Beirne
- Roy Benham

- Dawn Wasson
- Kahu Cy Bridges
- Margaret Primacio
- Thomas Shirai
- Ollie Lunasco
- Tom Lenchanko

Finally, please be informed of our new office location and mailing address: **Office of Hawaiian Affairs, 560 N. Nimitz Hwy., Suite 200, Honolulu, HI 96817**. All future formal requests for comment should be mailed attention: **Dr. Kamanaʻopono Crabbe, Ka Pouhana, CEO**.

Please feel free to contact me directly with any questions or concerns at (808) 594-0129 or jeromey@oha.org.

Mahalo,

Jerome

Effective January 17, 2014, OHA's formal MAILING ADDRESS will be
560 N. Nimitz Hwy., Suite 200, Honolulu HI 96817, *(phone/fax numbers will remain the same)*

Jerome Yasuhara
Ka ʻAho Pueo, Kiaʻi Kānāwai
Compliance Specialist
Office of Hawaiian Affairs

OHA
Office of Hawaiian Affairs

560 N. Nimitz Hwy., Suite 200, Honolulu HI 96817
Ph: 808-594-0129
Fax: 808-594-1825
email: jeromey@oha.org

APPENDIX D

Ethnographic Interview Questionnaire

Pacific Legacy, Inc.

Cultural Impact Assessment (CIA)
Ethnographic Interview Form

Job Name/#:_____ **Interviewer Name:**_____

Location:_____ **Date/Time:**_____

Permission to Record Audio (Y/N):_____

Interviewee Full Name:	Birth Name:
Birth Date:	Occupation/Title:
Current Residence:	Birth Place & Place of formative years:
Years spent in or near subject area:	Affiliation with subject area:
Parents:	Informants/Mentors:

1) **How familiar are you with the subject area?**

2) **What is this area traditionally called? Can you recall any other names of the area?**

3) **What stories or mythologies have you heard of this area?**

4) **How would you describe the physical characteristics of the area from your earliest memory?**

5) **Are there any significant or special features (i.e. landmarks or unique topography) in this area as it relates to land use and/or its history?**

6) How was the area used by people in the past?

Land Use Details:

Activity	Types (specific names)	When	Intensity and Frequency	By Who
7) Hunting/ Fishing				
8) Gathering				
9) Agriculture/ Aquaculture				
10) Habitation				
11) Ceremonial				
12) Burial				
13) Other				

14) Have you observed changes to the land or its resources? Please Explain.

15) What are your thoughts about the project proposal?

16) Additional Comments by the Interviewee:

17) Additional Comments:

Would you like to view the synopsis of the interview prior to CIA report submittal(Y/N)?_____

Time Interview Concludes :_____

Interviewee Signature: _____ Date: _____

APPENDIX E

Signed Oral History Release Forms

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: NA PUA MAKANI WIND FARM

Date of Interview: 25 JUNE 2014

I, JUNIOR PRIMACIO, have been previously interviewed by ELIZABETH KAHAHAHANE of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

SPECIFIC OBJECTIONS AND RESTRICTIONS:

Junior Primacio
Interviewee Signature

1/1/15
Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: NA PUA MAKANI WIND FARM

Date of Interview: NOVEMBER 19, 2014

I, RAYMOND "BUDDY" A.H. AKO, have been previously interviewed by KIMBERLY M. MOONEY of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

NONE

SPECIFIC OBJECTIONS AND RESTRICTIONS:

NONE

Raymond A.H. Ako
Interviewee Signature

DECEMBER 22, 2014
Date

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Nā Pua Makani Wind farm

Date of Interview: 6/25/14

I, KENNETH HEE, have been interviewed by E.L. KAHAHANE of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Kenneth M. Hee
Interviewee Signature

6-25-14
Date

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Nā Pua Makani Wind farm

Date of Interview: 6/25/14 10:30

I, Germaine K Halualani-Lee have been interviewed by E.L. KAHAHANE of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Germaine K Halualani-Lee
Interviewee Signature

06-25-14
Date

APPENDIX H
PRELIMINARY DRAINAGE REPORT

PRELIMINARY DRAINAGE REPORT
NĀ PUA MAKANI WIND FARM

Kahuku, O‘ahu, Hawai‘i
Tax Map Keys: 5-6-006:018,047,051,055; 5-6-005:018, 5-6-008:006

December 2014

Prepared for:
Champlin Hawai‘i Wind Holdings LLC
2020 Alameda Padre Serra, Suite 123
Santa Barbara, CA 93102

Prepared by:
BELT COLLINS HAWAII LLC
2153 North King Street, Suite 200
Honolulu, Hawai‘i 96819

2014.33.1001

1 PROJECT DESCRIPTION

1.1 GENERAL

The Nā Pua Makani Wind Farm project (Project) is located at the northeast coast of Oʻahu, in Kahuku and Kaʻena Town, Tax Map Key (TMK) 5-6-006:018,047,051,055; 5-6-005:018, 5-6-008:006. See Figure 1 – Location Map. The 707 acre project area is approximately 9,000 feet inland from the coast on a steep sloping ridge with elevations ranging from 13- to 400-feet above mean sea level.

Three alternatives evaluated in the Project EIS: Alternative 1 – No Action, Alternative 2 – Proposed Action Wind Project of up to 10 turbines (up to approximately 25 megawatts (MW)) and Alternative 3 – Larger Generation Wind Project of up to 12 turbines (up to 42-MW). Under Alternative 1, there will be no new construction of wind turbines, meteorological towers, supporting structures, and access roadways. Thus, the main focus of this report will only discuss Alternative 2 and 3.

Alternative 2 entails the construction and operation of an approximately 25 MW wind generation facility, consisting of 8 to 10 wind turbines, meteorological tower, operations and maintenance facility, electrical collections system, transmission line, and 16-foot- wide internal access roads using compacted gravel.

Alternative 3 entails the construction and operation of an approximately 42 MW wind generation facility, consisting of up to 12 wind turbines, meteorological tower, operations and maintenance facility, electrical collections system, transmission line, and 16-foot-wide access roads using compacted gravel.

1.2 EXISTING DRAINAGE

The developed portions of the project area consist mostly of agricultural and vegetated fields. Runoff generated onsite and offsite is routed through three gulches located in the project site. Farthest north of the project site is ʻŌhiʻaʻai Gulch, Keaʻaulu Gulch is located in the middle of the project site, and Lamaloa Gulch is to the south of the project site. Runoff from the three gulches discharges into Mālaekahana Stream or its tributaries just upstream of Kamehameha Highway which discharges directly to the Pacific Ocean.

2 REGULATORY REQUIREMENTS

2.1 CITY AND COUNTY OF HONOLULU (CCH) STORM DRAINAGE STANDARDS

The City and County of Honolulu Rules Relating to Storm Drainage Standards requires developments to manage storm water runoff such that there is no adverse impact to downstream properties, typically resulting from an increase in storm water runoff or a change in drainage patterns. On-site disposal or retention of the net increase in storm water runoff is proposed to mitigate any adverse downstream impact.

2.2 FLOOD HAZARD AREA

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM Panel 15003C0045G, effective date January 19, 2011), a portion of the project site is located within Zone AE, or areas where base flood elevations (BFEs) are determined; Zone A, or areas where no BFE is determined; Zone X, or areas determined to be outside of the 0.2% annual chance floodplain; and Zone D, or unstudied areas where flood hazards are undetermined but flooding is possible. See Figure 2 – Flood Zones. The AEF zone immediately adjacent to Kamehameha Highway is designated as a floodway.

Chapter 21-9.10-5 of the Revised Ordinances of Honolulu prohibits encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrological and hydraulic analyses that such encroachments would not result in any increased flood levels within the community during the occurrence of the base flood discharge.

3 ANALYSIS AND RESULTS

The approximate total area of proposed roadways, wind turbines, and structures is 8.9 acres and 10.4 acres for Alternative 2 and 3, respectively. The net change in runoff is computed using the rational method and the 10 year design storm. The on-site retention volume is computed using the modified rational method and the 50 year design storm. The design storm durations are equal to the time of concentration.

The runoff rate from the area to be occupied by the proposed improvements is computed for the existing and developed conditions and the net increase determined. Under the 10 year design storm, the net increase in storm water runoff is 7.1 cfs and 8.2 cfs for Alternative 2 and 3, respectively. See Appendix A for computations.

To mitigate any adverse downstream impact, the project will need to either dispose or store the net increase in runoff on-site. The criteria for disposal is a 10 year design storm and is limited to the installation of seepage pits or drywells. Additional subsurface investigation is needed to characterize the disposal rate of the project area. The alternative is to retain the runoff on-site using open detention areas or subsurface storage. The required storage volume, determined using the 50 year design storm, is 2.0 ac-ft and 2.4 ac-ft for Alternative 2 and 3, respectively, which may be provided in one or several distributed locations. The design of the on-site disposal or storage facilities would be developed in conjunction with preparation of detailed construction plans.

4 CONCLUSION

No adverse impacts to neighboring properties are expected. The net increase in runoff due to the proposed improvements will be mitigated through the use of on-site disposal and/or on-site detention. Drainage drywells or seepage pits may be used to dispose of the net increase in storm water runoff. Alternatively, the net increase in storm water runoff may be stored on-site using retention basins. The use of on-site disposal and retention, individually or in combination, will address the net increase in storm water runoff.

Improvements within the floodway are limited to surface pavements and underground power transmission lines. The conveyance capacity of the floodway is not expected to change as a result of these improvements, consequently, no rise in the BFE is expected.

5 REFERENCES

- Flood Insurance Study, Volume 1 and 2, City and County of Honolulu, Hawaiʻi, Federal Emergency Management Agency, Revised November 26, 2010.

- Flood Insurance Rate Map, Map Number 15003C0045G, Federal Emergency Management Agency, Map Revised January 19, 2011.

- NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 4 Version 3: Hawaiian Islands, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Revised 2011.

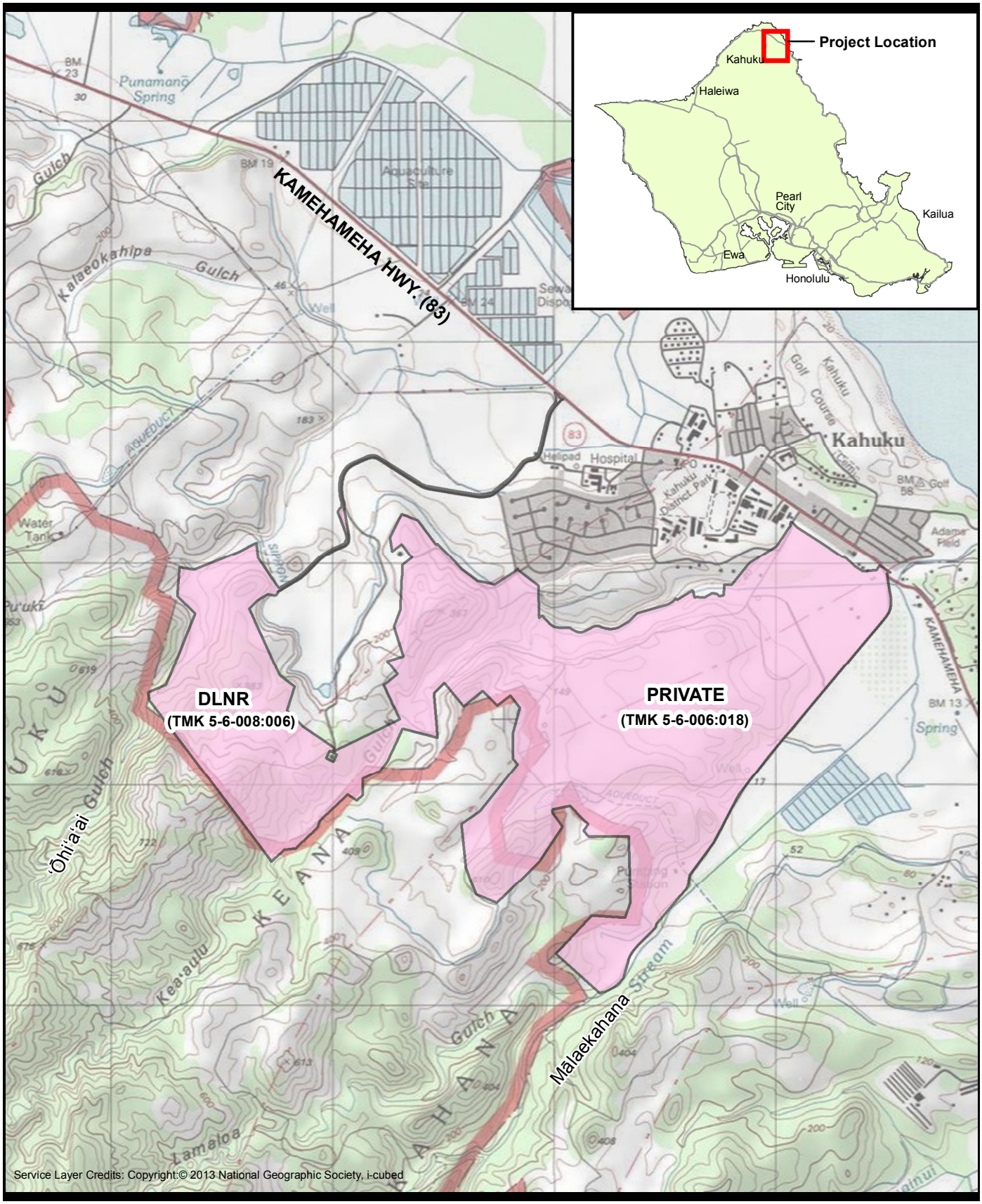

Figure 1

LOCATION MAP

Na Pua Makani Wind Farm
Champlin Hawaii Wind Holdings LLC
December 2014

BELT COLLINS

NORTH

0 500 1,000 2,000

SCALE IN FEET

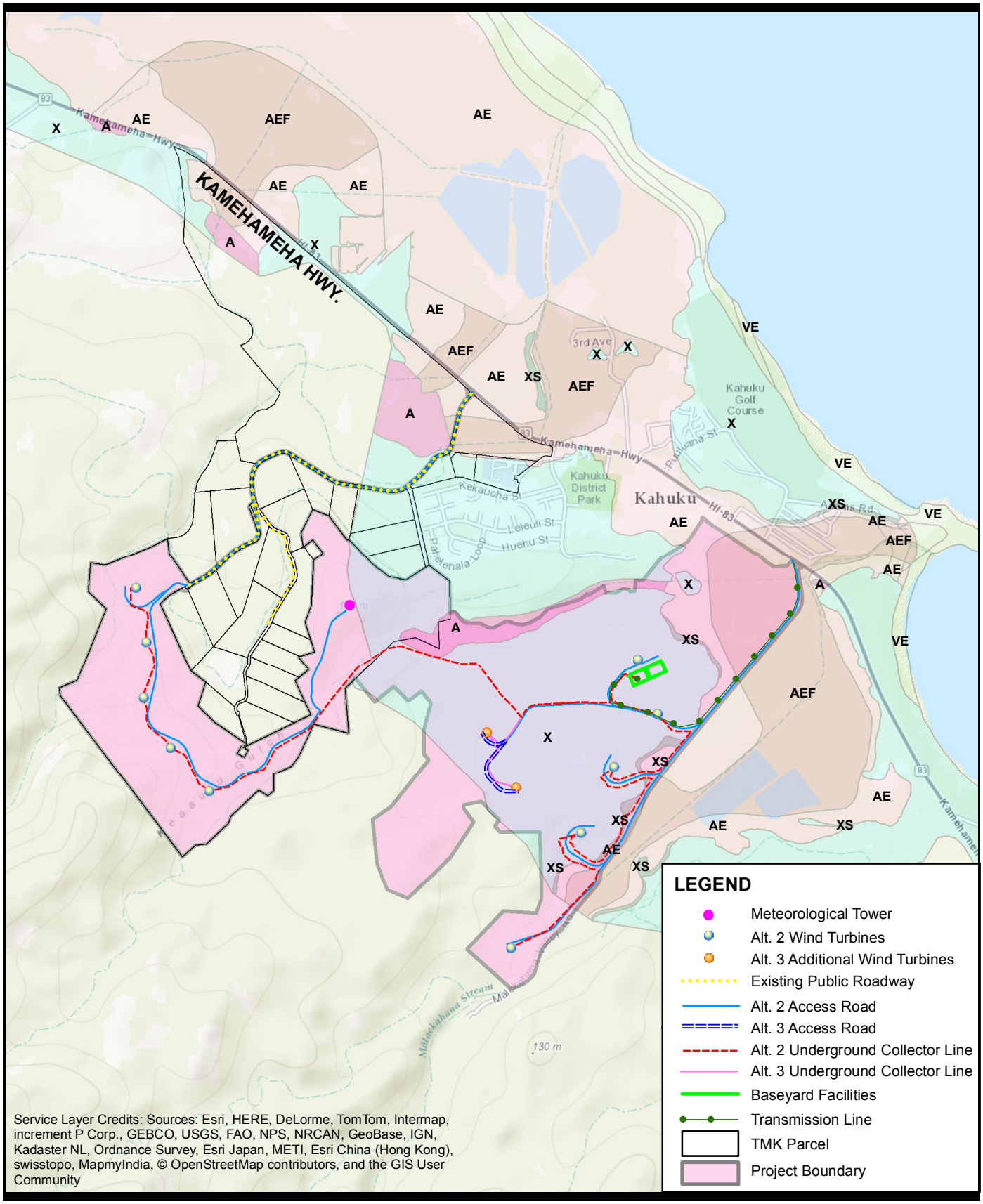

Figure 2

FLOOD ZONES

Nā Pua Makani Wind Farm
Champlin Hawaii Wind Holdings LLC
December 2014

BELT COLLINS

NORTH

0 500 1,000 2,000

SCALE IN FEET

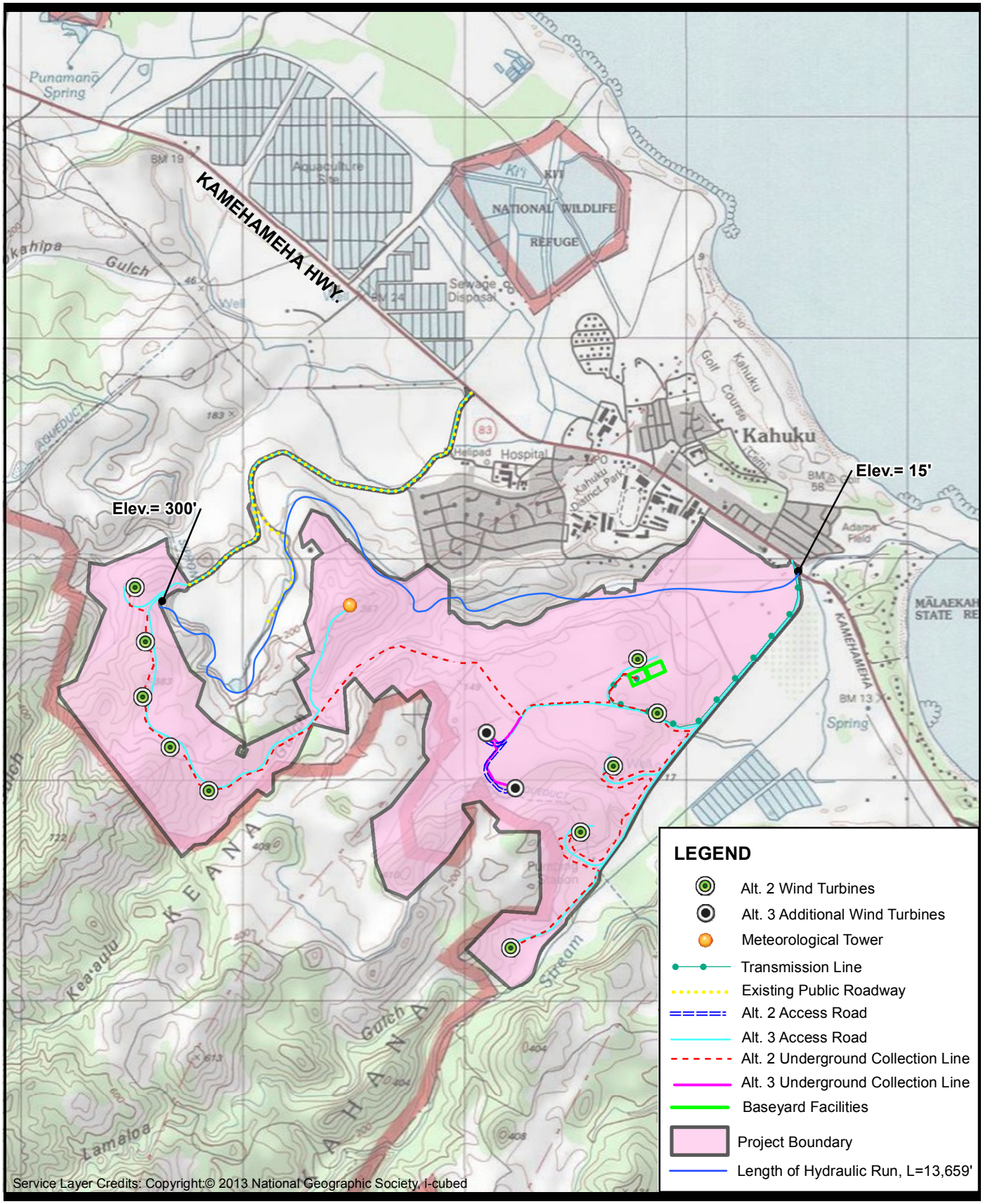

Figure 3

TIME OF CONCENTRATION

Nā Pua Makani Wind Farm
Champlin Hawaii Wind Holdings LLC
December 2014

BELT COLLINS

NORTH

0 500 1,000 2,000

SCALE IN FEET

PROJECT:	Nā Pua Makani Wind Farm	JOB NO:	2014.33.1001
CLIENT:	Champlin Hawai'i Wind Holdings LLC	DATE:	13-Nov-14
SUBJECT:	Preliminary Drainage Calculations Alternative 2	BY:	JC/CKL
FILE:	M:\Na Pua Makani Wind Farm\2014331001 Drainage Study\05 Basis of Design\Calculations\[Alternative 3 Runoff Calcs.xlsx]Runoff-Storage		

Runoff Coefficient, C

	Length (ft)	Width (ft)	Area (ac)	C Value	Composite C
Existing Condition					
Agriculture Areas	n/a	n/a	8.9	0.3	
Developed Condition					
Buildings and Yards	n/a	n/a	1.6	0.9	1.467
New gravel roads	19,700	16	7.2	0.70	5.1
			8.9		**0.74**

Time of Concentration, Tc

Length Hydraulic Run (ft)	13659
Start Elevation (ft)	300
End Elevation (ft)	15
Slope	2.1%
Open Channel Velocity (fps)	1.5
Tc (min)	151.8
Tc (hrs)	2.53

Runoff Rates

	Area (ac)	I_{10Y-2H} (in.)	I_{50Y-2H} (in.)	C	Q_{10} (cfs)	Q_{50} (cfs)
Existing Condition	8.9	1.82	2.53	0.30	4.84	6.73
Developed Condition	8.9	1.82	2.53	0.74	11.89	16.53
			Total Increase in Runoff (cfs) =		**7.05**	9.80

On-site Detention

Volume to store runoff (Q_{50} x Tc)	89,213	cf
Total on-site retention requirement =	**2.0**	ac-ft

PROJECT:	Nā Pua Makani Wind Farm	JOB NO:	2014.33.1001
CLIENT:	Champlin Hawai'i Wind Holdings LLC	DATE:	13-Nov-14
SUBJECT:	Preliminary Drainage Calculations Alternative 3	BY:	JC/CKL
FILE:	M:\Na Pua Makani Wind Farm\2014331001 Drainage Study\05 Basis of Design\Calculations\[Alternative 2 Runoff Calcs.xlsx]Runoff-Storage		

Runoff Coefficient, C

	Length (ft)	Width (ft)	Area (ac)	C Value	Composite C
Existing Condition					
Agriculture Areas	n/a	n/a	10.4	0.3	
Developed Condition					
Buildings and Yards	n/a	n/a	1.8	0.9	1.584
New gravel roads	23,400	16	8.6	0.70	6.0
			10.4		**0.73**

Time of Concentration, Tc

Length Hydraulic Run (ft)	13659
Start Elevation (ft)	300
End Elevation (ft)	15
Slope	2.1%
Open Channel Velocity (fps)	1.5
Tc (min)	151.8
Tc (hrs)	2.53

Runoff Rates

	Area (ac)	I_{10Y-2H} (in.)	I_{50Y-2H} (in.)	C	Q_{10} (cfs)	Q_{50} (cfs)
Existing Condition	10.4	1.82	2.53	0.30	5.65	7.86
Developed Condition	10.4	1.82	2.53	0.73	13.83	19.23
			Total Increase in Runoff (cfs) =		**8.2**	11.37

On-site Detention

Volume to store runoff (Q_{50} x Tc)	103,534	cf
Total on-site retention requirement =	**2.4**	ac-ft

NOAA Atlas 14, Volume 4, Version 3
Location name: Hauula, Hawaii, US*
Latitude: 21.6722°, Longitude: -157.9518°
Elevation: 118 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

S. Perica, D. Martin, B. Lin, T. Parzybok, D. Riley, M. Yekta, L. Hiner, L.-C. Chen, D. Brewer, F. Yan, K. Maitaria, C. Trypaluk, G. M. Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.44** (3.89-5.10)	**5.82** (5.02-6.78)	**7.62** (6.53-8.90)	**9.04** (7.66-10.6)	**11.0** (9.16-13.0)	**12.5** (10.3-15.0)	**14.0** (11.3-17.0)	**15.6** (12.3-19.1)	**17.8** (13.5-22.1)	**19.6** (14.4-24.6)
10-min	**3.29** (2.88-3.78)	**4.31** (3.72-5.02)	**5.65** (4.84-6.60)	**6.70** (5.68-7.87)	**8.14** (6.79-9.65)	**9.26** (7.61-11.1)	**10.4** (8.39-12.6)	**11.6** (9.13-14.2)	**13.2** (10.0-16.4)	**14.5** (10.6-18.3)
15-min	**2.76** (2.41-3.16)	**3.61** (3.11-4.20)	**4.73** (4.05-5.52)	**5.61** (4.75-6.58)	**6.82** (5.68-8.08)	**7.76** (6.37-9.28)	**8.72** (7.02-10.5)	**9.71** (7.64-11.9)	**11.1** (8.39-13.7)	**12.1** (8.90-15.3)
30-min	**1.94** (1.70-2.23)	**2.54** (2.19-2.96)	**3.33** (2.85-3.89)	**3.95** (3.34-4.63)	**4.80** (4.00-5.69)	**5.46** (4.48-6.53)	**6.13** (4.94-7.41)	**6.84** (5.38-8.34)	**7.79** (5.90-9.67)	**8.55** (6.27-10.8)
60-min	**1.28** (1.12-1.47)	**1.67** (1.44-1.95)	**2.19** (1.88-2.56)	**2.60** (2.20-3.05)	**3.15** (2.63-3.74)	**3.59** (2.95-4.30)	**4.04** (3.25-4.87)	**4.50** (3.54-5.49)	**5.12** (3.88-6.36)	**5.62** (4.12-7.08)
2-hr	**0.878** (0.755-1.00)	**1.16** (1.00-1.35)	**1.53** (1.31-1.79)	**1.82** (1.55-2.14)	**2.22** (1.85-2.63)	**2.53** (2.08-3.02)	**2.84** (2.29-3.43)	**3.17** (2.49-3.87)	**3.61** (2.74-4.48)	**3.96** (2.90-4.98)
3-hr	**0.663** (0.569-0.761)	**0.890** (0.768-1.03)	**1.18** (1.01-1.38)	**1.40** (1.20-1.65)	**1.71** (1.43-2.03)	**1.95** (1.61-2.33)	**2.20** (1.78-2.65)	**2.46** (1.94-2.99)	**2.80** (2.13-3.47)	**3.07** (2.26-3.86)
6-hr	**0.423** (0.361-0.487)	**0.562** (0.486-0.654)	**0.752** (0.645-0.879)	**0.900** (0.765-1.06)	**1.10** (0.923-1.31)	**1.26** (1.04-1.51)	**1.43** (1.15-1.72)	**1.59** (1.25-1.94)	**1.82** (1.38-2.26)	**2.00** (1.47-2.52)
12-hr	**0.255** (0.217-0.295)	**0.344** (0.297-0.399)	**0.467** (0.401-0.547)	**0.564** (0.480-0.664)	**0.697** (0.583-0.826)	**0.801** (0.658-0.957)	**0.906** (0.731-1.09)	**1.02** (0.800-1.24)	**1.17** (0.885-1.45)	**1.28** (0.941-1.62)
24-hr	**0.148** (0.125-0.175)	**0.206** (0.174-0.243)	**0.285** (0.240-0.337)	**0.347** (0.291-0.411)	**0.431** (0.360-0.514)	**0.498** (0.413-0.595)	**0.566** (0.467-0.680)	**0.637** (0.521-0.771)	**0.734** (0.592-0.896)	**0.810** (0.646-0.996)
2-day	**0.088** (0.076-0.102)	**0.121** (0.104-0.140)	**0.166** (0.142-0.192)	**0.200** (0.171-0.233)	**0.248** (0.211-0.290)	**0.285** (0.241-0.334)	**0.322** (0.270-0.381)	**0.361** (0.301-0.429)	**0.414** (0.341-0.496)	**0.456** (0.370-0.550)
3-day	**0.066** (0.056-0.076)	**0.089** (0.077-0.104)	**0.121** (0.104-0.141)	**0.146** (0.124-0.170)	**0.179** (0.152-0.210)	**0.204** (0.172-0.241)	**0.230** (0.193-0.272)	**0.257** (0.213-0.305)	**0.292** (0.239-0.351)	**0.319** (0.259-0.387)
4-day	**0.054** (0.047-0.064)	**0.074** (0.063-0.086)	**0.099** (0.084-0.116)	**0.118** (0.101-0.139)	**0.144** (0.122-0.170)	**0.164** (0.138-0.194)	**0.184** (0.154-0.218)	**0.204** (0.169-0.244)	**0.231** (0.189-0.278)	**0.251** (0.203-0.305)
7-day	**0.036** (0.031-0.042)	**0.048** (0.041-0.056)	**0.064** (0.055-0.075)	**0.076** (0.065-0.089)	**0.092** (0.078-0.108)	**0.104** (0.088-0.123)	**0.116** (0.097-0.138)	**0.128** (0.106-0.153)	**0.144** (0.118-0.173)	**0.155** (0.126-0.189)
10-day	**0.028** (0.024-0.033)	**0.038** (0.032-0.044)	**0.050** (0.043-0.058)	**0.059** (0.050-0.069)	**0.071** (0.060-0.083)	**0.080** (0.067-0.094)	**0.088** (0.074-0.105)	**0.097** (0.080-0.115)	**0.108** (0.089-0.130)	**0.116** (0.094-0.141)
20-day	**0.019** (0.016-0.022)	**0.025** (0.021-0.029)	**0.032** (0.028-0.038)	**0.038** (0.032-0.044)	**0.045** (0.038-0.053)	**0.050** (0.042-0.059)	**0.055** (0.046-0.065)	**0.059** (0.049-0.071)	**0.065** (0.054-0.079)	**0.070** (0.057-0.084)
30-day	**0.015** (0.013-0.017)	**0.019** (0.017-0.023)	**0.025** (0.022-0.029)	**0.029** (0.025-0.034)	**0.035** (0.029-0.041)	**0.038** (0.032-0.045)	**0.042** (0.035-0.050)	**0.046** (0.038-0.054)	**0.050** (0.041-0.060)	**0.053** (0.043-0.064)
45-day	**0.012** (0.010-0.014)	**0.015** (0.013-0.018)	**0.020** (0.017-0.023)	**0.023** (0.020-0.027)	**0.027** (0.023-0.032)	**0.030** (0.026-0.036)	**0.033** (0.028-0.039)	**0.036** (0.030-0.043)	**0.039** (0.032-0.047)	**0.042** (0.034-0.051)
60-day	**0.010** (0.009-0.012)	**0.013** (0.011-0.015)	**0.017** (0.014-0.020)	**0.020** (0.017-0.023)	**0.023** (0.019-0.027)	**0.025** (0.021-0.030)	**0.028** (0.023-0.033)	**0.030** (0.025-0.035)	**0.032** (0.027-0.039)	**0.034** (0.028-0.042)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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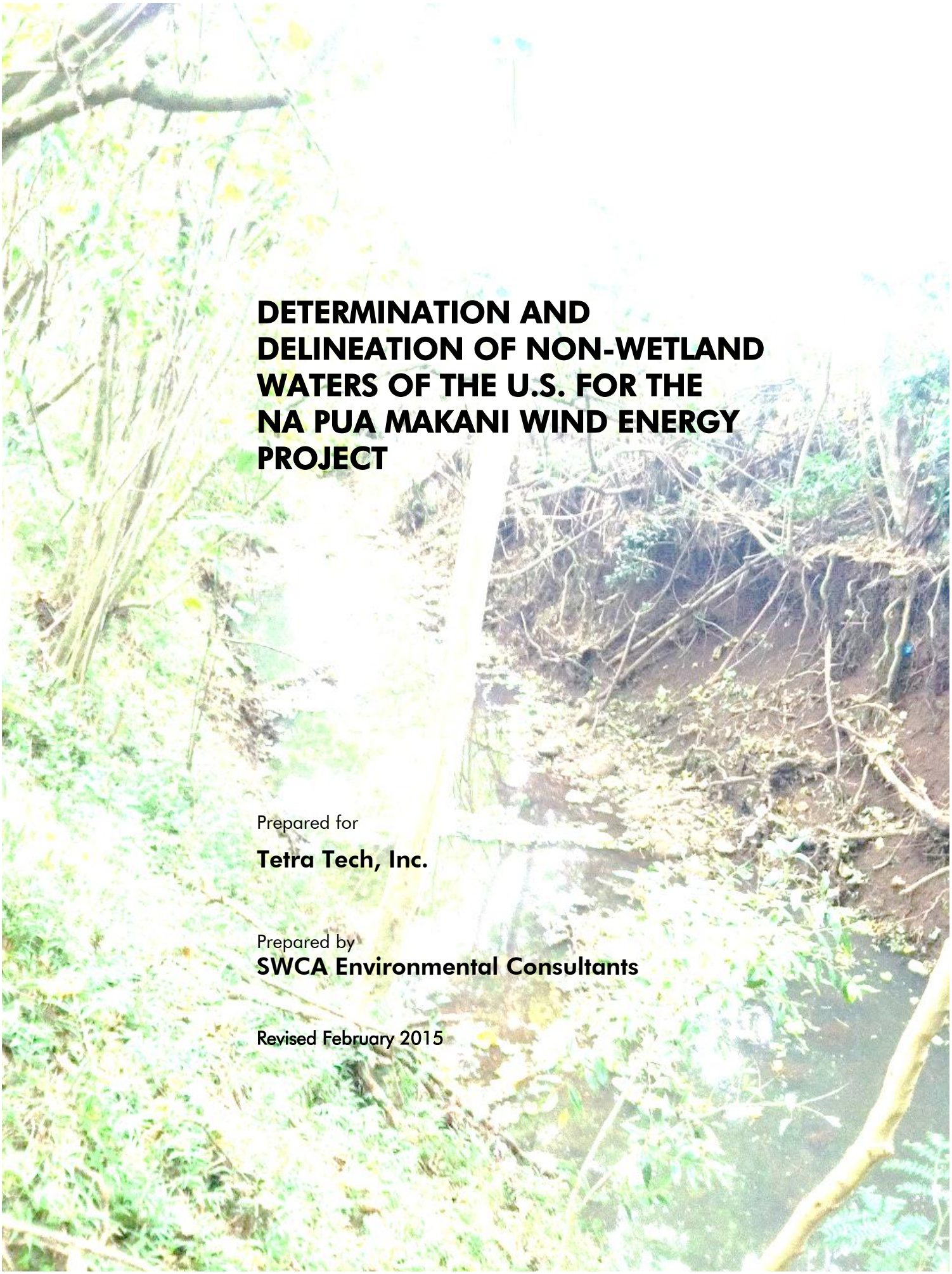
PF graphical

APPENDIX I
PRELIMINARY DETERMINATION AND DELINEATION OF NON-WETLAND WATER OF THE U.S.



DETERMINATION AND DELINEATION OF NON-WETLAND WATERS OF THE U.S. FOR THE NA PUA MAKANI WIND ENERGY PROJECT

Prepared for

Tetra Tech, Inc.

Prepared by

SWCA Environmental Consultants

Revised February 2015

DETERMINATION AND DELINEATION OF NON-WETLAND WATERS OF THE U.S. FOR THE NA PUA MAKANI WIND ENERGY PROJECT

Prepared for

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SWCA Project No. 28769

Draft Submitted July 2, 2014
Draft Revised July 24, 2014
Revised February 6, 2015

WATERS OF U.S. DETERMINATION AND DELINEATION SUMMARY

PROJECT NAME: Na Pua Makani Wind Energy Project

SITE LOCATION: Kahuku, Island of Oʻahu, Hawaiʻi
Tax Map Keys (TMKs) 5-6-006:018, 5-6-008-006, and 6-6-008:006

APPLICANT: Champlin Hawaii Wind Holdings, LLC

SURVEY DATES: April 10, 2014; June 16, 2014; June 24, 2014; and January 16, 2015

PROJECT STAFF: Tiffany Bovino Agostini, Botanist/Project Manager
Bryson Luke, Field Technician
Taya MacLean, Wetland Specialist

SWCA Environmental Consultants (SWCA) was contracted by Tetra Tech, Inc. to conduct a determination and delineation of potential waters of the U.S. (WoUS) regulated by the Clean Water Act (CWA) within 59.17 acres (23.9 hectares [ha]) in Kahuku as part of the proposed Na Pua Makani Wind Energy project. SWCA conducted fieldwork on April 10, 2014; June 16, 2014; June 24, 2014; and January 16, 2015. The delineation was performed in accordance with U.S. Army Corps of Engineers (USACE) Regulatory Guidance Letter 05-05 (USACE 2005) for identifying the ordinary high water mark (OHWM) for non-tidal, non-wetland waters.

The proposed Na Pua Makani project involves the construction and operation of a wind energy generation project near the community of Kahuku on the north shore of Oʻahu. The survey area encompasses four non-contiguous areas that have the potential to intersect with project components such as roads, overhead transmission lines, and collection lines. It is within three TMKs: 5-6-006:018, 5-6-008:006, and 6-6-008:006. Elevations range from approximately 3 feet (0.9 meters [m]) to over 200 feet (60 m) above mean sea level.

Two intermittent streams (Keaʻaulu Gulch and ʻŌhiʻaʻai Tributary) and one perennial stream (Mālaekahana Stream) as well as an aqueduct and ditch have been identified in the survey area according to geospatial data from the State of Hawaiʻi and the U.S. Geological Survey. The National Wetlands Inventory also identifies a Palustrine Forested Wetland type (PFO3C) along the length of these stream courses.

SWCA delineated portions of three potential non-wetland WoUS in the survey area. Approximately 2,980 linear feet (908 m) of Keaʻaulu Gulch and 1,873 linear feet (571 m) of Mālaekahana Stream were delineated. Approximately 562 linear feet (172 m) of the main ʻŌhiʻaʻai Tributary and 264 linear feet (80 m) of the second, ephemeral ʻŌhiʻaʻai Tributary were delineated. All these features are potential WoUS due to the presence of an OHWM and their connection to the Pacific Ocean. If dredged or fill material will be placed either temporarily or permanently below their OHWMs, a preliminary or approved jurisdictional determination can be requested and a Section 404 permit may be required from the Honolulu USACE. A State 401 Water Quality Certification permit from the Clean Water Branch may also be required, which can take several months to a year to process. If the project can avoid placement of dredged or fill material either temporarily or permanently below the delineated OHWMs, SWCA recommends that a No Permit Required determination/letter be requested from the USACE. This conclusion is subject to confirmation by the USACE Honolulu District.

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ABBREVIATIONS

CFR	Code of Federal Regulations
CWA	Clean Water Act
DAR	Division of Aquatic Resources
GPS	global positioning system
ha	hectare(s)
m	meter(s)
MW	megawatt
mm	millimeter(s)
NRCS	National Resources Conservation Service
NWI	National Wetlands Inventory
OHWM	ordinary high water mark
SWCA	SWCA Environmental Consultants
TMK	Tax Map Key
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WoUS	Water(s) of the U.S.

1. INTRODUCTION

The U.S. Army Corps of Engineers (USACE) derives its regulatory authority over wetlands and other waters of the U.S. (WoUS) from two federal laws: Section 10 of the Rivers and Harbors Act of 1899, and Section 404 of the Clean Water Act (CWA) of 1972. The Rivers and Harbors Act of 1899 prevents unauthorized obstruction or alteration of navigable WoUS. *Navigable waters* are defined as waters that are "subject to the ebb and flow of the tide and/or presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce" (33 Code of Federal Regulations [CFR] 325.5(c)(2)). A Section 10 permit is required for non-fill discharging activities proposed in, over, or under WoUS.

Under Section 404 of the CWA, dredged and fill material may not be discharged into jurisdictional WoUS (including wetlands) without a permit. According to 40 CFR 230.3, WoUS subject to agency jurisdiction under Section 404 include navigable waters and their tributaries, interstate waters and their tributaries, wetlands adjacent to these waters, and impoundments of these waters. In addition, waters are protected by the CWA if determined to have a "significant nexus" with a traditional navigable water or interstate water (U.S. Environmental Protection Agency and USACE 2011). The U.S. Supreme Court's decision in the consolidated cases *Rapanos v. United States* and *Carabell v. United States* (126 S. Ct. 2208) provides further information regarding whether a wetland or tributary is a WoUS. A Section 404 permit is required for all fill or discharge activities below (seaward or makai) the high tide line in tidal waters or below the ordinary high water mark (OHWM) for non-tidal, non-wetland waters.

Tetra Tech, Inc. (in coordination with Champlin Hawaii Wind Holdings, LLC) is reviewing the proposed Na Pua Makani Wind Energy project pursuant to Section 10 of the Rivers and Harbors Act and Section 404 of the CWA. The project involves the construction and operation of a 24-megawatt (MW) wind energy generation project near the community of Kahuku on the north shore of Oʻahu, Hawaiʻi.

SWCA Environmental Consultants (SWCA) was contracted by Tetra Tech, Inc. to delineate the potentially jurisdictional WoUS in the vicinity of several project components (hereafter *survey area*). The survey area encompasses four non-contiguous areas. Two intermittent streams and one perennial stream are identified in the survey area according to geospatial data from the State of Hawaiʻi Division of Aquatic Resources (DAR), the U.S. Geological Survey (USGS), and the National Wetlands Inventory (NWI) program. This report summarizes the findings of the WoUS survey conducted by SWCA biologists Tiffany Bovino Agostini, Bryson Luke, and Taya MacLean on the following dates: April 10, 2014; June 16, 2014; June 24, 2014; and January 16, 2015.

2. DESCRIPTION OF SURVEY AREA

2.1. Location and Vicinity

The project area is in the Kahuku area on the northeastern portion of the Island of Oʻahu in the State of Hawaiʻi. The survey area is composed of four non-contiguous areas in the project area—Lower Keaʻaulu, Upper Keaʻaulu, ʻŌhiʻaʻai, and Mālaekahana. Together, these areas encompass approximately 59.17 acres (23.9 hectares [ha]) (Figure 1). The entire project area was not surveyed because only these four areas are anticipated to have project components that may intersect with potentially jurisdictional features. The survey area is located within Tax Map Keys (TMKs) 5-6-006:018, 5-6-008:006, and 6-6-008:006. The survey area is accessed from Enos Road, Mālaekahana Valley Road, and an unnamed road near mile marker 15 off Kamehameha Highway.

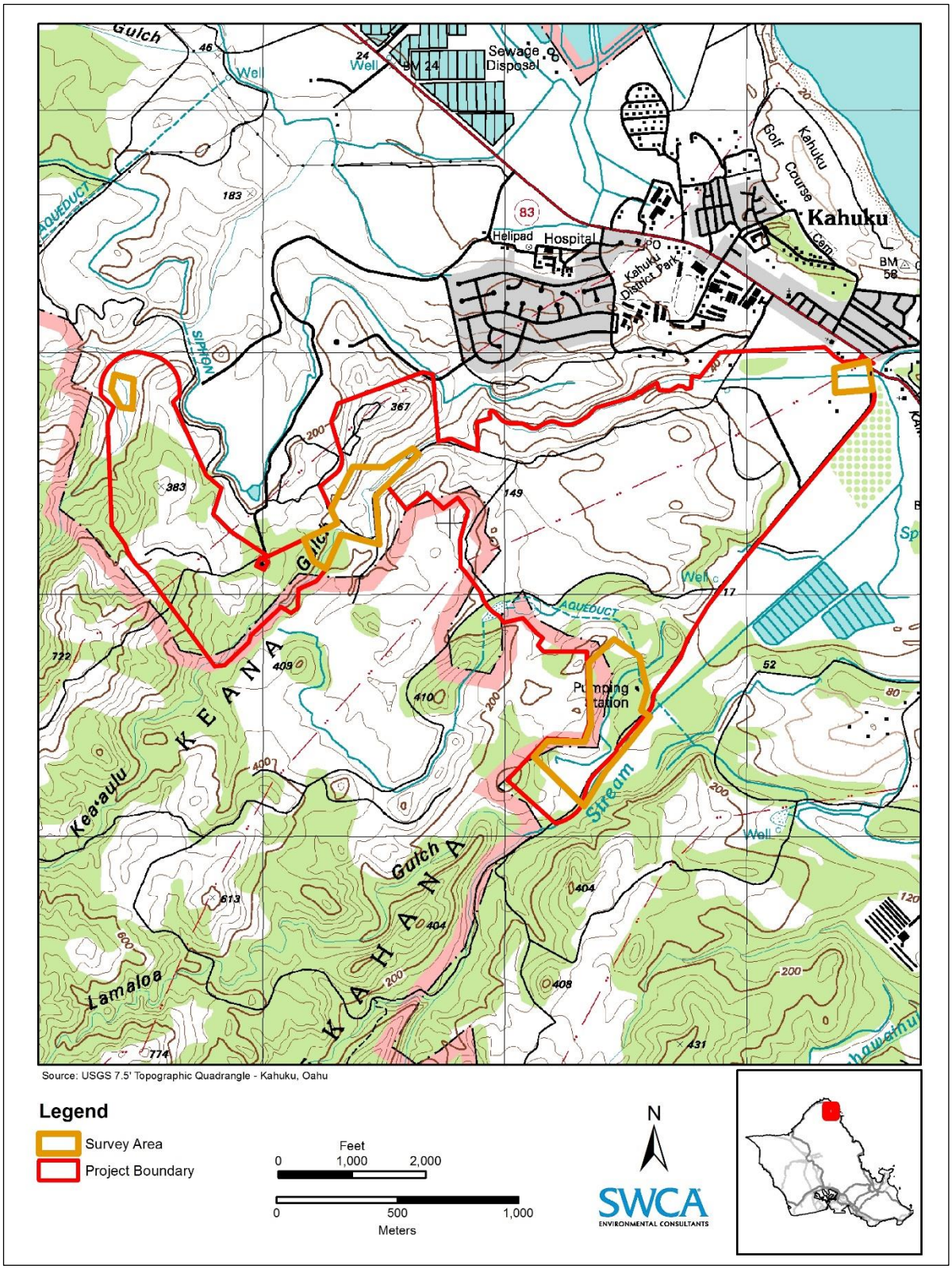

Figure 1. Location of survey area on the Island of O‘ahu.

2.2. Topography and Soils

Most of the survey area generally slopes from the southwest to the northeast. Near the ʻŌhiʻaʻai Tributary, the survey area slopes toward the northwest. Elevation at the survey area ranges from roughly 3 feet (0.9 meters [m]) near Kamehameha Highway to over 200 feet (60 m) above mean sea level in the more mauka (inland) sections.

The Natural Resources Conservation Service (NRCS) classifies eight soil types in the survey area: Mt (Mokuleia clay loam), HeB (Haleiwa silty clay, 2%–6% slopes), LaB (Lahaina silty clay, 3%–7% slopes), LaC (Lahaina silty clay, 7%–15% slopes), PeC (Paumalu silty clay, 3%–8% slopes), PeD (Paumalu silty clay, 15%–25% slopes), Pz (Paumalu-Badland complex), and KIA (Kawaihapai clay loam, 0%–2% slopes) (Foote et al. 1972; NRCS 2013). None of these soil types are considered hydric by the NRCS (NRCS 2012).

2.3. Hydrology

Most streams in the Kahuku area are considered to be naturally intermittent (Polhemus et al. 1992) and are typically short and steep, with permeable upland soils creating rapid infiltration into the Koʻolau aquifer. Numerous gulches cut into the upper portions of the Koʻolau Mountain Range and drain into the low-lying areas. Stream flow in the lowland areas have periods of high peak floods and little base flow (Hunt and De Carlo 2000).

Two intermittent streams (Keaʻaulu Gulch and ʻŌhiʻaʻai Tributary), one perennial stream (Mālaekahana Stream), one ditch/canal, and one aqueduct have been identified in the survey area according to geospatial data from the Hawaiʻi DAR and USGS. Keaʻaulu Gulch runs through dense vegetation in the central portion of the project area (Figure 2) and continues through various agricultural fields near the lower elevation survey area (Figure 3) before joining with Mālaekahana Stream just mauka (inland) of Kamehameha Highway. Mālaekahana Stream traverses the southern tip of the project area (Figure 4). It joins with Keaʻaulu Gulch before discharging to the ocean near Makahoa Point. ʻŌhiʻaʻai Tributary and Gulch run along the northwestern boundary of the project area (Figure 5). North of the survey area, ʻŌhiʻaʻai Tributary joins with a shorter tributary in the west and becomes Kiʻi Stream. This stream is referred to as Kiʻi ditch after crossing under Kamehameha Highway. It joins with Punamano ditch before entering the Kiʻi Unit of the James Campbell National Wildlife Refuge (Hunt and De Carlo 2000). Keaʻaulu Gulch, ʻŌhiʻaʻai Tributary, and Mālaekahana Stream are all listed on the *Atlas of Hawaiian Watersheds & Their Aquatic Resources* (Parham et al. 2008). A ditch/canal is identified as running roughly parallel to Mālaekahana Stream. An aqueduct is identified as intersecting with Mālaekahana Stream north of the survey area.

The NWI program identifies one wetland type in the survey area—PFO3C. This type is considered a Freshwater Forested/Shrub Wetland (Palustrine, Forested, Broad-Leaved Evergreen, Seasonally Flooded). The NWI features correspond with the locations of the three streams identified by DAR and USGS, and therefore are not displayed on the figures.

Annual average rainfall in the survey area is approximately 51.18 inches (1,300 millimeters [mm]) per year in the mauka areas and 45.47 inches (1,155 mm) near Kamehameha Highway. Rainfall is typically highest in March and lowest in June (Giambelluca et al. 2013). The nearby Kiʻi rainfall gage recorded less than average rainfall during 2014; the gage recorded 22% of the average monthly rainfall in April 2014 and 92% of average monthly rainfall during June 2014. In January 2015, the Kiʻi rainfall gage recorded roughly half the average rainfall (National Oceanic and Atmospheric Administration/National Weather Service Weather Forecast Office 2015).

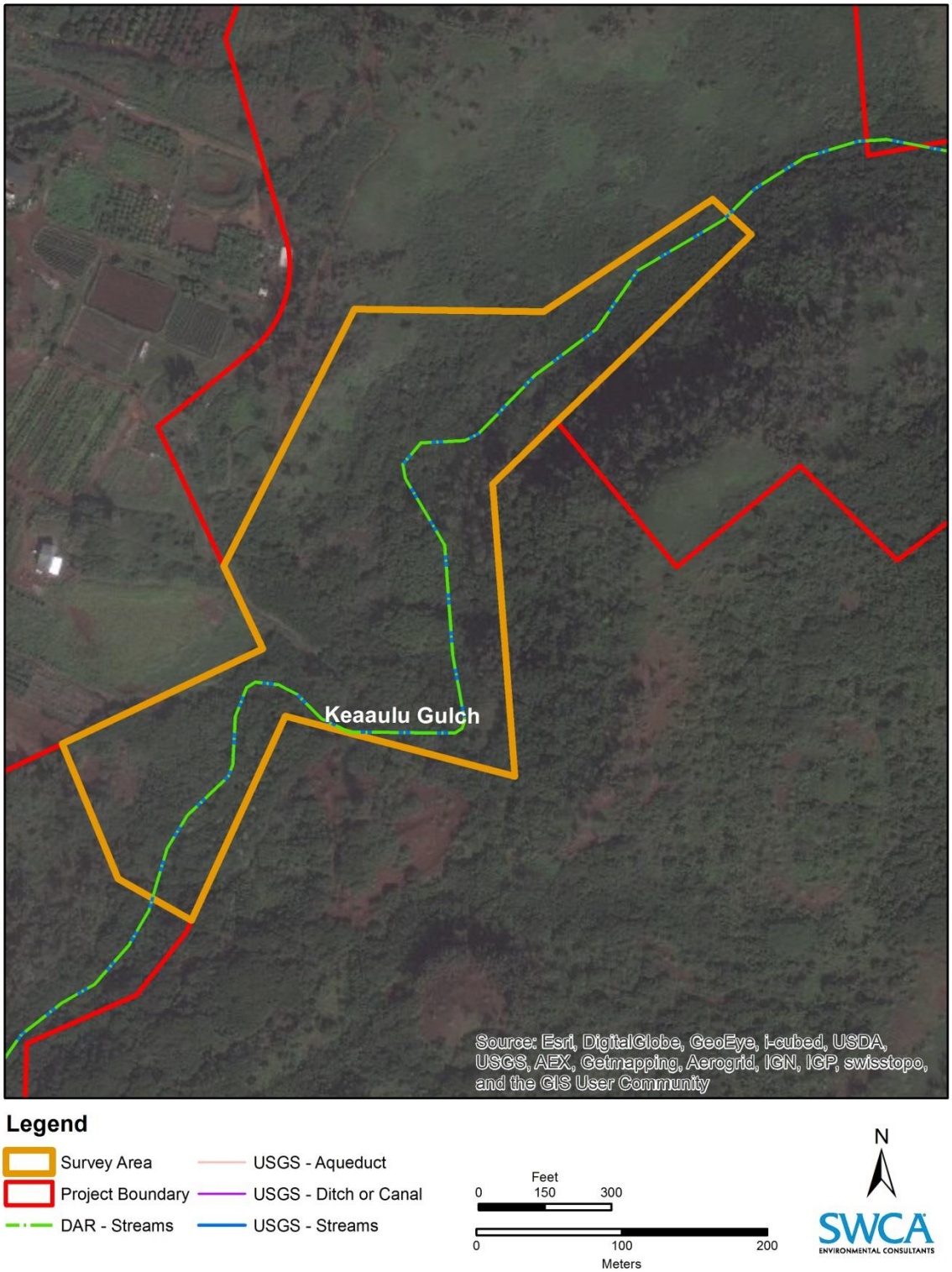

Figure 2. Upper Kea‘aulu survey area.

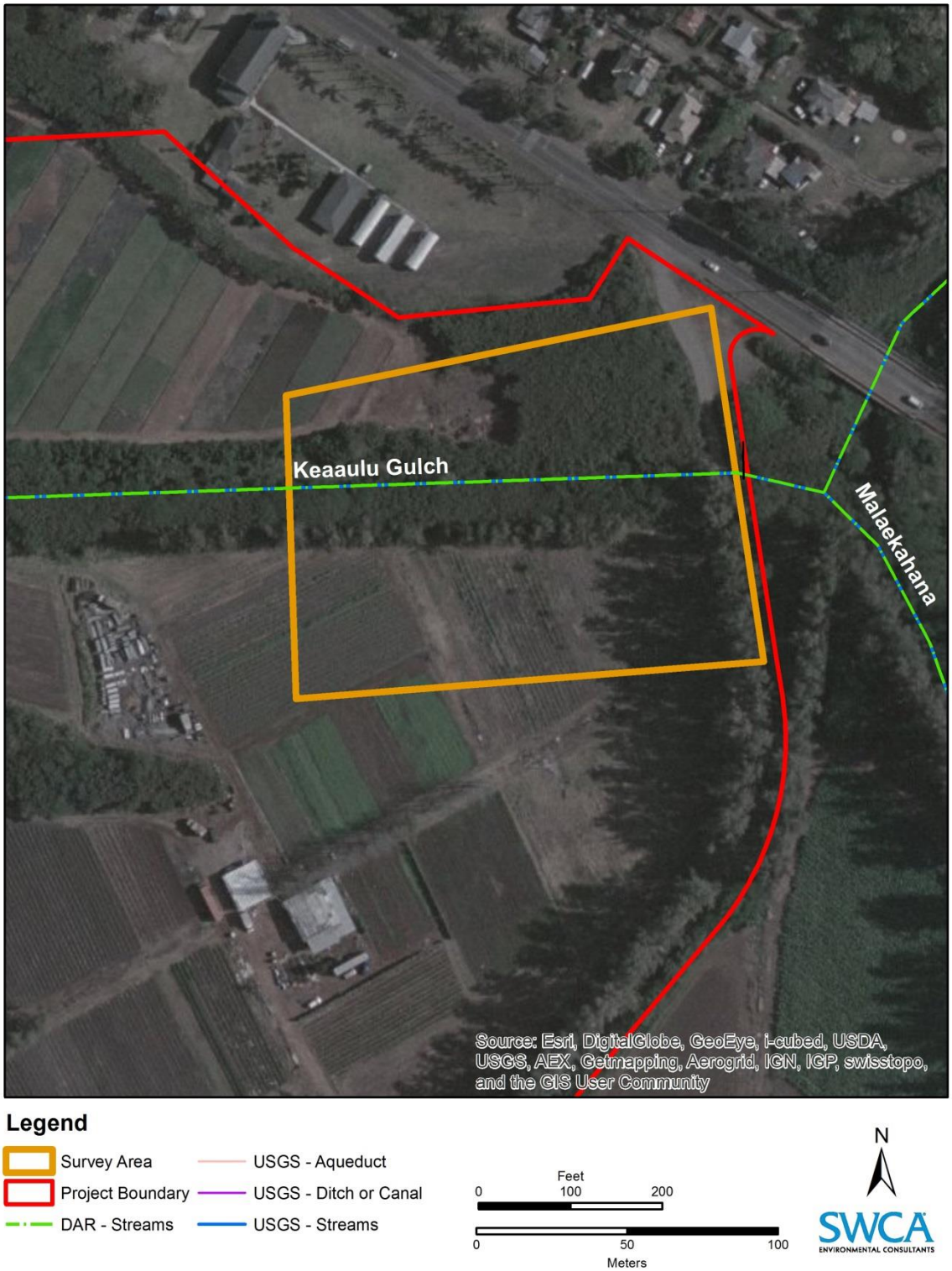

Figure 3. Lower Kea‘aulu survey area.

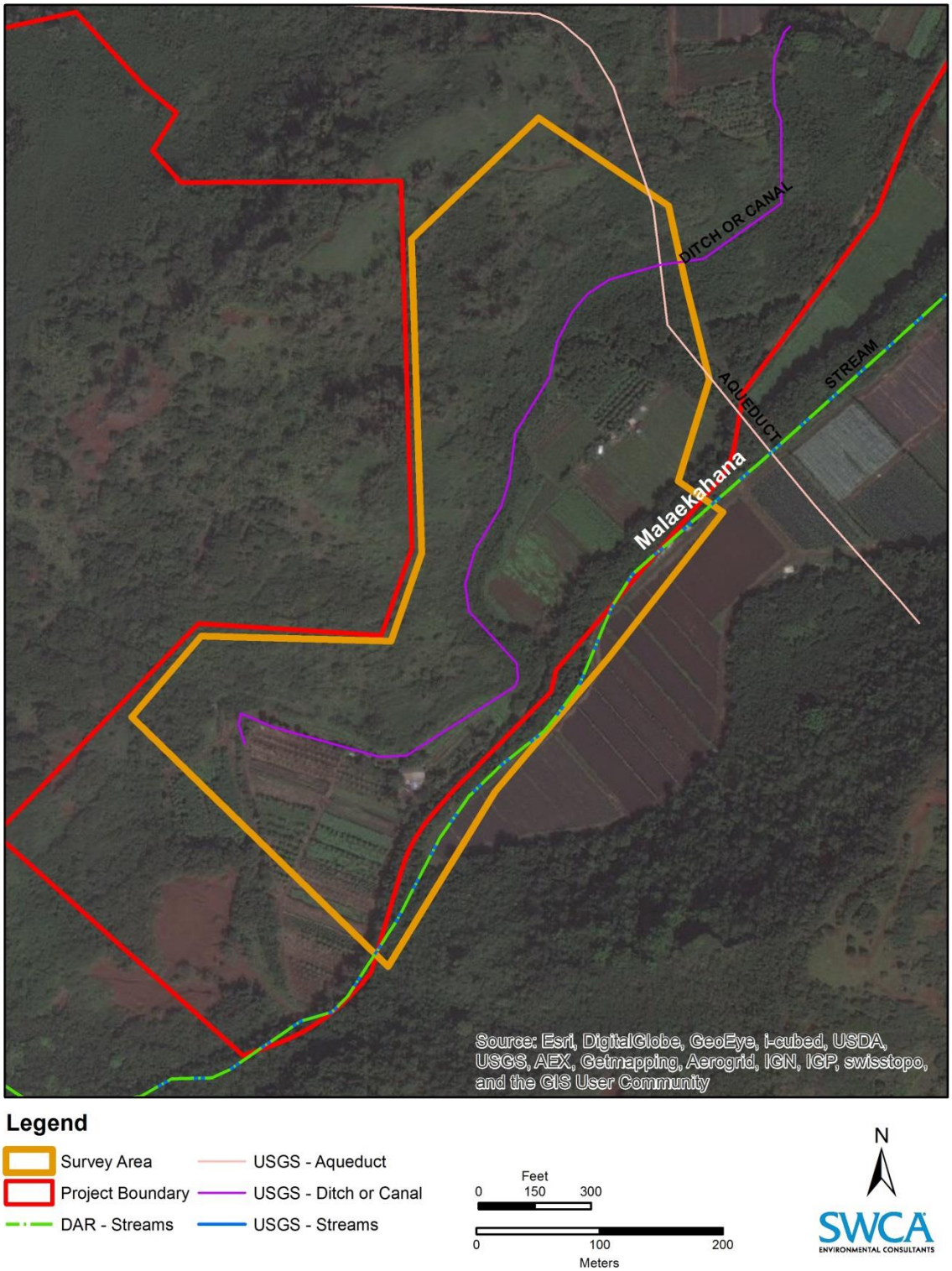

Figure 4. Mālaekahana survey area.

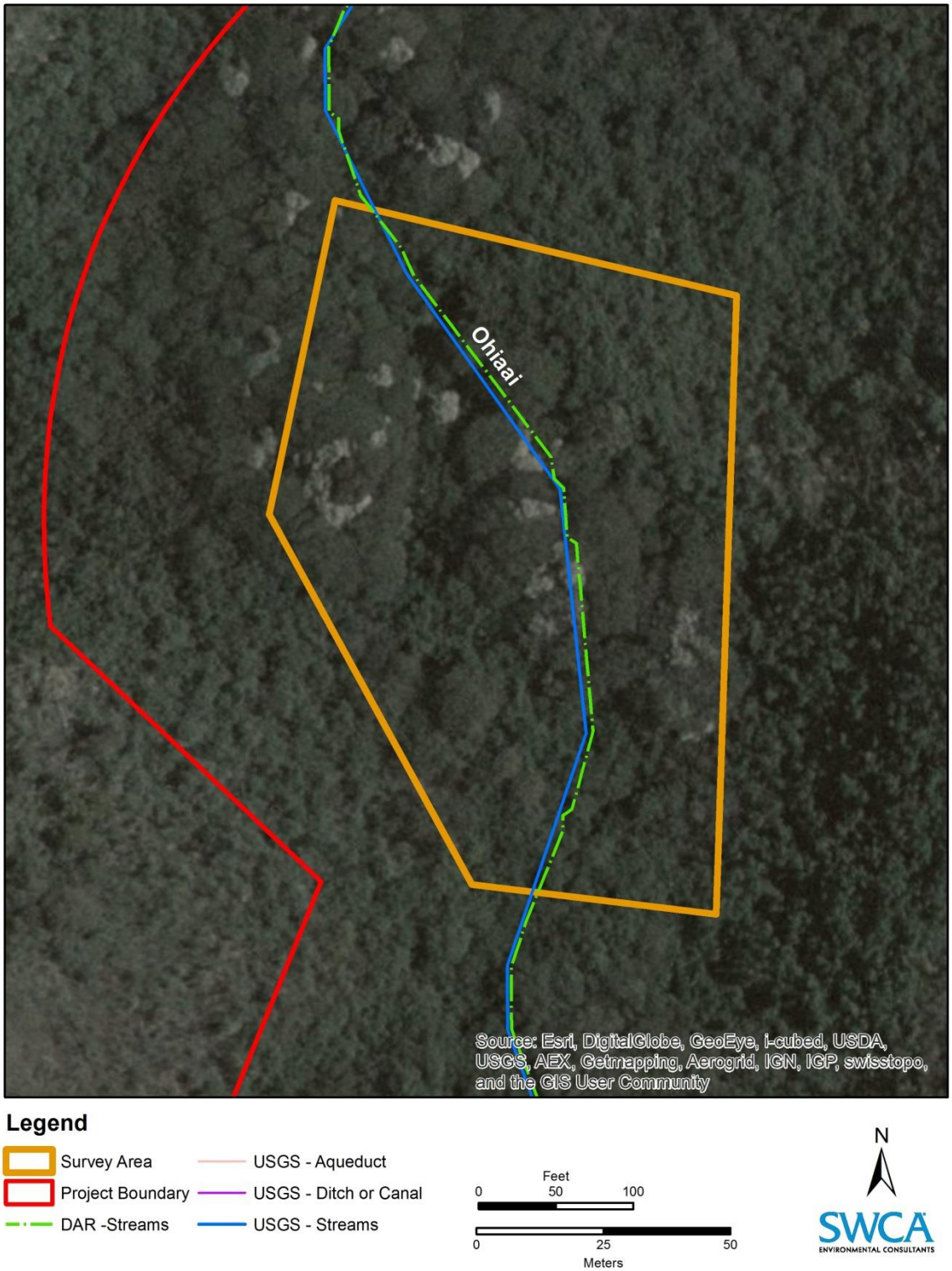

Figure 5. ʻŌhiʻaʻai survey area.

2.4. Flora and Fauna

The vegetation in the survey area is dominated by non-native species including koa haole (*Leucaena leucocephala*), Guinea grass (*Urochloa maxima*), and parasol leaf tree (*Macaranga tanarius*). Terrestrial fauna recorded in the area is predominantly non-native birds. The federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) and state endangered Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*) likely inhabit or transverse the area. Endangered waterbirds known to occur at the nearby National Wildlife Refuge may pass through the area, including Hawaiian duck (*Anas wyvilliana*), Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian gallinule (*Gallinula chloropus sandvicensis*). Finally, seabirds, particularly the endangered Hawaiian petrel (*Pterodroma sandwichensis*) and threatened Newell's shearwater (*Puffinus auricularis newelli*), may fly over the project area at night.

3. METHODS

Before the survey, SWCA reviewed NWI, USGS, and State of Hawaiʻi data; geospatial data; aerial photographs; and topographic maps to identify potential wetlands or other WoUS in the survey area or the immediate vicinity. Information was also taken from the NRCS hydric soil data, as well as previous water resource reports and environmental assessments/environmental impact statements.

SWCA conducted field surveys on April 10, 2014; June 16, 2014; June 24, 2014; and January 16, 2015. SWCA walked the stream paths identified by USGS, NWI, and DAR, as well as low-lying areas. The boundaries of potential non-wetland WoUS were delineated by recording the location of the OHWM, as defined in the USACE Regulatory Guidance Letter 05-05 (USACE 2005). Indicators of OHWM can be physical or vegetative and include benches, shelving, drift lines, natural lines impressed on the bank, changes in the character of soil, transitions in vegetation type and density, destruction of terrestrial vegetation (matted-down vegetation), sediment deposition, presence of litter and debris, presence of wrack lines, bed and banks, multiple observed flow events, scour, sediment sorting, and water staining (USACE 2005, 2008).

SWCA documented the presence of OHWMs at various points along the streams and drainage features. For Keaʻaulu Gulch, SWCA mapped the centerline, recorded the maximum channel width, and buffered the centerline by half the width. In areas with open canopy, SWCA collected data points at the OHWM on both sides of Keaʻaulu Gulch. For Mālaekahana Stream, SWCA mapped the OHWM on the right bank and recorded the maximum channel width due to accessibility and because no project components are planned adjacent to the left bank. At ʻŌhiʻaʻai Tributary, SWCA combined methodology for mapping the centerline and left bank, depending on the density of canopy coverage and the feature width.

Data were collected using a Trimble GeoExplorer 2008 Series global positioning system (GPS) unit and Zephyr antenna, then post-processed in ArcGIS using GPS Correct to submeter accuracy. The linear lengths of the features were calculated by projecting these point/line data files in geographic information system software.

No attempt was made to determine "significant nexus" to a traditional navigable water by investigating whether the features discharge to the Pacific Ocean, or whether they may potentially affect the chemical, physical, and biological integrity of the ocean.

4. FINDINGS

In all, approximately three non-wetland WoUS were delineated in the survey area, including portions of Keaʻaulu Gulch, Mālaekahana Stream, and ʻŌhiʻaʻai Tributary. The types and acreage of the WoUS delineated by SWCA are summarized in Table 1.

Table 1. Potential Waters of the U.S. Delineated by SWCA in the Survey Area

Waters of the U.S. Identification	Type	Length (linear feet)
Keaʻaulu Gulch	Riverine – Intermittent	2,980
Mālaekahana Stream	Riverine – Perennial	1,873
ʻŌhiʻaʻai Tributary	Riverine – Intermittent	826
Non-Wetland Total		5,679

4.1. Keaʻaulu Gulch

Approximately 2,980 linear feet (908 m) of Keaʻaulu Gulch were delineated in the survey area. Of this total, 2,491 linear feet (759 m) were in the upper survey area (Figure 6) and 489 linear feet (149 m) were in the lower survey area (Figure 7).

For most of the upper Keaʻaulu Gulch survey area, physical indicators of an OHWM are weak and the drainage appears ephemeral (i.e., driven purely by heavy precipitation events and lacking a groundwater component). In many areas the channel is overgrown by tall Guinea grass. No physical characteristics to indicate an OHWM were seen within a 135-foot (41-m) stretch immediately downstream of the sharp bend in the gulch; the most likely drainage course for this area is identified in Figure 6 as a single line. However, some physical indicators of an OHWM were observed in certain areas of the upper Keaʻaulu Gulch survey area. These include changes in the character of soil; shelving; benches; exposed root hairs; and vegetation that was matted down, bent, or absent (Figures 8 and 9).

Portions of the original drainage course were likely modified by human activities for roads, trails, and agriculture. Several culverts exist near the northern portion of the survey area (see Figure 9). A few culverts are within the stream channel, and at least two culverts appear to convey water to the channel from the east.

In the lower Keaʻaulu Gulch survey area, physical indicators of the OHWM were most apparent in the immediate vicinity of the existing Mālaekahana Valley Road bridge, and included destruction of terrestrial vegetation; change in plant community (upland to facultative species); and the presence of litter and debris. Standing water was observed in the immediate vicinity of the bridge. Further upstream, the drainage is overgrown with non-hydrophytic herbaceous vegetation along the bottom and slopes (Figure 10).

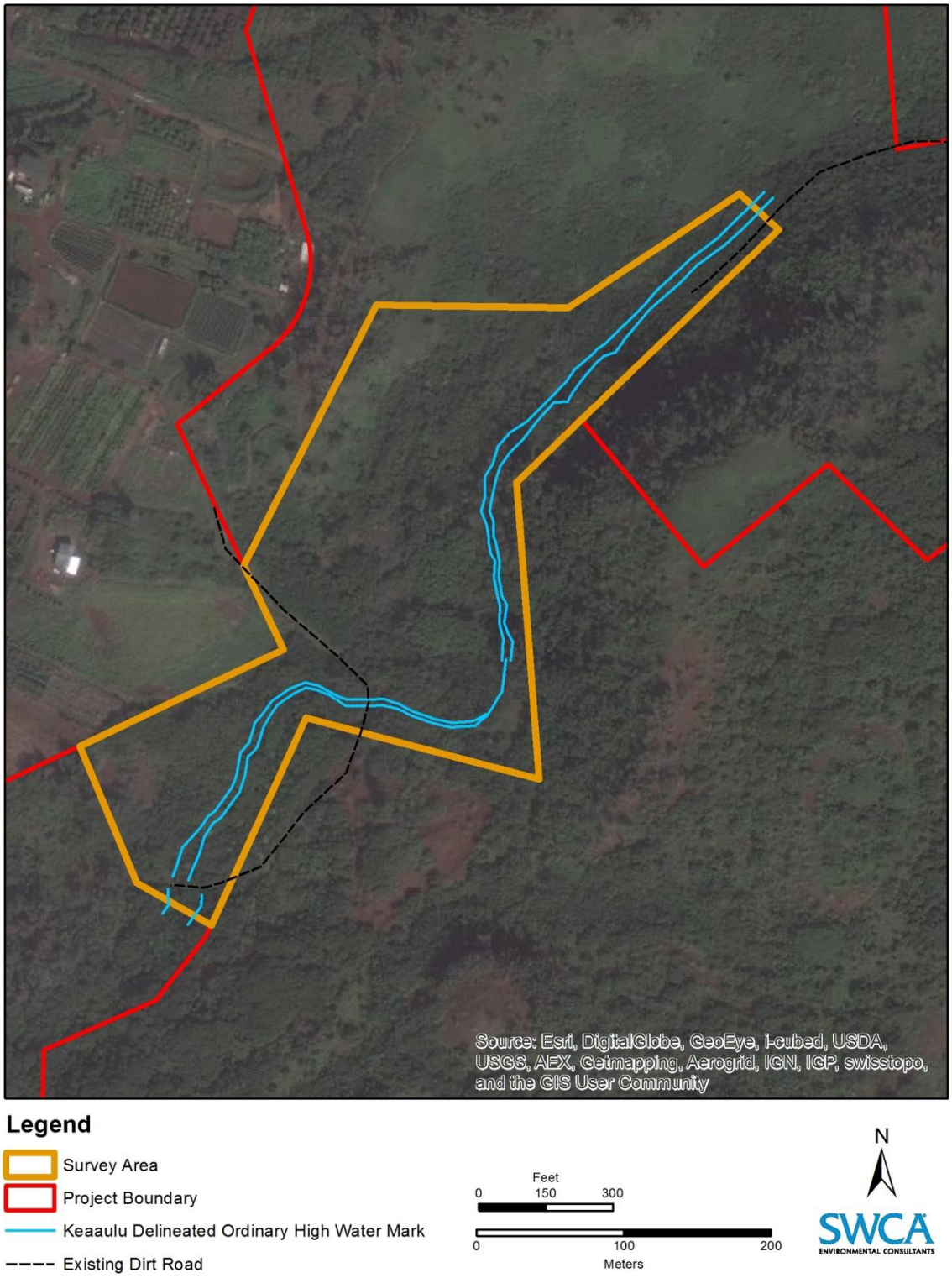

Figure 6. Delineated OHWM in the upper Kea‘aulu survey area.
Note: The break in the OHWM is a dirt road.

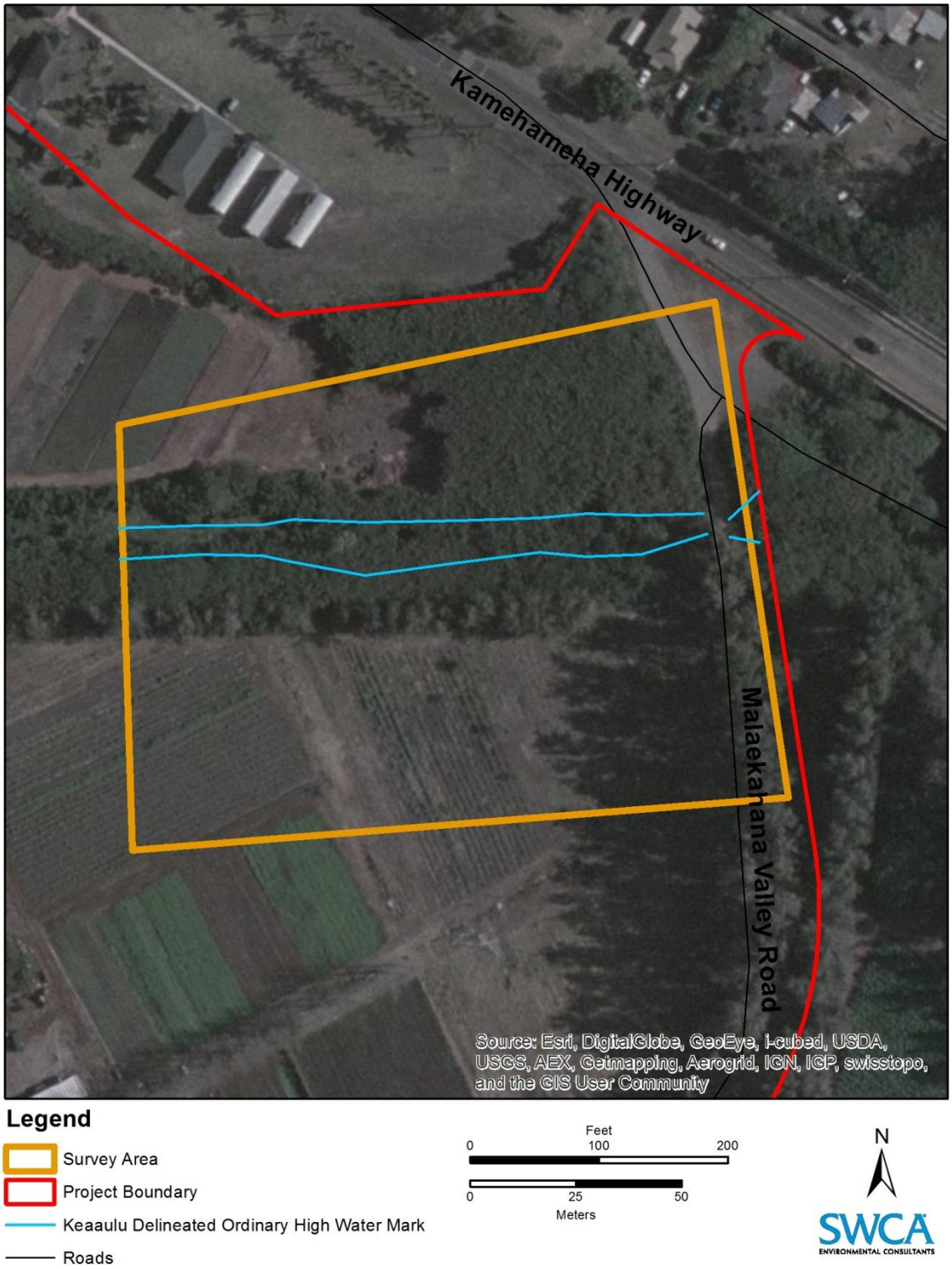

Figure 7. Delineated OHWM in the lower Kea‘aulu survey area near Kamehameha Highway. *Note:* The break in the OHWM is a bridge.

Figure 8. Looking toward the OHWM on right bank in the upper Kea‘aulu survey area.

Figure 9. Looking toward the OHWM on right bank in the upper Kea‘aulu Gulch survey area.

Figure 10. Overgrown channel in the lower Kea‘aulu survey area.

4.2. Mālaekahana Stream

Approximately 1,873 linear feet (571 m) of Mālaekahana Stream were delineated in the survey area (Figure 11). Mālaekahana Stream is perennial. It has a defined bed and bank with flow present throughout the year. Various indicators of the OHWM were seen throughout the Mālaekahana survey area, including a clear, natural line impressed on the bank; organic debris collecting behind obstructions; exposed root hairs; and benches (Figure 12).

The ditch/canal identified by the USGS in the Mālaekahana survey area (see Figure 4) appears to have been filled in and is no longer active. It was likely excavated in uplands and was not observed to contribute flow (either directly or indirectly) to another potentially jurisdictional water.

During SWCA’s survey, water was observed in the narrow, human-made channel identified as an aqueduct by USGS data (see Figures 4, 11, and 13). The edges were densely vegetated with upland species. The feature did not continue east of the road, and therefore does not appear to connect to Mālaekahana Stream.

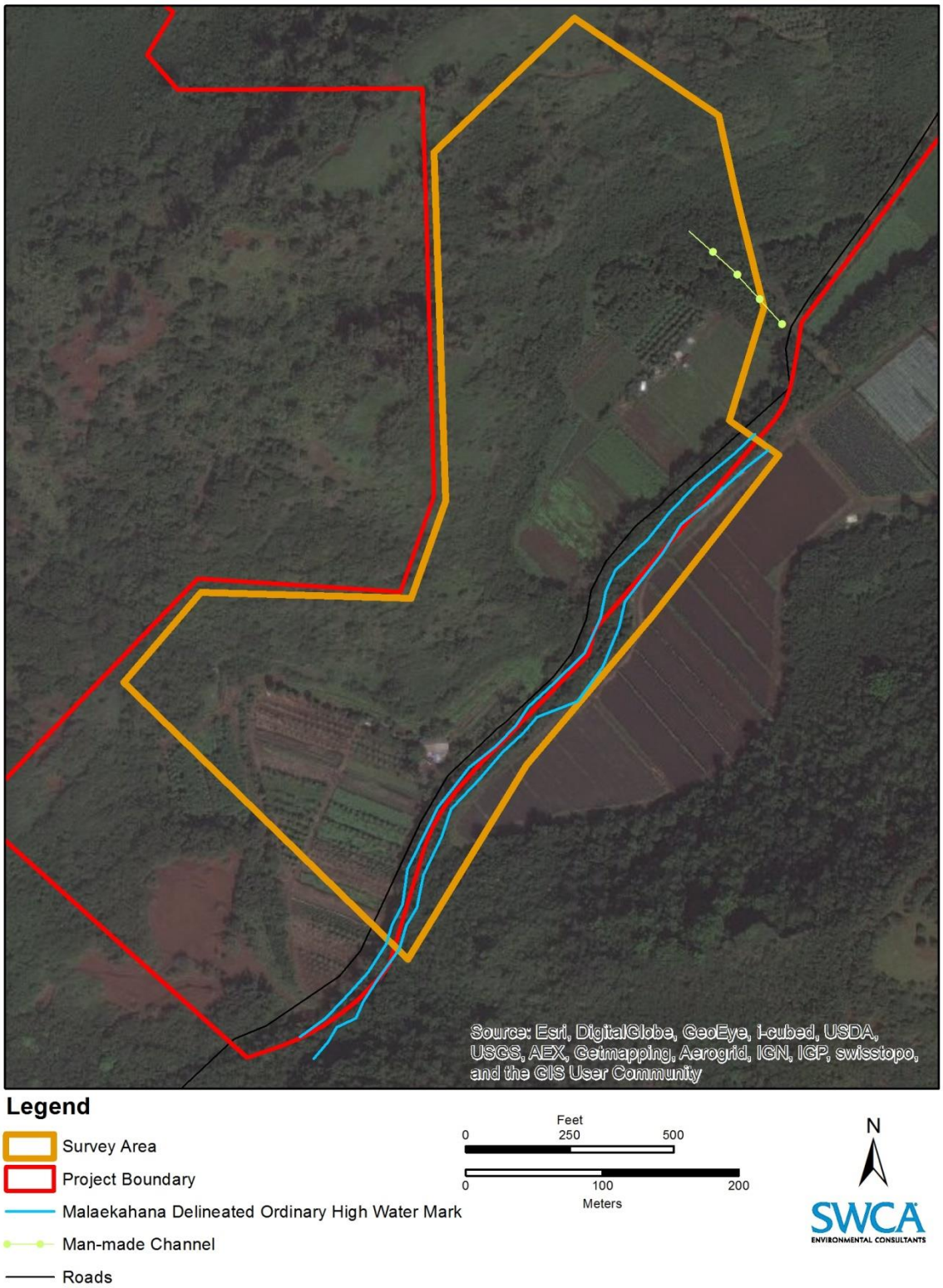

Figure 11. Delineated OHWM in the Mālaekahana survey area.

Figure 12. Mālaekahana Stream with standing water.

Figure 13. Narrow, human-made channel identified by the USGS as an aqueduct in the Mālaekahana survey area.

4.3. ‘Ōhi‘a‘ai Tributary

Two tributaries were delineated in this portion of the survey area, although only one feature is identified in the NWI, USGS, or DAR maps of the area. Approximately 562 linear feet (172 m) of the main stem of ‘Ōhi‘a‘ai Tributary were delineated in the survey area (Figure 14). The main stem of ‘Ōhi‘a‘ai Tributary is intermittent, with surface water flow during wetter months or high rainfall events, but interspersed by dry periods. The bed and bank are well defined, with the bank reaching over 5 feet (1.5 m) in some areas. Various indicators of OHWM were seen throughout the ‘Ōhi‘a‘ai survey area, including a clear, natural line impressed on the bank; undercut banks; sediment sorting and changes in soil character; organic debris collecting behind obstructions (wracking); litter removal due to flowing water; water staining on boulders; exposed roots; and standing water (Figures 15 and 16).

A smaller tributary was also identified during the survey. Approximately 264 linear feet (80 m) of this feature were delineated (see Figure 14). It flows northwest and directly connects to the main portion of ‘Ōhi‘a‘ai Tributary described above (Figure 17). It is likely to be ephemeral; flowing briefly only during rainfall events or extreme flooding. Indicators of flow were not strong throughout the entire feature, but included matted or missing vegetation, a well-defined bed and bank, and change in soil character (Figure 18).

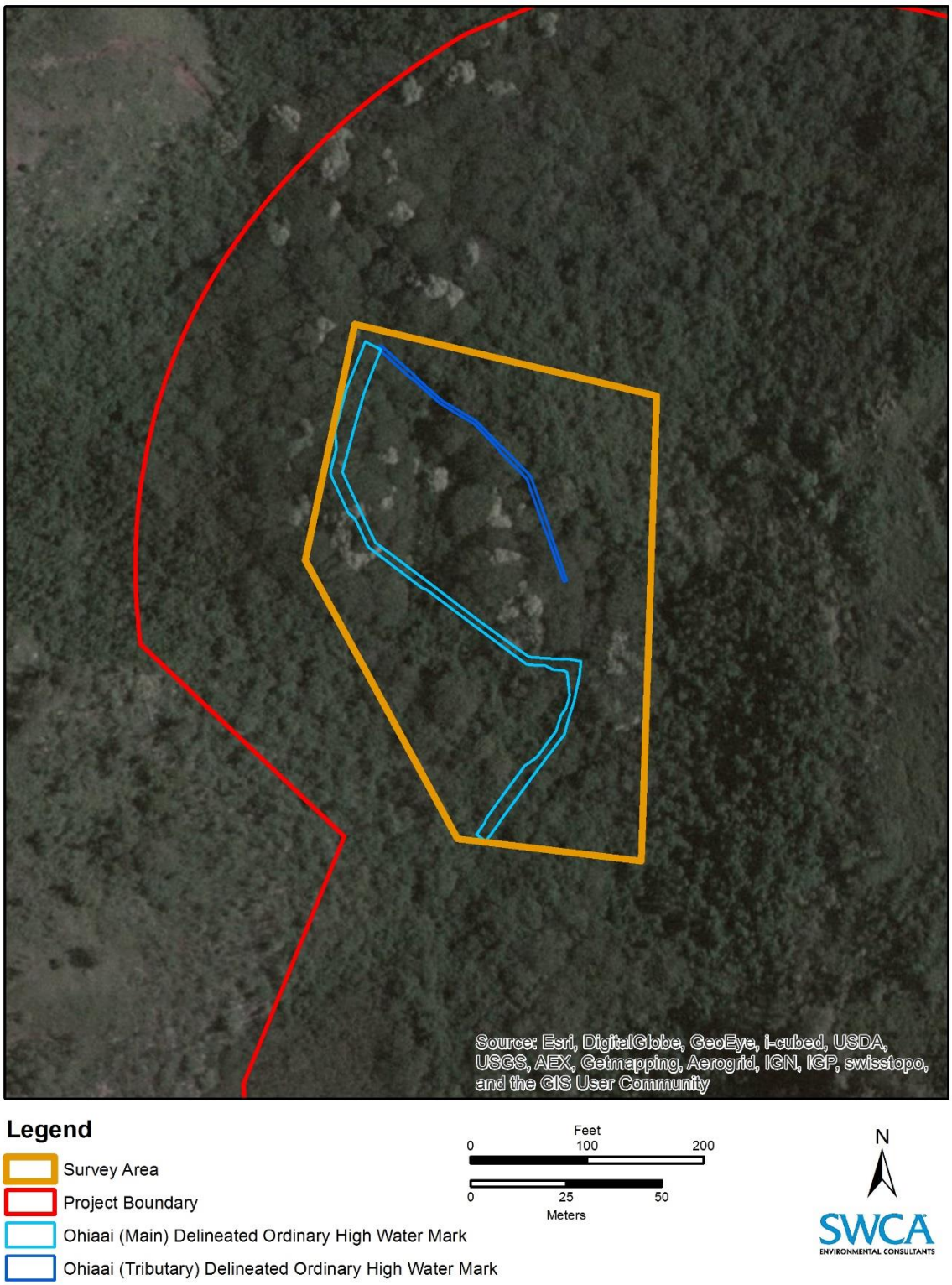

Figure 14. Delineated OHWM in the ‘Ōhi‘a‘ai survey area.

Figure 15. Main ‘Ōhi‘a‘ai Tributary indicators include cut banks, exposed roots, scour, and standing water.

Figure 16. Water-stained leaves collected on an elevated obstruction along the ‘Ōhi‘a‘ai Tributary.

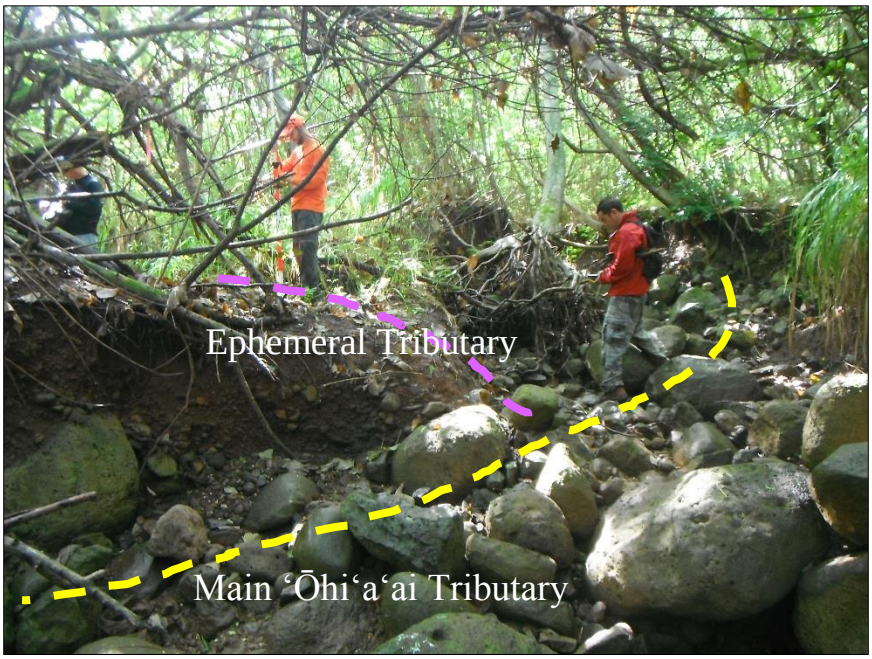

Figure 17. Junction between the ephemeral tributary (pink line) and the main ʻŌhiʻaʻai Tributary (yellow line).

Figure 18. Ephemeral ʻŌhiʻaʻai tributary showing defined bed and bank and unvegetated channel bottom.

5. CONCLUSIONS AND RECOMMENDATIONS

SWCA surveyed and delineated three potentially jurisdictional streams in the survey area. Approximately 2,980 linear feet (908 m) of the intermittent Keaʻaulu Gulch, 1,873 linear feet (571 m) of the perennial Mālaekahana Stream, and 826 linear feet (252 m) of the intermittent ʻŌhiʻaʻai Tributary were delineated in the survey area. In contrast to the Mālaekahana Stream and ʻŌhiʻaʻai Tributary, Keaʻaulu Gulch did not have strong indictors of flow or an OHWM in many areas. Portions of Keaʻaulu Gulch were likely modified by human activities for roads and agriculture. However, it may convey water and sediment from upland areas to lower reaches and subsequently the Pacific Ocean during heavy rainfall events.

It is not known whether the project will require placement of dredged or fill material either temporarily or permanently below the delineated OHWMs. If this can be avoided, SWCA recommends requesting a preliminary jurisdictional determination and a No Permit Required letter from the Honolulu USACE. If the project requires placement of dredged or fill material below the delineated OHWMs, a preliminary or approved jurisdictional determination can be requested, and a permit may be required from the USACE if the features are determined to be WoUS. A State 401 Water Quality Certification permit from the Clean Water Branch may also be required, which can take several months to a year to process. Because portions of Keaʻaulu Gulch lack strong indicators of an OHWM, the jurisdictional status of the gulch could be argued via the approved jurisdictional determination process.

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APPENDIX J
VISUAL IMPACT RATING FORMS

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	01	21.6478 ,-157.9290	Laie Hawii Temple

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Clear and Clean Prominent water Flat landform in the foreground Rolling to rugged landform in the background	Jagged domed and flat vegetation in the foreground Rolling vegetation in the background	Bold and rectangular buildings and staircases
Line	Horizontal smooth (reflecting pool) and vertical geometric (fountain) water Horizontal landform - foreground Curving mountains - background	Flat lawn and shrubs. Regular to round shrubs and trees. Angular and irregular palm trees	Simple vertical columns and horizontal fountains
Color	cool blues reflection light to dark greens	light to dark greens grays browns reds	whites, grays, tans
Texture	smooth and glossy (reflecting pool) medium directional (fountain) gradational landform	smooth to rough	smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	same as above
Line	same as above	same as above	same as above
Color	same as above	same as above	same as above
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

Overall Level of Contrast: None

Section E: Viewer Response

Viewer Sensitivity	Duration of View	Viewer Use	Overall Response
High	Moderate	High	High

Additional Comments

The Project is 1.7 Miles from the Viewpoint 01. Project would be partially to fully screened by vegetation, but could potentially see turbines but would not draw attention.

Evaluator(s)
Jennifer D'Avanzo

Date
Picture Taken - May 1, 2013
Evaluated - May 2014

TETRA TECH, INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	02	21.63920000000, -157.92000000000	Polynesian Cultural Center

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat	Rounded and irregular	Flat, blocky parking lot, regular square building
Line	Horizontal	Angular and smooth	Horizontal parking lot and curbs and vertical light poles and fencing.
Color	Browns	Light to dark greens Browns Tans	dark to light grays, tans, whites blues
Texture	Smooth	Smooth to rough	smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	same as above
Line	same as above	same as above	same as above
Color	same as above	same as above	same as above
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

Overall Level of Contrast: none

Section E: Viewer Response

Viewer Sensitivity	Duration of View	Use Volume	Overall Response
High	Moderate	High	Moderate

Additional Comments

Enclosed landscape. Project is 2.5 miles from Viewpoint 02. Project would be screened by vegetation, but may potentially see turbine blades through trees.

Evaluator(s)
Jennifer D'Avanzo

Date
Picture Taken - May 1, 2013
Evaluated - May 5 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	03	21.6062, -157.9040	LDS Church

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Prominent flat ocean Flat beach Rugged mountains, rolling to flat land	Rounded and irregular	Flat and curving road Boxy building
Line	Horizontal ocean Flat beach Rugged mountains in middle ground Rolling to flat hills in background	Bold and rugged to parallel	Horizontal and curving conductor lines Bold building Vertical poles, fencing
Color	Cool to medium Blues Tans, Browns,	Light to dark greens Browns Tans Reds	Browns, blacks, grays, tans, yellow
Texture	Smooth water Stippled beach and landform - foreground Medium middle ground Striated background	Medium and gradational	smooth and directional

Section C: Proposed Activity Description

Has Photo Simulation Been Created for KOP? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	same as above
Line	same as above	same as above	same as above
Color	same as above	same as above	same as above
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

Overall Level of Contrast: None

Section E: Viewer Response

Viewer Sensitivity	Duration of View	Use Volume	Overall Response
Moderate	Moderate	Moderate	Moderate

Additional Comments

Project is 5 miles from Church. May see the tips of the turbine blades behind terrain. But likely is low.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 1, 2013

Evaluated - May 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	04	21.6757, -157.9580	Kahuku Community

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat in foreground to rugged in background	Flat and rolling Angular and rugged	Rectangular boxy homes Vertical poles and fences Diagonal and curving conductor lines. Few turbines
Line	Horizontal to undulating	Horizontal and vertical rugged and jagged	Bold, geometric Vertical converging and diverging
Color	Browns	light greens to dark greens Yellows, grays, browns	Browns, yellows, blues, greens, pinks, tans. Grays and blacks Whites
Texture	Smooth to medium	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	Same as above	Additional Turbines
Line	same as above	Same as above	Additional Vertical wind turbines
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓			✓	
Line				✓				✓			✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Moderate	High	High

Additional Comments

The project is 0.6 miles from residential community.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 1, 2013

Evaluated - May 5, 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	05	21.6756, -157.958	Kahuku Sugar Mill Historical Site

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat in foreground to rugged in middle ground. Rolling Background	Flat and rolling Angular and rugged	Rectangular buildings, curving roads. Vertical poles and signs Diagonal and curving conductor lines. Few turbines
Line	Horizontal to undulating	Horizontal and vertical and wispy rounded, rugged and jagged	Bold, geometric, and horizontal Vertical Curving lines
Color	Browns	light greens to dark greens Yellows, grays, browns	Browns, yellows, blues, greens, tans dark Grays and blacks oranges reds Whites
Texture	Smooth to medium	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Additional Turbines
Line	same as above	same as above	Additional vertical wind turbines
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓							✓	
Line				✓							✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
Moderate	Moderate	High	Moderate

Additional Comments

Tourists and residents use the area. Project is 0.6 miles from Project.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 1, 2013

Evaluated - May 5 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	06(SIM)	21.6756, -157.958	Kahuku Community Center

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat in foreground to rolling in middle ground and background	Flat and rolling Angular and rugged	Rectangular buildings Vertical poles and fences. Diagonal and curving conductor lines. Few turbines
Line	Horizontal to undulating	Horizontal rounded, rugged and jagged	Bold, geometric, and horizontal Vertical Curving lines
Color	Browns	light greens to dark greens Yellows, grays, browns	Browns, greens, tans, beiges light grays, browns Whites
Texture	Smooth to medium	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☑ Yes ☐ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Additional wind turbines
Line	same as above	same as above	Additional vertical wind turbines
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements: Form				✓				✓		✓		
Elements: Line				✓				✓		✓		
Elements: Color				✓				✓			✓	
Elements: Texture				✓				✓				✓

Overall Level of Contrast: Moderate

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High (Residential)	Moderate	Short	Moderate

Additional Comments

Project is 0.5 miles from viewpoint 06. Scenic quality is moderate,

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 2, 2013

Evaluated - May 5 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	07	21.6756, -157.958	Malaekahana State Recreation Area

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat in foreground to rolling in middle ground and rugged background background	Flat and rounded to rolling rugged	Distant geometric buildings and turbine blades Vertical poles and fences. Curving conductor lines and roads.
Line	Horizontal to undulating	Horizontal rounded, rugged and jagged	Bold bands and curving conductors Vertical poles
Color	Browns	light greens to dark greens Yellows, grays, browns, tans	Browns, greens, tans, beiges light grays, browns Whites
Texture	Smooth to medium	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Triangular turbine blades
Line	same as above	same as above	Irregular turbine blades
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓		✓		
Line				✓				✓		✓		
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Moderate

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Short	Moderate	Moderate

Additional Comments

Views inside the park are completely screened by vegetation
Viewpoint 07 is located at the entrance of the Park so users would be driving by and not stopping.
Scenic quality is moderate.
Project is 1.0 miles from viewpoint 07

Evaluator(s)
Jennifer D'Avanzo

Date
Picture Taken - April 22, 201 (KOP 25)
Evaluated - May 5, 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	08	21.6937, -157.98	Kamehameha Highway

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat to rolling in middle ground. Rugged background	Flat and rounded Rolling and rugged	Curving road, horizontal fences, rectangular building, prominent vertical poles and non directional blades from wind turbines. Curving conductors
Line	Horizontal and rounded to undulating	Horizontal and rounded Vertical, angular and wispy Rugged	Geometric, vertical, Turbines. horizontal, curving conductors
Color	Browns, tans and light greens	light greens to dark greens Yellows, grays, browns, tans, beiges	Whites, browns grays, blacks, tans, greens, reds yellows,
Texture	Smooth to medium	smooth to coarse	Smooth to medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Additional vertical turbines
Line	same as above	same as above	Additional turbines
Color	same as above	same as above	glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓		✓		
Line				✓				✓		✓		
Color				✓				✓		✓		
Texture				✓				✓				✓

Overall Level of Contrast: Moderate

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
Moderate	Short	High	Moderate

Additional Comments

From highway. 0.6 Miles from the Project. Scenic Quality is Moderate.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - April 22, 2014

Evaluated - May 5 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	09	21.6763, -157.947	Kahuku Intermediate and High School

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat in foreground to rugged and rolling Background	Flat, vertical and rounded Rugged background	Rectangular buildings, curving roads. Vertical poles and signs Diagonal and curving conductor lines.
Line	Horizontal to undulating	Horizontal and vertical and wispy Rolling	Bold, geometric, and horizontal Vertical Curving lines
Color	Browns	light greens to dark greens Yellows, grays, browns	Browns, yellows, blues, greens, tans dark Grays and blacks oranges reds Whites
Texture	Smooth to medium	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Vertical and angular wind turbines
Line	same as above	same as above	vertical wind turbines
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓			✓	
Line				✓				✓			✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
Moderate	Short	High	Moderate

Additional Comments

Scenic Quality is moderate. Project is 0.5 miles from School. Residents in school in classes and recreating on the fields

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 2, 2013

Evaluated - May 5, 2014

TETRA TECH INC.

Visual Contrast Rating Worksheets

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	10	21.7022, -157.992	Turtle Bay Resort and Golf Course

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Wetland/Water - curving Flat to rolling foreground to rugged background	Flat and rolling to vertical and rounded Angular and rugged	Vertical wind turbines Curving paths rectangular buildings
Line	undulating to rugged	Horizontal Vertical, rounded, rugged and jagged	Bold vertical and irregular curving Geometric
Color	Browns, oranges, sienna, and greens	light greens to dark greens Yellows, grays, browns	Whites, greys, tans
Texture	Smooth to medium	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Potentially angular and vertical
Line	same as above	same as above	Potentially vertical and geometric
Color	same as above	same as above	Potentially glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓			✓	
Line				✓				✓			✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Moderate	Moderate	Moderate

Additional Comments

Project is 2.5 miles. There is an existing wind farm closer to viewer.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - April 23, 2013

Evaluated - May 5, 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	11	21.5771, -157.882	Punaluu Beach Park

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Prominent flat ocean Flat beach Rugged mountains, rolling to flat land	Irregular and rugged	Rectangular buildings Vertical poles
Line	Horizontal ocean Flat beach Rugged mountains in middle ground Rolling to flat hills in background	Vertical and Rugged	Geometric and vertical
Color	Cool to medium and dark Blues with tans and whites Tans, Browns,	Light to dark greens, yellows Browns Tans	Tans, light grays, greens, browns
Texture	Smooth water Stippled beach and landform - foreground Medium middle ground and background	Medium and gradational	smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created ? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	same as above
Line	same as above	same as above	same as above
Color	same as above	same as above	same as above
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

Overall Level of Contrast: none

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Short	Moderate	Moderate

Additional Comments

Project is 7.5 miles from Beach. Maybe visible from the HWY. Viewer would be looking at ocean mostly likely not toward project.

Evaluator(s)
Jennifer D'Avanzo

Date
Picture Taken - May 1, 2013
Evaluated - May 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	12	21.5569, -157.853	Kahama Valley State Park Beach

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Flat clear water Rocky and flat to rugged landform	Rugged to vertical	Distant geometric buildings
Line	Horizontal Rugged	Undulating and vertical	Geometric
Color	Cool light blues to medium and dark blues Tans, blacks, browns, beiges and whites	Light to dark greens, tans, browns, yellows	whites
Texture	Coarse to medium	Medium and rough	Scattered fine

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	same as above
Line	same as above	same as above	same as above
Color	same as above	same as above	same as above
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements: Form				✓				✓				✓
Elements: Line				✓				✓				✓
Elements: Color				✓				✓				✓
Elements: Texture				✓				✓				✓

Overall Level of Contrast: none

Section E: Viewer Response

Scenic Quality	Duration of View	User Volume	Overall Response
High	Moderate	Moderate	Moderate

Additional Comments

Project is 9.0 miles from Beach. Maybe visible from the HWY.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 1, 2013

Evaluated - May 5, 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	13	21.6839, -157.955	James Campbell NWR

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat in foreground to rolling in middle ground and rugged background	Flat and rolling Angular and rugged	Rectangular sign, scattered rectangular buildings Vertical poles, turbines, and horizontal fences. Diagonal and curving conductor lines.
Line	Horizontal to undulating	Horizontal rounded, rugged and jagged	Geometric, and horizontal Bold Vertical Lines Curving lines
Color	Browns	light greens to dark greens Yellows, grays, browns	Browns, greens, tans, beiges light grays, browns Whites
Texture	Smooth to medium	smooth to rough	Smooth and coarse

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☑ Yes ☐ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	Same as above	Same as above	Additional Vertical and angular turbine blades
Line	same as above	Same as above	Additional Vertical and angular wind turbines
Color	same as above	same as above	Whites and glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Degree of Contrast / Features	Land/Water				Vegetation				Structures			
Elements	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓		✓		
Line				✓				✓		✓		
Color				✓				✓		✓		
Texture				✓				✓				✓

Overall Level of Contrast: Moderate

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Long	Low	Moderate

Additional Comments

Proposed Project will co-dominate with existing wind project. Scenic Quality is high. Distance from Project is 1.0 miles

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 2, 2013

Evaluated - May 5 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	14	21.6027, -157.9050	North Windward Baptist Church

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Flat	Flat to rounded and angular	Rectangular building Vertical poles Curving conductors
Line	Horizontal	Horizontal Undulating and jagged	Geometric, vertical and curving
Color	Tans, Browns,	Light to dark greens and yellows Browns Tans	Browns, grays, tans, whites
Texture	Smooth to medium	Smooth to medium to coarse	smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	same as above
Line	same as above	same as above	same as above
Color	same as above	same as above	Same as above
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

Overall Level of Contrast: None

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Moderate	Moderate	Moderate

Additional Comments

Project is 5 miles from Church and the grounds are enclosed with vegetation. No views from Church or property.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 1, 2013

Evaluated - May 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	15	21.6489, -157.914	Coastal Residences

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Prominent flat ocean Flat beach Rugged hills	Irregular and rugged	Rectangular buildings Angular and irregular turbine blades
Line	Horizontal undulating ocean Flat beach Rugged mountains in middle ground Rolling to flat hills in background	Vertical and Rugged	Geometric and vertical
Color	Cool to medium and dark Blues with tans and whites Beiges Tans, Browns,	Light to dark greens, yellows Browns Tans	Whites,Tans, light grays, greens, browns
Texture	Smooth water Stippled beach and landform - foreground Medium middle ground and background	Medium and gradational	smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Additional turbines
Line	same as above	same as above	Additional vertical and irregular turbines
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓			✓	
Line				✓				✓			✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Long	High	High

Additional Comments

Project is 2.5 miles from Laie Point where residences are located. Scenic quality is high.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 1, 2013

Evaluated - May 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	16	21.5569, -157.853	Swanzy Beach Park

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Flat clear water Rocky and flat to rugged landform	Flat Vertical and rounded Rugged	Geometric buildings Curving path and wall
Line	Horizontal Rugged	Horizontal Vertical Undulating	Geometric and curving
Color	Cool and light blues to medium and dark blues Tans, blacks, browns, beiges and whites	Light to dark greens, tans, browns, yellows	Grays, blues, whites, browns
Texture	Coarse and smooth to medium	smooth, medium and rough	Course to smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	same as above
Line	same as above	same as above	same as above
Color	same as above	same as above	same as above
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Degree of Contrast / Elements	Land/Water Strong	Land/Water Moderate	Land/Water Weak	Land/Water None	Vegetation Strong	Vegetation Moderate	Vegetation Weak	Vegetation None	Structures Strong	Structures Moderate	Structures Weak	Structures None
Form				✓				✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

Overall Level of Contrast: None

Section E: Viewer Response

Viewer Sensitvity	Duration of View	User Volume	Overall Response
High	Long	High	High

Additional Comments
Project is 9.5 miles from Park.

Evaluator(s)
Jennifer D'Avanzo

Date
Picture Taken - May 1, 2013
Evaluated - May 5, 2014

TETRA TECH INC

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	17	21.6759, -157.954	Kahuku Hospital and Medical Center

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat and rolling in foreground and middleground. Rugged background	Flat, irregular and rounded	Rectangular buildings and fences, Flat parking lots Vertical poles, turbines and signs. Non directional turbine blades Diagonal and curving conductor lines.
Line	Horizontal to undulating	Horizontal and vertical and wispy	Bold, geometric, and horizontal Vertical Curving lines
Color	Browns, siennas	light greens to dark greens Yellows, grays, browns	Browns, yellows, blues, greens, tans dark Grays and blacks oranges reds Whites
Texture	Smooth to medium	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	Same as above	Additional vertical and angular turbines
Line	same as above	Same as above	Additional vertical and angular wind turbines
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓			✓	
Line				✓				✓			✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Short	High	Moderate

Additional Comments

Scenic Quality is low due to many manmade features. Project is 0.5 miles from Viewpoint.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 2, 2013

Evaluated - May 5, 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	18	21.6745, -157.952	Kahuku Elementary School

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat and rolling in foreground and middleground. Rugged background	Flat, irregular and rounded	Rectangular buildings and fences, Curving road Vertical poles, turbines and signs. Non directional turbine blades Diagonal and curving conductor lines.
Line	Horizontal to undulating	Horizontal and vertical and wispy	Bold, geometric, and horizontal Vertical Curving lines
Color	Browns, siennas	light greens to dark greens Yellows, grays, browns	Browns, yellows, blues, greens, tans dark Grays and blacks oranges reds Whites
Texture	Smooth to coarse	smooth to rough	Smooth and medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	Same as above	Additional angular and vertical turbines
Line	same as above	Same as above	Additional vertical and angular wind turbines
Color	same as above	same as above	Glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓			✓	
Line				✓				✓			✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Short	High	Moderate

Additional Comments

Proposed project will co-dominate with existing project. Weak due to existing manmade features.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - May 2, 2013

Evaluated - May 5, 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	19	21.6832, -157.945	Kahuku Golf Course

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat and rolling in foreground to vertical in middle ground and rugged background	Flat and rolling Angular and rugged	Vertical poles, turbines, non directional blades
Line	Horizontal to jagged to undulating	Horizontal and rounded Rugged and jagged	Bold Vertical Lines
Color	Browns, tans and light greens	light greens to dark greens Yellows, grays, browns	Whites, browns greys
Texture	Smooth and rough to medium	smooth to rough	Smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☑ Yes ☐ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Increased number irregular turbine blades
Line	same as above	same as above	Increased number vertical wind turbines
Color	same as above	same as above	Whites
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓		✓		
Line				✓				✓		✓		
Color				✓				✓		✓		
Texture				✓				✓				✓

Overall Level of Contrast: Moderate

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
High	Short - Rec user	High	Moderate

Additional Comments

Golfcourse is 1.0 miles from Project Site. There is an existing wind farm in view.

Evaluator(s): Jennifer D'Avanzo

Date: Picture Taken - May 2, 2013; Evaluated - May 5 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	20	21.6596, -157.933	Malaekahana Bike and Pedestrian Path

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat in foreground to rolling in middle ground and rugged background	Flat and rounded Rolling and rugged	Curving Path, horizontal fences, vertical turbines, non directional blades. Highway Rectangular scattered buildings
Line	Horizontal and rounded to undulating	Horizontal and rounded Rugged	Vertical, horizontal, curving geometric
Color	Browns, tans and light greens	light greens to dark greens Yellows, grays, browns, tans, beiges	Whites, browns greys
Texture	Smooth to medium	smooth to medium	Smooth

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☑ Yes ☐ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Increased number turbines
Line	same as above	same as above	Increased number vertical wind turbines
Color	same as above	same as above	Whites and glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓		✓		
Line				✓				✓		✓		
Color				✓				✓		✓		
Texture				✓				✓				✓

Overall Level of Contrast: Moderate

Section E: Viewer Response

Viewer Sensitvity	Duration of View	User Volume	Overall Response
Moderate	High	High	High

Additional Comments

Path viewpoint location is 1.0 miles from Project.

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - April 22, 2014

Evaluated - May 5 2014

TETRA TECH INC.

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Viewpoint / Photo Point	Latitude / Longitude	Location
Na Pua Makani	21	21.6937, -157.98	Kamehameha Highway

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	No water Flat to rolling in middle ground. Rugged background	Flat and rounded Rolling and rugged	Curving road, horizontal fences, rectangular building, prominent vertical poles and non directional blades from wind turbines. Curving conductors
Line	Horizontal and rounded to undulating	Horizontal and rounded Vertical, angular and wispy Rugged	Geometric, vertical, Turbines. horizontal, curving conductors
Color	Browns, tans and light greens	light greens to dark greens Yellows, grays, browns, tans, beiges	Whites, browns grays, blacks, tans, greens, reds yellows,
Texture	Smooth to medium	smooth to coarse	Smooth to medium

Section C: Proposed Activity Description

Has Photo Simulation Been Created? ☐ Yes ☑ No If Yes, Figure Number: _____

	Land / Water	Vegetation	Structures
Form	same as above	same as above	Additional vertical turbines
Line	same as above	same as above	Additional turbines
Color	same as above	same as above	glaring
Texture	same as above	same as above	same as above

Section D: Contrast Rating

Features

Degree of Contrast / Elements	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				✓				✓			✓	
Line				✓				✓			✓	
Color				✓				✓			✓	
Texture				✓				✓				✓

Overall Level of Contrast: Weak

Section E: Viewer Response

Viewer Sensitivity	Duration of View	User Volume	Overall Response
Moderate	Short	High	Moderate

Additional Comments

From highway. 1.6 Miles from the Project. Scenic Quality is Low due to the prominence of an existing wind farm

Evaluator(s)

Jennifer D'Avanzo

Date

Picture Taken - April 22, 2014

Evaluated - May 5 2014

APPENDIX K
SHADOW FLICKER IMPACT ANALYSIS

Shadow Flicker Impact Analysis for the Na Pua Makani Wind Energy Project

Oahu, Hawaii

Prepared for

Na Pua Makani Power Partners, LLC

Prepared by

Tetra Tech, Inc.

160 Federal Street – 3rd Floor

Boston, Massachusetts 02110

June 2014

Revised November 2014

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ATTACHMENT

Attachment A. Detailed Summary of WindPro Shadow Flicker Analysis Results

1.0 OVERVIEW

Na Pua Makani Power Partners, LLC (NPMPP), is proposing to develop the Na Pua Makani Wind Energy Project (Project) on Oahu, Hawaii (see Figure 1). The Project is undergoing environmental review under both the Hawaii Environmental Policy Act (HEPA) and the National Environmental Policy Act (NEPA). As part of this review, the Project is analyzing three alternatives: Alternative 1 – no action; Alternative 2 (the Proposed Action) – construction and operation of an up to approximately 25 MW Project consisting of up to 10 wind turbines; and Alternative 3 – construction and operation of a larger generation facility of up to 42 MW and consisting of up to 12 turbines. Tetra Tech has conducted a shadow flicker analysis for Project Alternatives 2 and 3 the results of which are provided in this report.

2.0 PROJECT COMPONENTS

NPMPP is currently considering turbine models from leading turbine manufacturers including Siemens, Vestas, and GE. The turbine array could include a combination of models from a single manufacturer ranging in generating capacity and dimensions. For the purposes of impact analysis, Tetra Tech analyzed a turbine array that included the turbines with the tallest maximum blade tip height with the assumption that the tallest turbine would cast the furthest shadow and therefore potentially have the greatest effect. NPMPP will select the most appropriate turbines for the site-specific conditions of the wind farm prior to construction.

Two representative wind turbine models were selected to evaluate potential shadow flicker impacts. These models which represent the general range in dimensions of turbines that could be installed on site, have the following characteristics:

- **Vestas V110-2.0** - 3-blade 110-meter diameter rotor, with a hub height of 80 meters. Assumption that the 2.0-110 WT has a normal high rotor speed of approximately 14.9 rotations per minute (rpm) which translates to a blade pass frequency of 0.75 Hertz (Hz) which is less than 1 alternation per second.

- **Siemens SWT-3.0-113** - 3-blade 113-meter diameter rotor, with a hub height of 99.5 meters. Assumption that the 3.0-113 WT has a normal high rotor speed of approximately 16.0 rpm which translates to a blade pass frequency of 0.8 Hz (less than 1 alternation per second).

Smaller turbine models (Vestas V110-2.0) may be considered for turbine locations 1 and 2 , and larger turbines (Siemens SWT-3.0-113) may be considered for locations 3 to 10 (or up to turbine location 12 for Alternative 3). The combination of turbine models and specific number of turbines under each alternative will be selected to ensure consistency with HECO grid requirements, onsite wind resources, and other Project-specific factors. The Alternative 2 design is based on construction of ten (10) turbines (numbers 1-5, and 8-12), and Alternative 3 design is based on the construction of all twelve (12) turbines (numbers 1-12).If Alternative 3 were selected, the project would be built in two phases, with the first phase build out of up to 10 turbines (up to

approximately 25 MW), and the second phase builds out of the remaining turbines, for total of 12 turbines (up to approximately 42 MW).

3.0 SHADOW FLICKER BACKGROUND

A wind turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker, and can be a temporary phenomenon experienced at nearby residences or public gathering places. The impact area depends on the time of year and day (which determine the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades). Shadow flicker impact to surrounding properties generally occurs during low angle sunlight conditions, typically during sunrise and sunset times of the day. However, when the sun angle gets very low (less than 3 degrees), sunlight passes through more atmosphere and becomes too diffused to form a coherent shadow. Shadow flicker will not occur when the sun is obscured by clouds or fog, at night, or when the source turbine(s) are not operating. In addition, shadow flicker is only an issue when at least 20% of the sun's disc is covered by the turbine blades.

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity diminishes with greater receptor-to-turbine separation distance. Shadow flicker intensity for receptor-to-turbine distances beyond 2,500 meters (8,202 feet) is very low and generally considered imperceptible. In general, increasing proximity to turbines may make shadow flicker more noticeable, with the largest number of shadow flicker hours, along with greatest shadow flicker intensity, occurring nearest the wind turbines.

Shadow flicker frequency is related to the wind turbine's rotor blade speed and the number of blades on the rotor. From a health standpoint, the low flicker frequencies associated with wind turbines, are harmless, and public concerns that flickering light from wind turbines can have negative health effects, such as triggering seizures in people with epilepsy are unfounded. Epilepsy Action (working name for the British Epilepsy Foundation) states that there is no evidence that wind turbines can cause seizures (Epilepsy Action 2008). However, they recommend that wind turbine flicker frequency be limited to 3 Hz. (For comparison, strobe lights used in discotheques have frequencies which range from about 3 Hz to 10 Hz (1 Hz = 1 flash per second). Since the proposed Project's wind turbine blade pass frequency is approximately 0.74-0.8 Hz (less than 1 alternation per second), no negative health effects to individuals with photosensitive epilepsy are anticipated.

Shadow flicker impacts are not regulated in applicable state or federal law, and there is no permitting threshold with regard to hours per year of anticipated impacts to a receptor from a wind energy project. A threshold of 30 hours per year has been widely used in the industry as a target value in the absence of formal guidelines. This threshold originally came from German court case, where a judge found 30 hours of actual shadow flicker per year at a certain neighbor's property

to be tolerable (WindPower 2003). The 30 hours per year threshold value has been widely used in the industry as a target value in the absence of formal guidelines. However, predicted shadow flicker greater than this threshold does not necessarily create a nuisance and is still well below concerns for impacts to health such as triggering epileptic seizers.

4.0 WINDPRO SHADOW FLICKER ANALYSIS

An analysis of potential shadow flicker impacts from the Project was conducted using the WindPro software package. The turbine array provided by Na Pua Makani Power Partners, LLC (layout dated October 15, 2014), which includes up to twelve (12) turbine locations, was included in the analysis. The analysis evaluated the following two turbine scenarios:

- Alternative 2: Two (2) Vestas V110-2.0 plus eight (8) Siemens SWT-3.0-113 wind turbines
- Alternative 3: Two (2) Vestas V110-2.0 plus ten (10) Siemens SWT-3.0-113 wind turbines

The WindPro analysis was conducted to determine shadow flicker impacts under realistic impact conditions (actual expected shadow). This analysis calculated the total amount of time (hours and minutes per year) that shadow flicker are expected to occur at receptors surrounding the project. The realistic impact condition scenario is based on the following assumptions:

- The elevation and position geometries of the wind turbines and surrounding receptors (potentially occupied residences). Elevations were determined using United States Geological Survey (USGS) digital elevation model (DEM) data. Positions geometries were determined using geographic information system (GIS) and referenced to Universal Transverse Mercator (UTM) Zone 4 (NAD83).
- The position of the sun and the incident sunlight relative to the wind turbine and receptors on a minute-by-minute basis over the course of a year.
- Historical sunshine availability (percent of total hours available). Historical sunshine rates for the area (as summarized by the National Climatic Data Center (NCDC 2008) for nearby Honolulu, Hawaii) used in this analysis are as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
65%	68%	72%	70%	72%	74%	76%	77%	77%	70%	65%	63%

- Estimated wind turbine operations and orientation (based on approximately 4 years of wind data (4/7/09 – 6/27/13), including the wind speed and wind direction frequency distribution, measured at on-site meteorological towers).
- Receptor viewpoints (i.e., house windows) are conservatively assumed to always be directly facing turbine to sun line of sight (“greenhouse mode”).

WindPro incorporates terrain elevation contour information and the analysis accounts for terrain elevation differences. The sun's path with respect to each turbine location is calculated by the software to determine the cast shadow paths every minute over a full year. Sun angles less than 3 degrees above the horizon were excluded, for the reasons identified earlier in this section. Since shadow flicker is only an issue when at least 20% of the sun disc is covered by the blades, WindPro uses blade width dimension data to calculate the maximum distance from the turbine where shadow flicker must be calculated. Beyond this distance, the turbine will not contribute to the shadow flicker impact.

It should be noted however, that WindPro provides a conservative estimate of shadow flicker as obstacles such as trees, haze, and visual obstructions (window facing, coverings) are not fully accounted for despite the likelihood of their reducing or eliminating shadow flicker impacts to receptors. A total of 737 receptor locations were identified within 2.5 kilometers of proposed Project turbines. A receptor in the model is defined as a 1 meter squared area (approximate size of a typical window), 1 meter (3.28 feet) aboveground level. Approximate eye level is set at 1.5 meters (4.94 feet). Figure 2 shows the receptor locations and proposed Project turbines considered for Alternatives 1 and 2.

5.0 SHADOW FLICKER ANALYSIS RESULTS

As expected, WindPro predicts that shadow flicker impacts will be greatest at locations nearer to the wind turbines. Figures 3 and 4 describe the WindPro predicted shadow flicker impact areas for turbine Alternatives 2 and 3, respectively (not that Alternative 1 in the associated Environmental Impact Statement is the No Action alternative, under which the Project would not be constructed). A detailed WindPro shadow flicker analysis summary, for the full build-out scenario (Alternative 3) for each of the modeled receptor location, is provided in Attachment A.

Tables 1 and 2 present the WindPro predicted shadow flicker impacts for the ten receptors with the greatest total annual shadow flicker impact for each of the turbine alternatives modelled. Under Alternative 2 (the Proposed Action), 17 of the 737 receptors had expected shadow flicker impacts of more than 30 hours per year. The predicted shadow flicker impact at any receptor ranged from 0 to 204 hours and 2 minutes (Receptor 647). Under Alternative 3 (larger generation wind project), 18 of the 737 receptors had expected shadow flicker impacts of more than 30 hours per year. The predicted shadow flicker impact at any receptor ranged from 0 hours to 354 hours 38 minutes per year (Receptor 647), which is approximately 8.0 percent of the potential available daylight hours.

Table 1. WindPro Predicted Shadow Flicker Impacts for Receptors with Maximum Expected Impacts – Turbine Alternative 2

Receptor ID	UTM-E (meters)	UTM-N (meters)	Shadow Hours per Year (expected) [hh:mm / year]
647	608,527	2,396,107	204:02
595	606,848	2,396,756	164:05
610	609,038	2,396,445	159:34
609	609,014	2,396,499	148:27
608	608,881	2,396,182	120:19
645	608,721	2,396,023	110:09
599	607,110	2,396,193	92:17
594	606,815	2,396,680	90:43
607	608,797	2,396,201	83:13
601	607,038	2,396,488	80:21

Table 2. WindPro Predicted Shadow Flicker Impacts for Receptors with Maximum Expected Impacts – Turbine Alternative 3

Receptor ID	UTM-E (meters)	UTM-N (meters)	Shadow Hours per Year (expected) [hh:mm / year]
647	608,527	2,396,107	354:38
648	608,251	2,396,015	293:45
645	608,721	2,396,023	176:01
610	609,038	2,396,445	174:58
605	607,825	2,396,209	170:10
595	606,848	2,396,756	168:53
609	609,014	2,396,499	157:21
608	608,881	2,396,182	149:39
607	608,797	2,396,201	123:29
599	607,110	2,396,193	103:14

The shadow flicker impact prediction statistics are summarized in Tables 3 and 4, for each of the turbine alternatives modeled.

Table 3. Statistical Summary of WindPro Predicted Shadow Flicker Impacts at Modeled Receptor Locations – Turbine Alternative 2

Cumulative Shadow Flicker Time (expected)	Number of Receptors
Total	737
= 0 Hours	429
> 0 Hours < 10 Hours	188
≥ 10 Hours < 20 Hours	73
≥ 20 Hours < 30 Hours	30
≥ 30 Hours	17

Table 4. Statistical Summary of WindPro Predicted Shadow Flicker Impacts at Modeled Receptor Locations – Turbine Alternative 3

Cumulative Shadow Flicker Time (expected)	Number of Receptors
Total	737
= 0 Hours	428
> 0 Hours < 10 Hours	186
≥ 10 Hours < 20 Hours	75
≥ 20 Hours < 30 Hours	30
≥ 30 Hours	18

6.0 CONCLUSION

The analysis of potential shadow flicker impacts from the Project on nearby receptors shows that shadow flicker impacts for the large majority of receptors expected to be well within acceptable industry standard ranges for avoiding nuisance impacts. The analysis was deliberately conservative and actual shadow flicker is expected to occur for less than the modeled durations. The analysis assumes that the receptors all have a direct in-line view of the incoming shadow flicker sunlight and does not account for trees or other obstructions which may block sunlight. In reality, the windows of many houses will not face the sun directly for the key shadow flicker impact times.

Only 17 of the 737 receptors modeled had expected shadow flicker impacts of more than 30 hours per year under the Proposed Action. Of these 17 receptors, 11 are located within the Project boundary on the Malaekahana Hui West, LLC parcel which is leasing land to the Project developer and will work with tenant farmers to mitigate any possible shadow flicker impacts. No federal, state, or local regulations regulate shadow flicker; however, the 30 hours per year threshold is an industry standard that was established in a German court case which has been widely adopted in the United States as a threshold to evaluate shadow flicker impacts. There would be no shadow flicker impacts (zero hours of shadow flicker time) at the Kahuku Elementary School, Kahuku High School, or Kahuku Medical Center.

Mitigation measures such as strategic vegetative screening and/or installation of curtains and blinds on the windows facing the turbine casting the shadows are effective and economically viable mitigation options that the Project could consider on an individual basis with landowners, if necessary.

7.0 REFERENCES

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FIGURES

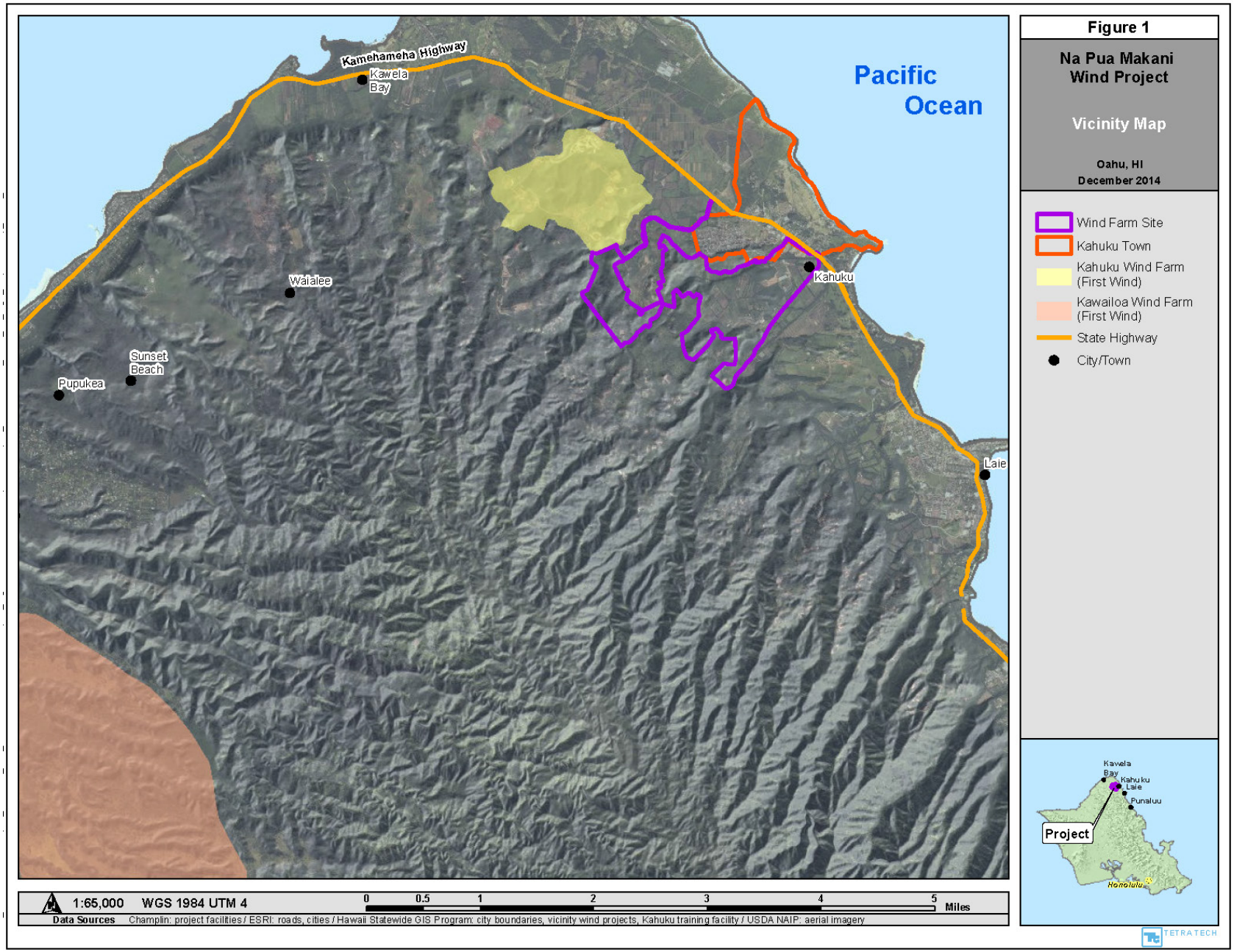


Figure 1
Na Pua Makani Wind Project
Vicinity Map
Oahu, HI
December 2014
Wind Farm Site
Kahuku Town
Kahuku Wind Farm (First Wind)
Kawailoa Wind Farm (First Wind)
State Highway
City/Town
Pacific Ocean
Kamehameha Highway
Kawela Bay
Waialee
Sunset Beach
Pupukea
Kahuku
Laie
Kawela Bay
Kahuku
Laie
Punaluu
Project
Honolulu
1:65,000
WGS 1984 UTM 4
0
0.5
1
2
3
4
5
Miles
Data Sources
Champlin: project facilities / ESRI: roads, cities / Hawaii Statewide GIS Program: city boundaries, vicinity wind projects, Kahuku training facility / USDA NAIP: aerial imagery
TETRA TECH

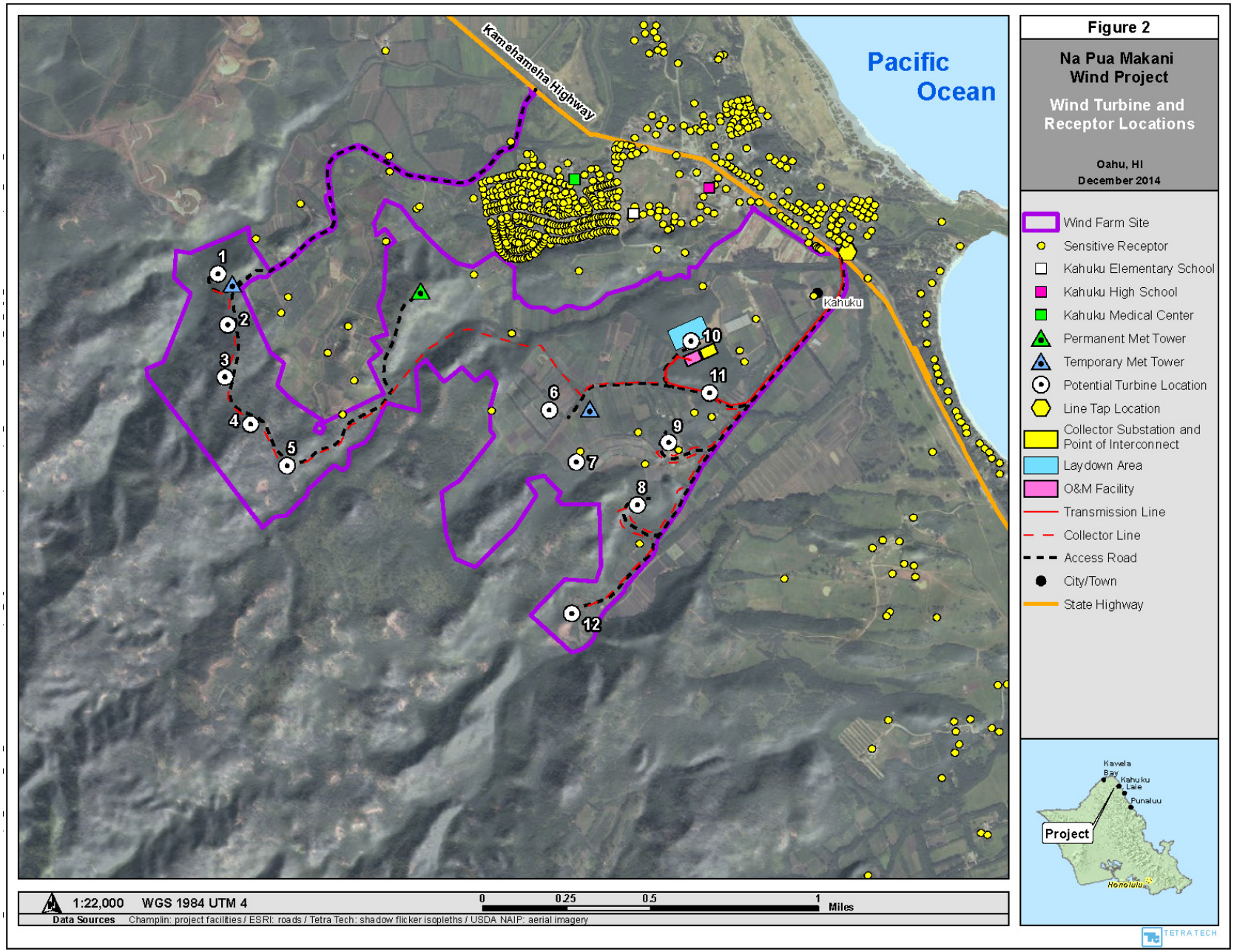
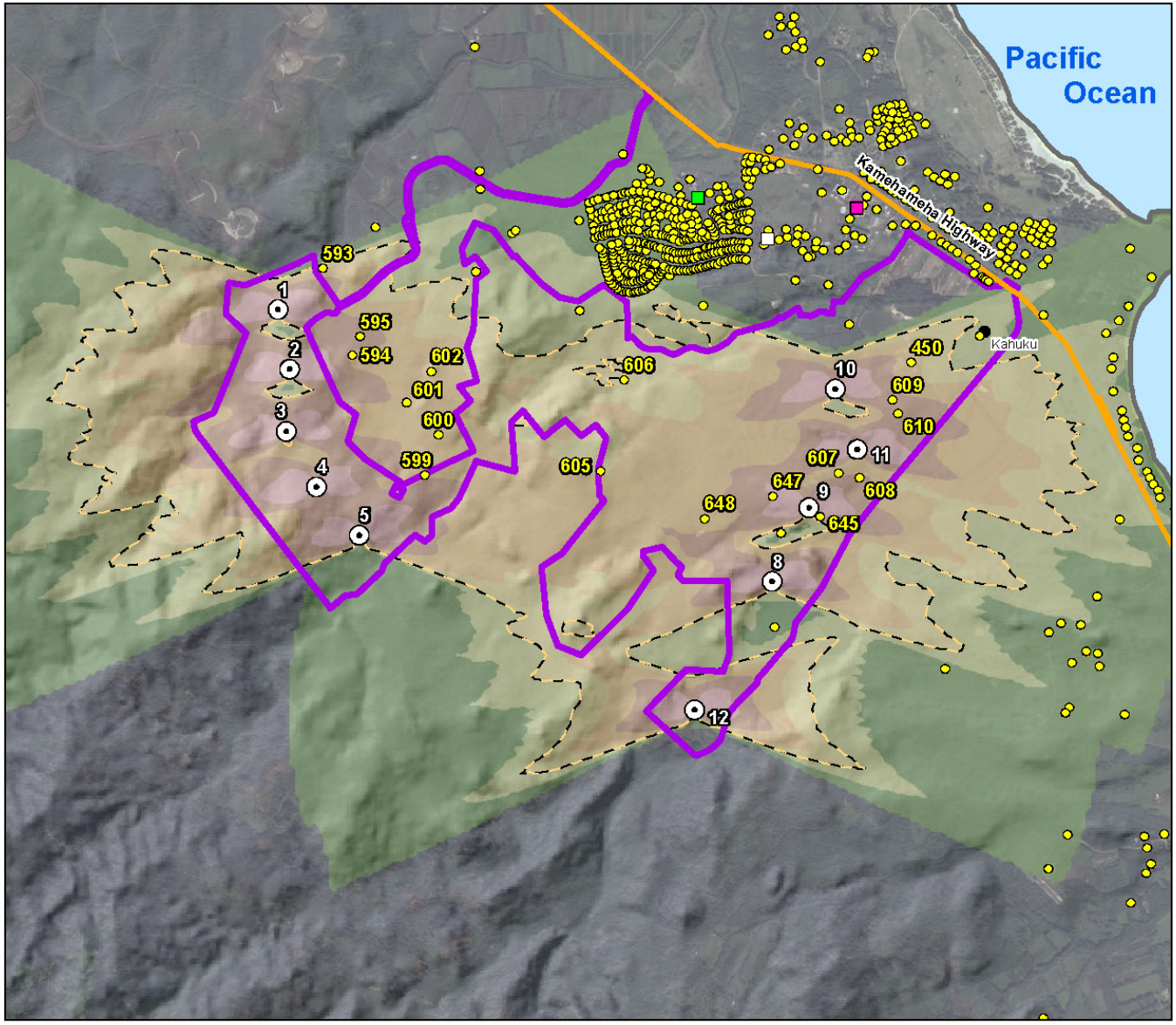


Figure 2
Na Pua Makani Wind Project
Wind Turbine and Receptor Locations
Oahu, HI
December 2014
Pacific Ocean
Kamehameha Highway
Kahuku
1
2
3
4
5
6
7
8
9
10
11
12
Wind Farm Site
Sensitive Receptor
Kahuku Elementary School
Kahuku High School
Kahuku Medical Center
Permanent Met Tower
Temporary Met Tower
Potential Turbine Location
Line Tap Location
Collector Substation and Point of Interconnect
Laydown Area
O&M Facility
Transmission Line
Collector Line
Access Road
City/Town
State Highway
Kawela Bay
Kahuku
Laie
Punaluu
Project
Honolulu
1:22,000
WGS 1984 UTM 4
0
0.25
0.5
1
Miles
Data Sources
Champlin: project facilities / ESRI: roads / Tetra Tech: shadow flicker isopleths / USDA NAIP: aerial imagery
TETRA TECH



1:22,000 WGS 1984 UTM 4

0 0.25 0.5 1 Miles

Data Sources Champlin: project facilities / ESRI: roads / Tetra Tech: shadow flicker isopleths / USDA NAIP: aerial imagery

Figure 3

Na Pua Makani Wind Project

WindPro Expected Shadow Flicker Impact Areas Turbine Alternative 2

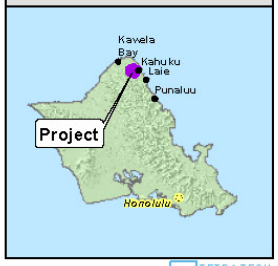
Oahu, HI
December 2014

- Sensitive Receptor *
- Kahuku Elementary School
- Kahuku High School
- Kahuku Medical Center
- Potential Turbine Location
- City/Town
- State Highway
- Wind Farm Site
- Shadow Flicker Boundary (30 hours per year)

Shadow Flicker (hours per year)

- 0 - 15
- 15 - 30
- 30 - 50
- 50 - 100
- 100 - 200
- > 200

* Only sensitive receptors with greater than 30 hours of shadow flicker per year labeled.



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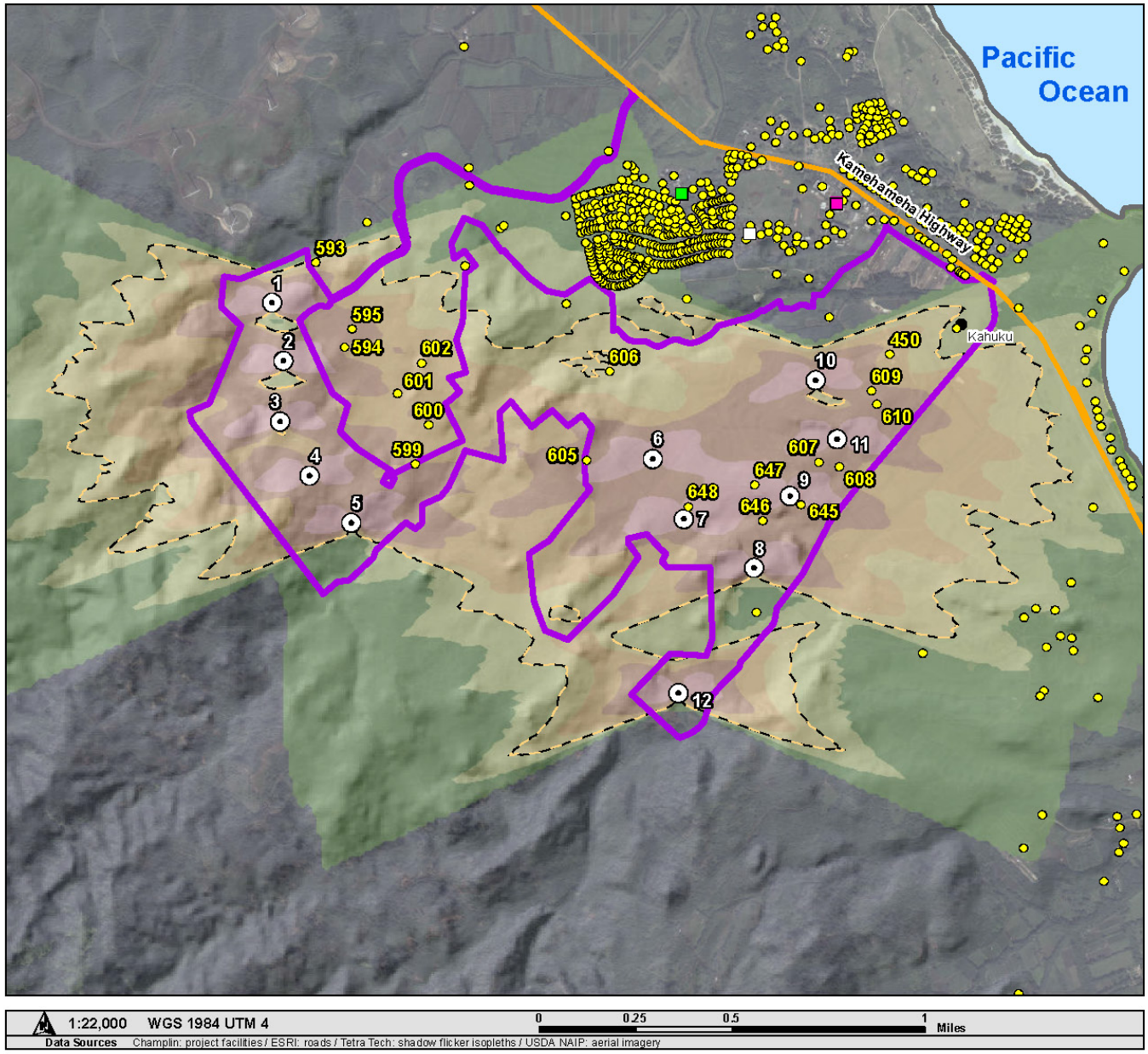


Figure 4

Na Pua Makani Wind Project

WindPro Expected Shadow Flicker Impact Areas Turbine Alternative 3

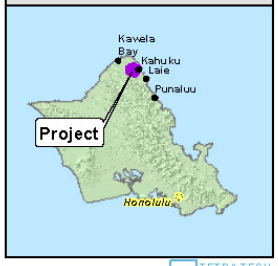
Oahu, HI
December 2014

- Sensitive Receptor *
- Kahuku Elementary School
- Kahuku High School
- Kahuku Medical Center
- Potential Turbine Location
- City/Town
- State Highway
- Wind Farm Site
- Shadow Flicker Boundary (30 hours per year)

Shadow Flicker (hours per year)

- 0 - 15
- 15 - 30
- 30 - 50
- 50 - 100
- 100 - 200
- > 200

* Only sensitive receptors with greater than 30 hours of shadow flicker per year labeled.



TETRA TECH

ATTACHMENT A.

Detailed Summary of WindPro Shadow Flicker Analysis Results

Na Pua Makani Energy Wind Project
WindPro Shadow Flicker Analysis Results Summary
Turbine Alternative 3

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
1	607,176	2,399,049	0:00:00
2	606,746	2,398,890	0:00:00
3	606,799	2,398,858	0:00:00
4	606,842	2,398,805	0:00:00
5	606,658	2,398,901	0:00:00
6	604,655	2,398,661	0:00:00
7	604,645	2,398,491	0:00:00
8	607,253	2,398,382	0:00:00
9	607,199	2,398,126	0:00:00
10	607,636	2,398,333	0:00:00
11	607,593	2,398,333	0:00:00
12	607,512	2,398,229	0:00:00
13	608,083	2,398,265	0:00:00
14	608,168	2,398,224	0:00:00
15	608,939	2,397,915	0:00:00
16	608,922	2,397,913	0:00:00
17	608,912	2,397,893	0:00:00
18	608,841	2,397,626	0:00:00
19	608,918	2,397,620	0:00:00
20	608,957	2,397,631	0:00:00
21	608,950	2,397,656	0:00:00
22	608,952	2,397,678	0:00:00
23	608,976	2,397,685	0:00:00
24	608,995	2,397,674	0:00:00
25	608,983	2,397,640	0:00:00
26	609,005	2,397,639	0:00:00
27	608,998	2,397,612	0:00:00
28	609,035	2,397,614	0:00:00
29	609,058	2,397,622	0:00:00
30	609,077	2,397,645	0:00:00
31	609,083	2,397,622	0:00:00
32	609,093	2,397,602	0:00:00
33	609,058	2,397,596	0:00:00
34	609,038	2,397,593	0:00:00
35	608,984	2,397,593	0:00:00
36	609,039	2,397,639	0:00:00
37	609,043	2,397,666	0:00:00
38	609,069	2,397,663	0:00:00
39	609,059	2,397,685	0:00:00
40	609,053	2,397,703	0:00:00
41	609,027	2,397,699	0:00:00
42	609,007	2,397,695	0:00:00
43	609,015	2,397,668	0:00:00
44	609,150	2,397,622	0:00:00
45	609,119	2,397,651	0:00:00
46	608,720	2,397,875	0:00:00
47	608,594	2,397,624	0:00:00
48	608,652	2,397,607	0:00:00
49	608,798	2,397,682	0:00:00
50	608,615	2,398,057	0:00:00
51	608,509	2,397,984	0:00:00
52	608,562	2,398,018	0:00:00
53	608,555	2,398,058	0:00:00
54	608,604	2,398,024	0:00:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
55	608,619	2,397,995	0:00:00
56	608,647	2,397,960	0:00:00
57	608,651	2,397,927	0:00:00
58	608,622	2,397,938	0:00:00
59	608,582	2,397,923	0:00:00
60	607,315	2,397,935	0:00:00
61	604,622	2,397,929	0:00:00
62	606,910	2,397,202	0:00:00
63	607,335	2,397,430	0:00:00
64	607,465	2,397,178	12:23:00
65	607,479	2,397,188	12:00:00
66	607,739	2,397,228	11:08:00
67	607,336	2,397,356	4:40:00
68	607,918	2,397,499	3:30:00
69	607,995	2,397,440	2:19:00
70	608,013	2,397,439	2:36:00
71	608,065	2,397,384	5:56:00
72	607,973	2,397,379	5:43:00
73	608,000	2,397,377	6:02:00
74	608,025	2,397,391	5:42:00
75	608,028	2,397,420	4:32:00
76	608,190	2,397,397	0:00:00
77	608,143	2,397,364	0:00:00
78	608,207	2,397,343	0:00:00
79	608,153	2,397,330	0:00:00
80	607,891	2,397,180	6:06:00
81	607,883	2,397,210	6:44:00
82	607,870	2,397,204	6:52:00
83	607,879	2,397,178	6:21:00
84	607,868	2,397,176	6:36:00
85	607,856	2,397,174	6:47:00
86	607,843	2,397,170	6:56:00
87	607,833	2,397,166	7:11:00
88	607,820	2,397,165	7:28:00
89	607,804	2,397,157	7:37:00
90	607,802	2,397,185	8:25:00
91	607,824	2,397,190	7:52:00
92	607,839	2,397,193	7:27:00
93	607,855	2,397,196	7:09:00
94	607,798	2,397,209	10:04:00
95	607,794	2,397,227	10:28:00
96	607,817	2,397,233	10:02:00
97	607,833	2,397,239	9:45:00
98	607,856	2,397,240	9:03:00
99	607,875	2,397,242	8:24:00
100	607,872	2,397,264	9:01:00
101	607,862	2,397,283	8:59:00
102	607,847	2,397,266	9:18:00
103	607,832	2,397,266	9:28:00
104	607,816	2,397,257	9:49:00
105	607,793	2,397,248	10:16:00
106	607,783	2,397,274	9:03:00
107	607,778	2,397,301	6:54:00
108	607,800	2,397,309	6:55:00
109	607,817	2,397,315	6:50:00
110	607,833	2,397,317	7:07:00
111	607,850	2,397,323	6:59:00
112	607,865	2,397,326	7:06:00
113	607,880	2,397,332	6:55:00
114	607,897	2,397,332	7:10:00
115	607,910	2,397,336	7:04:00
116	607,926	2,397,342	6:53:00
117	607,942	2,397,343	6:56:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
118	607,957	2,397,349	6:45:00
119	607,987	2,397,346	6:52:00
120	608,014	2,397,343	6:43:00
121	608,036	2,397,339	6:16:00
122	608,062	2,397,329	5:18:00
123	608,082	2,397,325	4:42:00
124	608,104	2,397,317	1:34:00
125	608,133	2,397,307	1:26:00
126	608,154	2,397,303	0:00:00
127	608,176	2,397,293	0:00:00
128	608,198	2,397,289	0:00:00
129	607,923	2,397,182	5:36:00
130	607,934	2,397,190	5:30:00
131	607,946	2,397,193	5:22:00
132	607,965	2,397,192	5:07:00
133	607,981	2,397,188	4:48:00
134	607,987	2,397,219	4:51:00
135	607,968	2,397,228	5:14:00
136	607,948	2,397,221	5:36:00
137	607,930	2,397,221	5:54:00
138	607,915	2,397,217	6:13:00
139	607,972	2,397,251	5:29:00
140	607,971	2,397,270	5:53:00
141	607,903	2,397,255	7:45:00
142	607,922	2,397,262	7:17:00
143	607,932	2,397,265	6:55:00
144	607,953	2,397,273	6:32:00
145	607,956	2,397,305	7:22:00
146	607,931	2,397,293	7:52:00
147	607,909	2,397,289	8:16:00
148	607,894	2,397,282	8:31:00
149	607,981	2,397,308	6:57:00
150	607,987	2,397,293	6:12:00
151	608,016	2,397,177	4:20:00
152	608,028	2,397,181	4:13:00
153	608,040	2,397,178	4:06:00
154	608,055	2,397,172	4:02:00
155	608,050	2,397,196	4:01:00
156	608,054	2,397,231	4:08:00
157	608,044	2,397,254	4:25:00
158	608,022	2,397,222	4:25:00
159	608,012	2,397,288	5:22:00
160	608,016	2,397,309	6:01:00
161	608,049	2,397,301	4:46:00
162	608,028	2,397,284	4:59:00
163	608,018	2,397,248	4:40:00
164	608,131	2,397,268	1:25:00
165	608,139	2,397,236	1:23:00
166	608,131	2,397,214	3:22:00
167	608,122	2,397,239	3:28:00
168	608,103	2,397,250	3:42:00
169	608,110	2,397,278	3:45:00
170	608,085	2,397,286	4:05:00
171	608,069	2,397,266	4:08:00
172	608,069	2,397,248	4:01:00
173	608,049	2,397,212	4:06:00
174	608,102	2,397,195	3:35:00
175	608,096	2,397,183	3:38:00
176	608,076	2,397,168	3:47:00
177	608,093	2,397,167	3:35:00
178	608,102	2,397,164	3:32:00
179	608,113	2,397,158	3:27:00
180	608,124	2,397,155	3:19:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
181	608,124	2,397,178	3:22:00
182	608,148	2,397,144	3:08:00
183	608,167	2,397,147	3:03:00
184	608,176	2,397,152	1:17:00
185	608,190	2,397,153	0:00:00
186	608,202	2,397,157	0:00:00
187	608,216	2,397,157	0:00:00
188	608,194	2,397,174	0:00:00
189	608,167	2,397,170	1:17:00
190	608,169	2,397,184	1:18:00
191	608,194	2,397,196	0:00:00
192	608,221	2,397,211	0:00:00
193	608,219	2,397,233	0:00:00
194	608,211	2,397,254	0:00:00
195	608,191	2,397,233	0:00:00
196	608,194	2,397,214	0:00:00
197	608,169	2,397,204	1:19:00
198	608,153	2,397,209	1:22:00
199	608,159	2,397,240	1:19:00
200	608,178	2,397,256	0:00:00
201	607,821	2,397,116	7:09:00
202	607,870	2,397,131	7:25:00
203	607,897	2,397,137	7:40:00
204	607,973	2,397,141	9:10:00
205	607,957	2,397,145	8:45:00
206	607,942	2,397,145	8:19:00
207	607,942	2,397,131	9:24:00
208	607,952	2,397,120	10:14:00
209	607,973	2,397,116	10:28:00
210	607,985	2,397,115	10:30:00
211	607,998	2,397,108	10:32:00
212	608,012	2,397,105	10:31:00
213	608,071	2,397,116	3:40:00
214	608,057	2,397,120	3:49:00
215	608,044	2,397,125	3:57:00
216	608,032	2,397,128	4:03:00
217	608,022	2,397,131	4:09:00
218	608,009	2,397,135	4:18:00
219	607,996	2,397,135	9:46:00
220	607,985	2,397,141	9:24:00
221	608,096	2,397,111	3:29:00
222	608,108	2,397,107	3:25:00
223	608,124	2,397,102	3:19:00
224	608,239	2,397,158	0:00:00
225	608,253	2,397,162	0:00:00
226	608,267	2,397,168	0:00:00
227	608,290	2,397,166	0:00:00
228	608,289	2,397,180	0:00:00
229	608,280	2,397,196	0:00:00
230	608,272	2,397,207	0:00:00
231	608,263	2,397,219	0:00:00
232	608,239	2,397,182	0:00:00
233	608,282	2,397,262	0:00:00
234	608,294	2,397,251	0:00:00
235	608,302	2,397,242	0:00:00
236	608,309	2,397,232	0:00:00
237	608,317	2,397,221	0:00:00
238	608,325	2,397,205	0:00:00
239	608,332	2,397,190	0:00:00
240	608,354	2,397,191	0:00:00
241	608,368	2,397,194	0:00:00
242	608,381	2,397,195	0:00:00
243	608,393	2,397,193	0:00:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
244	608,408	2,397,193	0:00:00
245	608,426	2,397,187	0:00:00
246	608,357	2,397,209	0:00:00
247	608,353	2,397,228	0:00:00
248	608,350	2,397,247	0:00:00
249	608,383	2,397,248	0:00:00
250	608,397	2,397,250	0:00:00
251	608,411	2,397,255	0:00:00
252	608,423	2,397,258	0:00:00
253	608,436	2,397,260	0:00:00
254	608,408	2,397,229	0:00:00
255	608,427	2,397,233	0:00:00
256	608,300	2,397,268	0:00:00
257	608,306	2,397,273	0:00:00
258	608,330	2,397,281	0:00:00
259	608,346	2,397,284	0:00:00
260	608,354	2,397,286	0:00:00
261	608,366	2,397,289	0:00:00
262	608,378	2,397,293	0:00:00
263	608,390	2,397,297	0:00:00
264	608,400	2,397,301	0:00:00
265	608,413	2,397,301	0:00:00
266	608,426	2,397,305	0:00:00
267	608,270	2,397,341	0:00:00
268	608,311	2,397,313	0:00:00
269	608,348	2,397,323	0:00:00
270	608,341	2,397,346	0:00:00
271	608,327	2,397,370	0:00:00
272	608,302	2,397,368	0:00:00
273	608,391	2,397,335	0:00:00
274	608,235	2,397,107	0:00:00
275	608,246	2,397,112	0:00:00
276	608,256	2,397,118	0:00:00
277	608,270	2,397,119	0:00:00
278	608,278	2,397,122	0:00:00
279	608,294	2,397,124	0:00:00
280	608,305	2,397,131	0:00:00
281	608,316	2,397,131	0:00:00
282	608,325	2,397,136	0:00:00
283	608,337	2,397,137	0:00:00
284	608,352	2,397,139	0:00:00
285	608,361	2,397,141	0:00:00
286	608,371	2,397,141	0:00:00
287	608,389	2,397,139	0:00:00
288	608,402	2,397,139	0:00:00
289	608,415	2,397,140	0:00:00
290	608,428	2,397,138	0:00:00
291	608,508	2,397,151	0:00:00
292	608,511	2,397,189	0:00:00
293	608,493	2,397,131	0:00:00
294	608,425	2,397,485	0:00:00
295	608,417	2,397,464	0:00:00
296	608,437	2,397,466	0:00:00
297	608,446	2,397,485	0:00:00
298	608,474	2,397,481	0:00:00
299	608,497	2,397,475	0:00:00
300	608,503	2,397,453	0:00:00
301	608,496	2,397,436	0:00:00
302	608,521	2,397,445	0:00:00
303	608,556	2,397,461	0:00:00
304	608,429	2,397,370	0:00:00
305	608,441	2,397,398	0:00:00
306	608,419	2,397,403	0:00:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
307	608,419	2,397,428	0:00:00
308	608,436	2,397,428	0:00:00
309	608,457	2,397,429	0:00:00
310	608,631	2,397,581	0:00:00
311	608,570	2,397,562	0:00:00
312	608,512	2,397,517	0:00:00
313	608,614	2,397,534	0:00:00
314	608,688	2,397,564	0:00:00
315	608,552	2,397,151	0:00:00
316	608,587	2,397,161	0:00:00
317	608,581	2,397,192	0:00:00
318	608,630	2,397,192	0:00:00
319	608,628	2,397,170	0:00:00
320	608,622	2,397,137	0:00:00
321	608,661	2,397,166	0:00:00
322	608,702	2,397,118	0:00:00
323	608,704	2,397,143	0:00:00
324	608,726	2,397,343	0:00:00
325	608,711	2,397,436	0:00:00
326	608,972	2,397,575	0:00:00
327	608,969	2,397,556	0:00:00
328	608,977	2,397,531	0:00:00
329	609,004	2,397,540	0:00:00
330	609,023	2,397,549	0:00:00
331	609,009	2,397,567	0:00:00
332	609,101	2,397,582	0:00:00
333	609,075	2,397,572	0:00:00
334	609,055	2,397,564	0:00:00
335	609,048	2,397,469	0:00:00
336	609,114	2,397,284	0:00:00
337	609,091	2,397,303	0:00:00
338	609,105	2,397,353	0:00:00
339	609,069	2,397,313	0:00:00
340	609,050	2,397,332	0:00:00
341	609,026	2,397,340	0:00:00
342	609,010	2,397,352	0:00:00
343	608,990	2,397,366	0:00:00
344	608,972	2,397,378	0:00:00
345	608,952	2,397,393	0:00:00
346	608,928	2,397,399	0:00:00
347	608,968	2,397,427	0:00:00
348	608,923	2,397,596	0:00:00
349	608,846	2,397,590	0:00:00
350	608,849	2,397,569	0:00:00
351	608,805	2,397,563	0:00:00
352	608,827	2,397,548	0:00:00
353	608,778	2,397,551	0:00:00
354	608,897	2,397,480	0:00:00
355	608,878	2,397,567	0:00:00
356	608,747	2,397,575	0:00:00
357	608,899	2,397,424	0:00:00
358	608,826	2,397,191	0:00:00
359	608,840	2,397,235	0:00:00
360	608,870	2,397,274	0:00:00
361	608,896	2,397,291	0:00:00
362	608,950	2,397,274	0:00:00
363	608,810	2,397,352	0:00:00
364	608,911	2,397,326	0:00:00
365	609,014	2,397,209	0:00:00
366	609,069	2,397,213	0:00:00
367	608,861	2,397,168	0:00:00
368	608,892	2,397,155	0:00:00
369	608,796	2,397,108	0:00:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
370	608,825	2,397,128	0:00:00
371	609,109	2,397,209	0:00:00
372	609,175	2,397,168	0:00:00
373	609,214	2,397,142	0:00:00
374	609,236	2,397,129	0:00:00
375	609,257	2,397,114	0:00:00
376	609,358	2,397,122	0:00:00
377	609,339	2,397,134	0:00:00
378	609,300	2,397,159	0:00:00
379	609,282	2,397,172	0:00:00
380	609,261	2,397,186	0:00:00
381	609,240	2,397,194	0:00:00
382	609,221	2,397,211	0:00:00
383	609,175	2,397,239	0:00:00
384	609,248	2,397,262	0:00:00
385	609,158	2,397,426	0:00:00
386	609,185	2,397,405	0:00:00
387	609,210	2,397,389	0:00:00
388	609,229	2,397,416	0:00:00
389	609,267	2,397,407	0:00:00
390	609,240	2,397,375	0:00:00
391	609,404	2,397,283	0:00:00
392	609,383	2,397,100	0:00:00
393	609,398	2,397,129	0:00:00
394	609,409	2,397,157	0:00:00
395	609,424	2,397,180	0:00:00
396	609,402	2,397,202	0:00:00
397	609,386	2,397,177	0:00:00
398	609,373	2,397,153	0:00:00
399	609,333	2,397,186	0:00:00
400	609,354	2,397,170	0:00:00
401	609,302	2,397,204	0:00:00
402	609,491	2,397,105	0:00:00
403	609,505	2,397,123	0:00:00
404	609,476	2,397,149	0:00:00
405	609,457	2,397,128	0:00:00
406	609,466	2,397,191	0:00:00
407	609,494	2,397,175	0:00:00
408	609,599	2,397,139	0:00:00
409	609,575	2,397,157	0:00:00
410	609,546	2,397,178	0:00:00
411	609,506	2,397,204	0:00:00
412	609,572	2,397,221	0:00:00
413	609,559	2,397,200	0:00:00
414	609,583	2,397,188	0:00:00
415	609,597	2,397,213	0:00:00
416	609,637	2,397,218	0:00:00
417	609,663	2,397,196	0:00:00
418	609,655	2,397,177	0:00:00
419	609,623	2,397,196	0:00:00
420	609,609	2,397,172	0:00:00
421	609,636	2,397,156	0:00:00
422	609,660	2,397,138	0:00:00
423	609,626	2,397,131	0:00:00
424	609,984	2,397,115	8:11:00
425	610,071	2,396,998	3:53:00
426	609,976	2,396,880	12:36:00
427	609,885	2,396,770	16:50:00
428	609,937	2,396,822	15:20:00
429	609,914	2,396,671	19:31:00
430	609,629	2,396,844	10:35:00
431	609,370	2,396,760	24:46:00
432	609,330	2,397,070	0:00:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
433	609,353	2,397,048	0:00:00
434	609,346	2,397,014	0:00:00
435	609,382	2,396,998	0:00:00
436	609,388	2,396,991	0:00:00
437	609,396	2,396,987	0:00:00
438	609,407	2,396,981	0:00:00
439	609,446	2,397,055	0:00:00
440	609,474	2,397,039	0:00:00
441	609,492	2,397,024	0:00:00
442	609,522	2,397,010	5:19:00
443	609,543	2,397,033	0:34:00
444	609,516	2,397,050	0:00:00
445	609,454	2,397,092	0:00:00
446	609,480	2,397,074	0:00:00
447	609,556	2,397,093	0:00:00
448	609,648	2,397,073	2:34:00
449	609,628	2,397,049	5:34:00
450	609,092	2,396,651	73:41:00
451	609,278	2,397,098	0:00:00
452	608,838	2,396,807	0:00:00
453	608,620	2,396,984	0:00:00
454	608,753	2,396,967	0:00:00
455	608,733	2,397,108	0:00:00
456	608,685	2,397,083	0:00:00
457	608,671	2,397,078	0:00:00
458	608,649	2,397,105	0:00:00
459	608,134	2,397,097	3:19:00
460	608,147	2,397,097	3:11:00
461	608,159	2,397,096	3:04:00
462	608,172	2,397,096	3:00:00
463	608,185	2,397,096	1:17:00
464	608,196	2,397,097	0:00:00
465	608,210	2,397,102	0:00:00
466	608,220	2,397,104	0:00:00
467	608,093	2,397,084	3:29:00
468	608,104	2,397,080	3:26:00
469	608,123	2,397,075	3:20:00
470	608,142	2,397,071	3:11:00
471	608,162	2,397,068	3:03:00
472	608,180	2,397,070	2:56:00
473	608,194	2,397,074	0:00:00
474	608,206	2,397,074	0:00:00
475	608,224	2,397,080	0:00:00
476	608,242	2,397,085	0:00:00
477	608,251	2,397,088	0:00:00
478	608,265	2,397,091	0:00:00
479	608,277	2,397,096	0:00:00
480	608,289	2,397,098	0:00:00
481	608,304	2,397,100	0:00:00
482	608,319	2,397,104	0:00:00
483	608,339	2,397,108	0:00:00
484	608,348	2,397,111	0:00:00
485	608,362	2,397,112	0:00:00
486	608,375	2,397,115	0:00:00
487	608,390	2,397,116	0:00:00
488	608,403	2,397,114	0:00:00
489	608,417	2,397,113	0:00:00
490	608,007	2,396,948	22:27:00
491	608,021	2,396,958	20:01:00
492	608,031	2,396,963	18:21:00
493	608,042	2,396,971	15:46:00
494	608,050	2,396,983	12:27:00
495	608,059	2,396,995	8:44:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
496	608,069	2,397,008	3:40:00
497	608,076	2,397,020	3:38:00
498	608,082	2,397,030	3:37:00
499	608,085	2,397,044	3:32:00
500	608,107	2,397,029	3:20:00
501	608,107	2,397,006	3:22:00
502	608,122	2,397,028	3:17:00
503	608,137	2,397,025	3:09:00
504	608,151	2,397,026	3:01:00
505	608,167	2,397,024	2:56:00
506	608,179	2,397,024	2:54:00
507	608,193	2,397,025	2:50:00
508	608,205	2,397,029	0:00:00
509	608,215	2,397,032	0:00:00
510	608,229	2,397,034	0:00:00
511	608,239	2,397,038	0:00:00
512	608,254	2,397,041	0:00:00
513	608,264	2,397,046	0:00:00
514	608,275	2,397,049	0:00:00
515	608,288	2,397,053	0:00:00
516	608,304	2,397,050	0:00:00
517	608,315	2,397,061	0:00:00
518	608,332	2,397,061	0:00:00
519	608,347	2,397,068	0:00:00
520	608,362	2,397,071	0:00:00
521	608,376	2,397,072	0:00:00
522	608,393	2,397,071	0:00:00
523	608,405	2,397,071	0:00:00
524	608,418	2,397,069	0:00:00
525	608,243	2,396,881	11:48:00
526	607,997	2,396,944	23:13:00
527	607,983	2,396,940	24:00:00
528	607,971	2,396,938	24:14:00
529	607,962	2,396,936	24:24:00
530	607,944	2,396,936	24:27:00
531	607,933	2,396,938	24:19:00
532	607,917	2,396,940	24:17:00
533	607,902	2,396,944	24:10:00
534	607,892	2,396,952	24:10:00
535	607,881	2,396,963	24:26:00
536	607,872	2,396,971	24:27:00
537	607,862	2,396,984	24:58:00
538	607,860	2,396,998	25:46:00
539	607,852	2,397,017	25:10:00
540	607,848	2,397,035	23:20:00
541	607,844	2,397,050	21:18:00
542	607,841	2,397,064	18:50:00
543	607,838	2,397,076	16:12:00
544	607,835	2,397,095	11:28:00
545	607,832	2,397,107	8:32:00
546	607,875	2,397,115	9:06:00
547	607,878	2,397,103	10:17:00
548	607,878	2,397,088	11:22:00
549	607,880	2,397,069	15:01:00
550	607,883	2,397,057	17:15:00
551	607,887	2,397,043	19:31:00
552	607,889	2,397,029	21:41:00
553	607,895	2,397,014	22:50:00
554	607,903	2,396,999	22:41:00
555	607,913	2,396,988	22:44:00
556	607,924	2,396,982	22:41:00
557	607,939	2,396,979	22:16:00
558	607,952	2,396,979	21:30:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
559	607,963	2,396,982	20:30:00
560	607,977	2,396,983	19:13:00
561	607,989	2,396,987	17:36:00
562	608,001	2,396,992	15:34:00
563	608,012	2,397,000	12:53:00
564	608,022	2,397,007	10:16:00
565	608,030	2,397,019	7:48:00
566	608,038	2,397,028	7:49:00
567	607,897	2,397,124	8:54:00
568	607,906	2,397,108	10:31:00
569	607,917	2,397,096	11:17:00
570	607,924	2,397,084	11:47:00
571	607,909	2,397,072	12:13:00
572	607,926	2,397,069	12:04:00
573	607,913	2,397,051	15:41:00
574	607,919	2,397,038	17:27:00
575	607,927	2,397,026	17:59:00
576	607,940	2,397,016	17:37:00
577	607,956	2,397,012	16:35:00
578	607,956	2,397,077	11:36:00
579	607,969	2,397,075	11:28:00
580	607,982	2,397,069	11:04:00
581	607,999	2,397,065	10:16:00
582	608,010	2,397,059	9:15:00
583	608,026	2,397,058	8:41:00
584	608,038	2,397,057	8:17:00
585	608,049	2,397,051	3:51:00
586	607,954	2,397,051	11:31:00
587	607,969	2,397,047	10:32:00
588	607,983	2,397,044	9:36:00
589	608,002	2,397,033	8:41:00
590	608,000	2,397,020	10:11:00
591	607,741	2,396,863	25:33:00
592	607,319	2,397,021	26:21:00
593	606,695	2,397,034	50:44:00
594	606,815	2,396,680	97:36:00
595	606,848	2,396,756	168:53:00
597	605,003	2,396,363	2:32:00
598	604,988	2,396,317	2:20:00
599	607,110	2,396,193	103:14:00
600	607,166	2,396,356	85:30:00
601	607,038	2,396,488	91:29:00
602	607,137	2,396,614	76:44:00
605	607,825	2,396,209	170:10:00
606	607,921	2,396,580	33:58:00
607	608,797	2,396,201	123:29:00
608	608,881	2,396,182	149:39:00
609	609,014	2,396,499	157:21:00
610	609,038	2,396,445	174:58:00
611	609,906	2,396,627	18:13:00
612	609,914	2,396,533	17:56:00
613	609,957	2,396,417	18:38:00
614	609,949	2,396,456	20:14:00
615	609,964	2,396,387	17:51:00
616	609,975	2,396,351	17:04:00
617	610,013	2,396,303	15:49:00
618	610,016	2,396,254	16:13:00
619	610,063	2,396,182	14:59:00
620	610,053	2,396,207	15:02:00
621	610,609	2,395,774	0:00:00
622	610,597	2,395,775	0:00:00
623	610,574	2,395,777	0:00:00
624	610,457	2,395,755	0:00:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
625	610,479	2,395,821	0:00:00
626	610,506	2,395,807	0:00:00
627	610,544	2,395,798	0:00:00
628	610,214	2,396,012	11:18:00
629	610,223	2,395,981	13:20:00
630	610,261	2,395,960	12:32:00
631	610,263	2,395,909	10:13:00
632	610,345	2,395,901	3:01:00
633	610,359	2,395,857	3:05:00
634	610,376	2,395,848	2:53:00
635	610,391	2,395,840	2:46:00
636	610,167	2,396,054	11:35:00
637	610,191	2,396,030	11:24:00
638	610,077	2,396,156	14:47:00
639	610,098	2,396,130	14:27:00
640	610,103	2,396,102	14:45:00
641	609,941	2,396,013	18:40:00
642	609,849	2,395,699	12:31:00
645	608,721	2,396,023	176:01:00
646	608,561	2,395,956	66:51:00
647	608,527	2,396,107	354:38:00
648	608,251	2,396,015	293:45:00
649	608,534	2,395,574	0:00:00
650	609,229	2,395,405	6:24:00
651	609,781	2,395,584	17:00:00
652	609,804	2,395,476	6:14:00
653	609,850	2,395,467	3:57:00
654	609,857	2,395,415	4:15:00
655	609,747	2,395,430	11:23:00
656	609,701	2,395,591	15:46:00
657	609,652	2,395,554	11:49:00
658	610,560	2,395,693	0:00:00
659	610,768	2,394,779	0:00:00
660	610,746	2,394,763	0:00:00
661	610,793	2,394,760	0:00:00
662	610,584	2,395,156	0:00:00
663	610,547	2,395,134	0:00:00
664	610,573	2,395,126	0:00:00
665	610,584	2,395,101	0:00:00
666	610,676	2,394,967	0:00:00
667	610,640	2,394,959	0:00:00
668	610,617	2,394,959	0:00:00
669	610,595	2,394,986	0:00:00
670	610,298	2,394,900	0:00:00
671	610,253	2,394,896	0:00:00
672	609,961	2,395,220	5:09:00
673	609,719	2,395,226	7:06:00
674	609,735	2,395,247	9:44:00
675	609,650	2,394,592	2:51:00
676	609,728	2,394,729	2:50:00
677	610,042	2,394,722	0:00:00
678	610,122	2,394,732	0:00:00
679	610,053	2,394,675	0:00:00
680	610,067	2,394,611	0:00:00
681	609,985	2,394,452	0:00:00
682	610,048	2,394,572	0:00:00
683	610,260	2,394,673	0:00:00
684	610,223	2,394,691	0:00:00
685	610,514	2,394,718	0:00:00
686	610,548	2,394,725	0:00:00
687	610,598	2,394,739	0:00:00
688	610,815	2,394,732	0:00:00
689	610,823	2,394,712	0:00:00

WindPro Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
690	610,799	2,394,689	0:00:00
691	610,781	2,394,704	0:00:00
692	610,760	2,394,740	0:00:00
693	610,717	2,394,580	0:00:00
694	610,746	2,394,589	0:00:00
695	610,767	2,394,607	0:00:00
696	610,768	2,394,584	0:00:00
697	610,761	2,394,562	0:00:00
698	610,723	2,394,543	0:00:00
699	610,740	2,394,523	0:00:00
700	610,758	2,394,640	0:00:00
701	610,731	2,394,632	0:00:00
702	610,704	2,394,624	0:00:00
703	610,670	2,394,648	0:00:00
704	610,687	2,394,656	0:00:00
705	610,719	2,394,664	0:00:00
706	610,746	2,394,672	0:00:00
707	610,706	2,394,687	0:00:00
708	610,738	2,394,698	0:00:00
709	610,678	2,394,683	0:00:00
710	610,651	2,394,674	0:00:00
711	610,623	2,394,674	0:00:00
712	610,614	2,394,706	0:00:00
713	610,646	2,394,708	0:00:00
714	610,669	2,394,716	0:00:00
715	610,707	2,394,728	0:00:00
716	610,639	2,394,592	0:00:00
717	610,619	2,394,584	0:00:00
718	610,596	2,394,577	0:00:00
719	610,578	2,394,564	0:00:00
720	610,553	2,394,550	0:00:00
721	610,535	2,394,541	0:00:00
722	610,516	2,394,529	0:00:00
723	610,504	2,394,506	0:00:00
724	610,523	2,394,473	0:00:00
725	610,551	2,394,482	0:00:00
726	610,541	2,394,342	0:00:00
727	610,533	2,394,374	0:00:00
728	610,525	2,394,394	0:00:00
729	610,514	2,394,426	0:00:00
730	610,545	2,394,450	0:00:00
731	610,565	2,394,428	0:00:00
732	610,584	2,394,432	0:00:00
733	610,604	2,394,437	0:00:00
734	610,613	2,394,409	0:00:00
735	610,592	2,394,405	0:00:00
736	610,563	2,394,400	0:00:00
737	610,631	2,394,417	0:00:00
738	610,660	2,394,427	0:00:00
739	610,172	2,394,187	0:00:00
740	610,203	2,394,179	0:00:00
741	609,656	2,393,882	0:00:00
742	609,629	2,393,983	0:00:00