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DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAI'I 96809

CDUA: OA-3717

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MAY 27 2014

JUN 08 2014

MEMORANDUM

To: Jessica Wooley, Director
Office of Environmental Quality Control

From: for Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

Subject: Draft Environmental Assessment (DEA) for Conservation District Use Application (CDUA) OA-3717 for the ICSD Pahole Radio Facility at Pahole Rare Plant Nursery Site, located at Waialua, O'ahu, Hawai'i
Tax Map Key (TMK): (1) 6-8-001:004

The Department of Land and Natural Resources has reviewed the DEA for the subject project, and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish notice of availability for this project in the June 8, 2014 issue of the *Environmental Notice*. We have enclosed one (1) hard copy of the DEA and OEQC publication form, as well as one (1) CD of the same in pdf format. A separate e-mail shall be sent with the OEQC publication form in word document format for publication purposes.

Please contact Lauren Yasaka of our Office of Conservation and Coastal Lands staff at 587-0386 should you have any questions.

Attachments: *Draft EA, OEQC Pub Form, 1 CD*

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)

~~MAY 28 2014~~ of
Received
MAY 27 2014

Project Name:	Pahole Radio Facility at the Pahole Rare Plant Nursery
Island:	O'ahu
District :	Waialua
TMK:	(1)-6-8-001:004
Permits	Building Permit, Electrical Code Review, and Conservation District Use Permit with Management Plan
Proposing/ Determination Agency:	State of Hawai'i Department of Land and Natural Resources Office of Conservation and Coastal Lands
Address	1151 Punchbowl Street, Room 131
City, State, Zip	Honolulu, Hawai'i 96813
Contact and Phone	Samuel Lemmo: 808-587-0377
Consultant:	Belt Collins Hawaii
Address	2153 North King Street
City, State, Zip	Suite 200, Honolulu, Hawai'i 96819
Contact and Phone	Joanne Hiramatsu: 808-521-5361
Send Comments To:	
Consultant	Belt Collins Hawaii
Address	2153 North King Street, Suite 200
City, State, Zip	Honolulu, Hawai'i 96819
Contact and Phone	Joanne Hiramatsu: 808-521-5361

Status (check one only):

√ DEA-AFNSI	Submit the proposing 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 proposing 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.
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__Act 172-12 EISPN	Submit the proposing 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 proposing agency simultaneously transmits to both the OEQC and the accepting authority, 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 oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.

__FEIS

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__ Section 11-200-23 Determination

The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.

__Section 11-200-27 Determination

The accepting authority simultaneously transmits its notice to both the proposing agency 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)**:**

The State of Hawai'i (State), Department of Accounting and General Services (DAGS), Information and Communication Services Division (ICSD), is proposing to build a new ICSD Radio Facility (IRF) at the Pahole Rare Plant Nursery and Communication Station site. The proposed work will include construction of a new ICSD communications building, new antennas and dishes on an existing concrete pillar, a new fuel tank, and electrical service to support the ICSD facility. The project will also construct various site and utility improvements, as agreed to with the DLNR, DOFAW. The site improvements include providing a paved vehicular turnaround within the ICSD site. The utility improvements include installing underground electric and communication service to DOFAW, the U.S. Army (Army), and the City and County of Honolulu (City). Additionally, the DOFAW water tanks, which store catchment water to irrigate DOFAW and Army plant nurseries, will be replaced and installed at a new location. The project design has set aside space for the City to replace their radio tower and communication building, if and when they decide to do so.

The overarching purpose for the proposed action is to support ICSD's efforts to provide effective and reliable telecommunication services to all agencies in the State of Hawai'i. The IRF at Pahole will be a part of the State's telecommunication system and connection to the statewide Anuenue system. The proposed new IRF at Pahole will provide a vital new communications station to augment the Anuenue system. In order to provide more efficient and reliable communication to various agencies at the local, State, and Federal level, a modern, high capacity digital interconnect is necessary.

DRAFT ENVIRONMENTAL ASSESSMENT

ICSD PAHOLE RADIO FACILITY AT PAHOLE RARE PLANT NURSERY SITE

Pahole, Waialua District, Island of Oʻahu, Hawaiʻi

DRAFT ENVIRONMENTAL ASSESSMENT

ICSD PAHOLE RADIO FACILITY AT PAHOLE RARE PLANT NURSERY SITE

Pahole, Waialua District, Island of Oʻahu, Hawaiʻi
Tax Map Key: First division, 6-8-001: portion 004

Prepared for:
State of Hawaiʻi
Department of Accounting and General Services
Information and Communication Services Division

Prepared by:
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, HI 96819

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City, State, Zip	Honolulu, Hawai'i 96813
Contact and Phone	Samuel Lemmo: 808-587-0377
Consultant:	Belt Collins Hawaii
Address	2153 North King Street
City, State, Zip	Suite 200, Honolulu, Hawai'i 96819
Contact and Phone	Joanne Hiramatsu: 808-521-5361
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Appendix A Pre-Consultation Comment Letters and Responses

Appendix B Archaeological Inventory Survey for ICSD Pahole Radio Facility at Pahole Rare Plant Facility, Kawaihāpai Ahupuaʻa, Mokuleʻia, Oʻahu, Hawaiʻi

Appendix C Cultural Impact Assessment for ICSD Radio Facilities at Pahole Rare Plant Facility, Mokulēʻia Forest Reserve, Kawaihāpai Ahupuaʻa, Mokulēʻia, Oʻahu, Hawaiʻi

Appendix D Biological Resource Assessment for Pahole Radio Facility Upgrades

Appendix E Surface Soil Screening Survey Report for Information and Communication Services Division Pahole Radio Facility Renovations and Other Improvements Mokuleia, Hawaii

Appendix F Targeted Hazardous Material Survey Report for Information and Communication Services Division Pahole Radio Facility Renovations and Other Improvements Mokuleia, Hawaii

ACRONYMS

ac	Acre
ACM	Asbestos Containing Materials
AFONSI	Anticipated Finding of No Significant Impact
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawaiʻi
AM	Amplitude modulated
Anuenue	Anuenue Radio System
Army	U.S. Army
BMP	Best Management Practices
CAB	Clean Air Branch, State Department of Health
CDUP	Conservation District Use Permit
CIA	Cultural Impact Assessment
City	City and County of Honolulu
CO	Carbon Monoxide
CMU	Concrete Masonry Unit
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DAGS	Department of Accounting and General Services, State of Hawaiʻi
DOH	Department of Health, State of Hawaiʻi
DOFAW	Division of Fish and Wildlife, State of Hawaiʻi
DLNR	Department of Land and Natural Resources, State of Hawaiʻi
DPR	Department of Parks and Recreation, City and County of Honolulu
EA	Environmental Assessment
EAL	Environmental Action Level
EMR	Electromagnetic Radiation
EMS	Emergency Medical Services
EPA	Environmental Protection Agency, Federal Government
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FM	Frequency modulated
FONSI	Finding of No Significant Impact
HAR	Hawaii Administrative Rules
HECO	Hawaiian Electric Company
HFD	Honolulu Fire Department, City and County of Honolulu
HPD	Honolulu Police Department, City and County of Honolulu
H-POWER	Honolulu Program of Waste Energy Recovery

HRHP	Hawaiʻi Register of Historic Places
HRS	Hawaii Revised Statutes
ICSD	Information and Communications Services Division
IRF	Information and Communications Services Division Radio Facility
kg	Kilogram
LBP	Lead-based paint
LCP	Lead-containing paint
LMR	Land Mobile Radio
LUC	Land Use Commission, State of Hawaiʻi
LUO	Land Use Ordinance
Mg	Milligram
MPE	Maximum Permissible Exposure
Mph	Miles per hour
NAR	Natural Area Reserve
O_3	Ozone
OCCL	Office of Conservation and Coastal Lands, State of Hawaiʻi
OH	Overhead
OTWC	Oceanic Time Warner Cable
Pahole	Pahole Rare Plant Nursery and Communications Station
Rainbow	Hawaiʻi Rainbow Communications System
RF	Radio Frequency
ROH	Revised Ordinances of Honolulu
SCP	Sustainable Communities Plan
SHPD	State Historic Preservation Division, State of Hawaiʻi
SIC	Sandwich Isle Communications
SMA	Special Management Area
State	State of Hawaiʻi
STP	Shovel Test Pit
SWCA	SWCA Environmental Consultants
TMK	Tax map key
U.S.	United States
UST	Underground Storage Tank
USCS	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service

GENERAL INFORMATION

Project:	ICSD Pahole Radio Facility at Pahole Rare Plant Nursery Site
Location:	Mokulēʻia Forest Reserve, Waialua District, Island of Oʻahu, Hawaiʻi.
Proposed Action:	The proposed work will include construction of: a new ICSD communications building; new ICSD antennas and dishes mounted on the sides of an existing concrete pillar; a new fuel tank; and electrical service to support the ICSD facility. ICSD will also construct various site and utility improvements, as agreed to with the Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW). The site improvement includes providing a paved vehicular turnaround adjacent to the ICSD building. The utility improvements include: installing underground electric and communications service to DOFAW, the Army, and the City; and replacing DOFAW's above ground irrigation tanks at a new location and reconnecting the irrigation system. Additionally, the new ICSD communications building will have a roof runoff catchment system that will connect to DOFAW's irrigation system.
Proposing Agency:	Department of Accounting and General Services, State of Hawaiʻi (DAGS).
Approving Agency:	Office of Conservation and Coastal Lands. Department of Land and Natural Resources, State of Hawaiʻi.
Recorded Fee Owner:	Department of Land and Natural Resources, State of Hawaiʻi
Anticipated Determination:	Anticipated Finding of No Significant Impact (AFONSI).
Property Profile:	
TMK	First division, 6-8-001: portion 004.
Land Area	Project parcel is approximately 3 acres and the proposed action would involve work in an area approximately less than 1 acre.
Existing Use:	Telecommunications and plant nurseries.
Proposed Use:	New telecommunication utilities and structures.
Land Use Designations:	
State Land Use	Conservation District, Resource Subzone.
County Zoning	P-1 Preservation Restricted.
North Shore Sustainable Communities Plan (2010)	Preservation.
Special Management Area (SMA)	Not within the SMA.
Major Approvals Required:	Conservation District Use Permit, Building, Grading, Stockpiling, and Electrical Code Permits.

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1 INTRODUCTION

The State of Hawaiʻi (State), Department of Accounting and General Services (DAGS), Information and Communication Services Division (ICSD), is proposing to build a new ICSD Radio Facility (IRF) at the Pahole Rare Plant Nursery and Communication Station site. The proposed work will include construction of a new ICSD communications building, new antennas and dishes on an existing concrete pillar, a new fuel tank, and electrical service to support the ICSD facility. The project will also construct various site and utility improvements, as agreed to with the DLNR, DOFAW. The site improvements include providing a paved vehicular turnaround within the ICSD site. The utility improvements include installing underground electric and communication service to DOFAW, the U.S. Army (Army), and the City and County of Honolulu (City). Additionally, the DOFAW water tanks, which store catchment water to irrigate DOFAW and Army plant nurseries, will be replaced and installed at a new location. The project design has set aside space for the City to replace their radio tower and communication building, if and when they decide to do so. The project would occur on a portion of tax map key (TMK) 6-8-001:004, which is owned by DLNR. See Figure 1-1 for the Vicinity Map.

While the plant nurseries and communication stations are situated on the same land parcel, the facilities are in two separate and distinct locations separated by a steep slope of 20 feet. In order to maximize the efficiency of the gravity fed irrigation system, the above ground water tanks are located within the communication station area of the site.

Figure 1-1: Vicinity Map

This section provides background information, identifies the reasons for the proposed action, and describes the environmental review associated with this proposed action.

1.1 BACKGROUND

1.1.1 INFORMATION AND COMMUNICATION SERVICES DIVISION

ICSD is the lead State agency responsible for statewide information processing and telecommunication systems. As part of this role, ICSD is responsible for developing and maintaining the State's telecommunication system, which is comprised of microwave radio systems, land mobile radio systems, antennas and towers, communication buildings, and supporting facilities. In the context of rapid technological advances and an increased reliance on telecommunications and computers, ICSD has been implementing and continues to implement cost-effective and efficient information and communication services. Proper application and installation of these systems is necessary for mission support for emergency rescue, civil defense, emergency medical services, and critical government operations.[1]

The new IRF at Pahole will connect to the State's telecommunication system.

1.1.2 ANUENUE RADIO SYSTEM

The Anuenue Radio System (Anuenue) is a statewide microwave radio communication system that is shared by Federal, State, and County agencies for mission support. Users of the Anuenue system include ICSD, U.S. Coast Guard (USCG), Hawaiʻi State Civil Defense, State Department of Health (DOH), State and City Emergency Medical Services, DLNR, National Oceanic and Atmospheric Administration, Federal Aviation Administration (FAA), Army, and U.S. Postal Service. The Anuenue system is a partnership between the State and the USCG that replaced the Hawaiʻi Rainbow Communications System (Rainbow) analog microwave radio system with a modern high-capacity digital microwave radio system. The need to replace Rainbow was due to (1) increasing unreliability of Rainbow due to its antiquated analog radio equipment; (2) State and Federal user requirements for a statewide communications system that would remain operational at wind speeds up to 110 miles per hour (mph) (highest winds in a Category 2 hurricane) and would survive winds up to 155 mph (highest winds in a Category 4 hurricane); (3) expanding voice and data communications requirements of Federal and State users; and (4) Federally-mandated auction of analog microwave frequencies from government to private users (such as cellular phone uses).[2&3]

ICSD and USCG have constructed new or upgraded communication facilities around the state for the Anuenue system. The work by ICSD has included constructing radio facilities at Humuʻula (Island of

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1 http://ags.hawaii.gov/icsd/

2 U.S. Coast Guard. 2009. Final Environmental Assessment, Anuenue Radio Facility Upgrade, Pahole, Oahu, Hawaii."

3 State of Hawaii, Department of Accounting and General Services. 2012. "Final Environmental Assessment, ICSD Waiakea Radio Facility, Construction of a New Radio Facility."

Hawai‘i)[4], Kahua Ranch (Island of Hawai‘i), Ka‘ūpūlehu (Island of Hawai‘i), Koko Head (O‘ahu), Pu‘u Nana (Moloka‘i),[5] and Waiākea (Island of Hawai‘i).[6]

As part of the Anuenue system, the new IRF at Pahole will include a communications building; a 1,000 gallon above-ground diesel tank; and microwave dishes, whip antennas, and a lightning rod. The IRF at Pahole will provide high capacity digital interconnect with the following existing facilities: Waiale‘e Station, Communications Station USCG, and Mount Ka‘ala Station.

1.2 PURPOSE AND NEED

The overarching purpose for the proposed action is to support ICSD's efforts to provide effective and reliable telecommunication services to all agencies in the State of Hawai‘i. The IRF at Pahole will be a part of the State's telecommunication system and connection to the statewide Anuenue system. The proposed new IRF at Pahole will provide a vital new communications station to augment the Anuenue system.

In order to provide more efficient and reliable communication to various agencies at the local, State, and Federal level, a modern, high capacity digital interconnect is necessary. The improved technology allows users to exchange voice, digital radio, video, and data communications. The key improvements are the capability to transmit larger-sized digital data at a much faster rate. This digital microwave system has the capacity to transmit up to 155 megabits of data per second.[7] This data size capacity is important considering the ever-expanding voice and data communications used by various agencies, including the public safety community. Moreover, the need for high-capacity digital microwave transmitting technology was encouraged by a Federal mandate to transfer analog microwave frequencies to cellular telephone users.[8] Establishing different frequencies, separate from personal communications systems like the cellular telephones, will help better protect the public in the coming years.

The proposed work includes the following:

1) **Install a new 800+ square foot ICSD communications building with equipment room, rectifier room, and generator room.** The new building will have all new technology and equipment that will help maintain the efficient transmission of digital information. The generator, located within the generator room, will automatically activate when the primary source of electricity is unavailable; thereby insuring continuous communication service during times of inclement weather or other unexpected events.

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4 State of Hawaii, Department of Accounting and General Services. 2012. "Final Environmental Assessment, ICSD Waiakea Radio Facility, Construction of a New Radio Facility."

5 Unknown. Looking Back and Forward: Department Accomplishments. No date. Available as of 12/23/2013 at http://thelingleyears.wordpress.com/department-accomplishments/

6 State of Hawaii, Department of Accounting and General Services. 2012. "Final Environmental Assessment, ICSD Waiakea Radio Facility, Construction of a New Radio Facility."

7 State of Hawaii, Department of Accounting and General Services. 2012. "Final Environmental Assessment, ICSD Waiakea Radio Facility, Construction of a New Radio Facility."

8 State of Hawaii, Department of Accounting and General Services. 2012. "Final Environmental Assessment, ICSD Waiakea Radio Facility, Construction of a New Radio Facility."

2) **Recondition an existing concrete pillar for use as the communications tower.** The installation of three new microwave dishes and whip antennas are necessary to receive and transmit the enhanced digital microwave signals. An existing concrete pillar (Nike structure) will be repurposed as a communications tower on which the new dishes, antennas, and lightning rod will be attached. The existing concrete pillar is 29 feet tall; the total structure height, including lighting rod, will be 51 feet tall. DAGS specifications require that communications remain operational at wind speeds up to 110 mph (highest winds in a Category 2 hurricane) and survive winds up to 155 mph (highest winds in a Category 4 hurricane);[9] the existing concrete pillar will be reconditioned to accommodate the microwave antenna dishes and whips to these specifications.

3) **Install a new 1,000 gallon above-ground diesel tank to provide back-up power.** This fuel tank will supply the generator with a minimum of seven days of fuel in the event the primary source of electricity is disabled, which will increase the reliability of the ICSD communication operations.

4) **Relocate Hawaiian Electric Company (HECO) high voltage overhead electric line and provide underground service to the ICSD building and existing facilities.** A new HECO pole will be constructed so that the high voltage overhead electrical line can be relocated to be clear of the Army greenhouse; thus bringing the service to code conformance. Underground electrical service from the new pole to a new HECO pad mounted transformer will be installed. As the ICSD facility would significantly increase the electrical demand, a new transformer, sized to accommodate ICSD, DOFAW and City facilities, is required; and the existing pole mounted transformer will be removed. Underground electrical service from the HECO transformer to the ICSD building and to the City's facilities, both existing and future, will be constructed. Underground electrical service from the ICSD generator room to DOFAW's buildings will provide continuous power for DOFAW's operations.

The ICSD facility will address the following DOFAW master planning concerns:

1) **Provide space for future City communication facility.** The design of the site improvements provides space for the City to construct replacements for its communication building and tower. If and when the City decides to construct the replacements, the City will be responsible for preparing any necessary environmental review documents (i.e. Environmental Assessment).

2) **Limit the footprint of the site improvements to maximize options for future use.** The site improvements footprint will be limited; thus, maximizing the available space for potential future uses of the site. Similar to the City facility, the proposing entity of any improvements would have to prepare any necessary environmental review documents.

Additional work required to support the aforementioned site improvements, as agreed to with DOFAW, will include the following:

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9 State of Hawaii, Department of Accounting and General Services. 2012. "Final Environmental Assessment, ICSD Waiakea Radio Facility, Construction of a New Radio Facility."

1) **Replace DOFAW's above ground catchment water tanks and irrigation system.** Three catchment water storage tanks need to be installed at a new location in order to construct the project's improvements. New irrigation lines will reconnect the water storage tanks to the remaining irrigation system located near the nurseries. Additionally, a new standpipe on the irrigation line will be provided and an irrigation sleeve will be installed for future DOFAW irrigation line construction.

2) **Replace a portion of the perimeter fence.** Due to the water tank relocation, the fence surrounding the eastern portion of the project site will also be relocated. This fence deters vandalism and prevents damage from feral pigs.

3) **Access and circulation improvements.** In order to facilitate vehicular movements to the ICSD facility, City radio facility, and potential future communication uses, a paved vehicular turnaround will be provided.

4) **Limit the amount of impervious area.** The ICSD facilities will be located almost entirely within an existing asphalt concrete paved area. However, in order to limit the total amount of impervious area to be constructed as part of this project, the ICSD building will have a roof catchment system and a 1,000 gallon runoff leader tank will be installed and connect to the DOFAW irrigation system. By implementing a roof catchment system the amount of impervious area associated with the project is anticipated to be less than the pre-project (or existing) condition. Thus, with the project, the generated storm water runoff is not anticipated to increase.

5) **Install underground communications conduits.** Communications conduits from the ICSD equipment room to DOFAW's buildings and to the future City facility site will be installed to provide for future communications service within the Pahole site.

1.3 ENVIRONMENTAL REVIEW

This Environmental Assessment (EA) has been prepared because State funds and State designated Conservation lands (TMK 6-8-001:004) are being used for the proposed action. It has been prepared in accordance with Chapter 343, Hawai'i Revised Statutes (HRS), and Title 11, Chapter 200, Hawai'i Administrative Rules (HAR). The DAGS anticipates a Finding of No Significant Impact (FONSI) for the proposed action.

1.4 PROPOSED AGENCY ACTION AND ACCEPTING AGENCY

HRS Chapter 343, Environmental Impact Statement, establishes an environmental review process whereby a government agency or private entity proposing a project must prepare an EA that considers potential impacts from the project. The requirement to prepare a Chapter 343 EA is triggered by, among other factors, the use of public funds, the use of public lands, and lands within the State Land Use Conservation District. The IRF at Pahole would be constructed with public funds on public land that is within the State Land Use Conservation District.

For this proposed action, DAGS is the proposing agency and the accepting agency is the DLNR, Office of Conservation and Coastal Lands (OCCL).

2 PROPOSED ACTION AND ALTERNATIVES CONSIDERED

This section describes the proposed action, identifies the estimated cost, outlines the preliminary schedule, and briefly summarizes the alternatives considered.

2.1 PROPOSED ACTION

The proposed action calls for the construction of a new DAGS ICSD communications building, ancillary communications equipment and various site improvements, as agreed to with DOFAW. See Figures 2-1 and 2-2 for photographs of the existing site.

As shown in Figure 2-1, the proposed action would include the following:

- Construct new 800+ square foot ICSD communications building with generator room, equipment room, and rectifier room. See Figures 2-2, 2-3, and 2-4 for more details.
- Recondition an existing concrete pillar to accommodate new microwave antenna dishes and whips and a lightning rod. Figure 2-5 illustrates this proposed action.
- Install a new above ground diesel tank.
- Relocate HECO high voltage overhead service.
- Install new HECO transformer and remove existing pole mounted transformer.
- Install new underground electrical conduits and communication ducts.
- Demolish a 370+ square foot generator building.
- Construct a paved vehicular turnaround adjacent to the ICSD site.
- Assemble three replacement catchment water storage tanks in the southeast periphery of the project site.
- Install an underground irrigation line to connect the water storage tanks to DOFAW's irrigation system and install a standpipe on this irrigation line.
- ICSD building to include a roof runoff catchment system and a 1,000 gallon leader runoff tank connected to DOFAW's irrigation system.
- Replace the chain link fence around the project site.

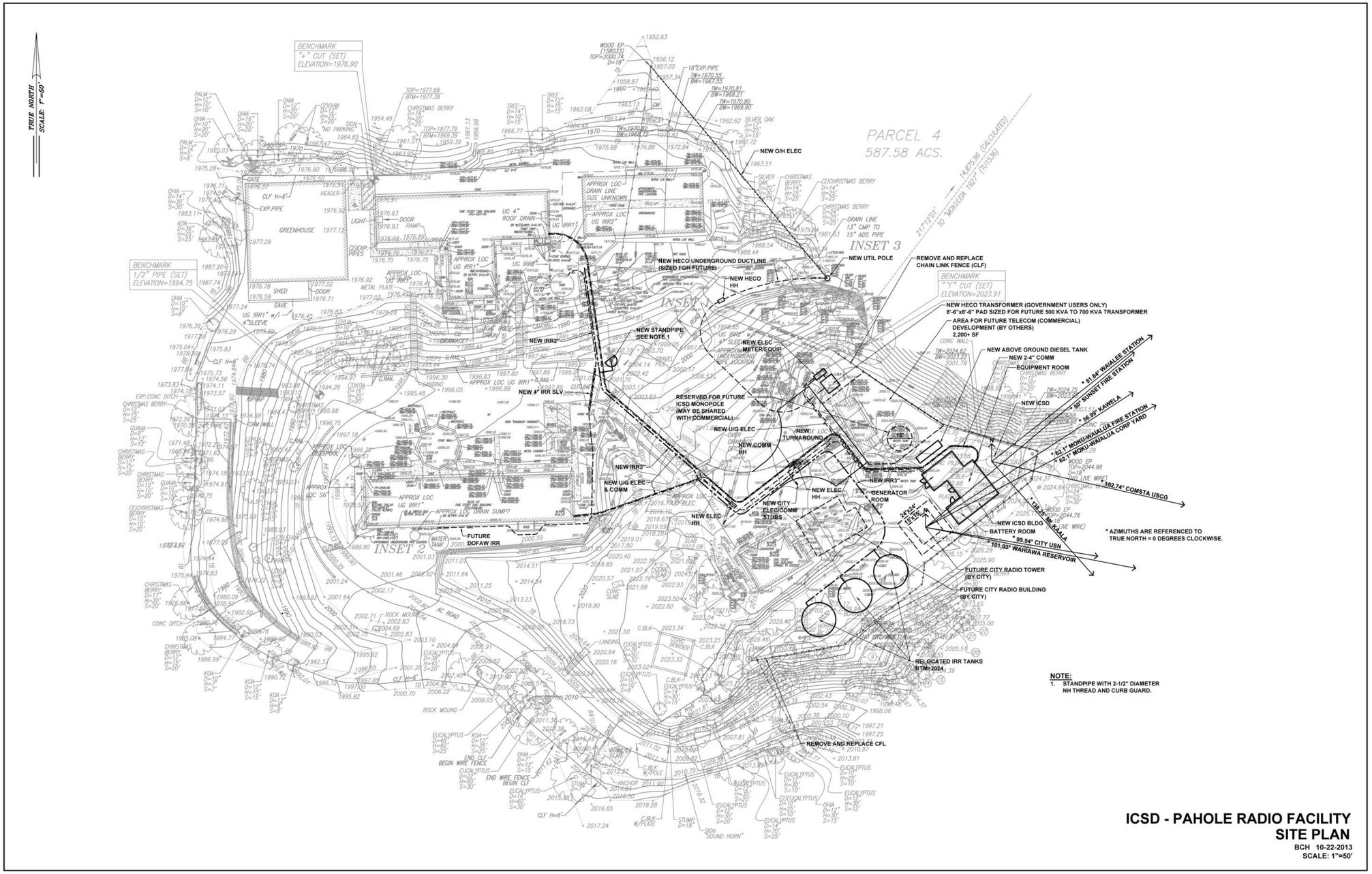

Figure 2-1: Site Plan

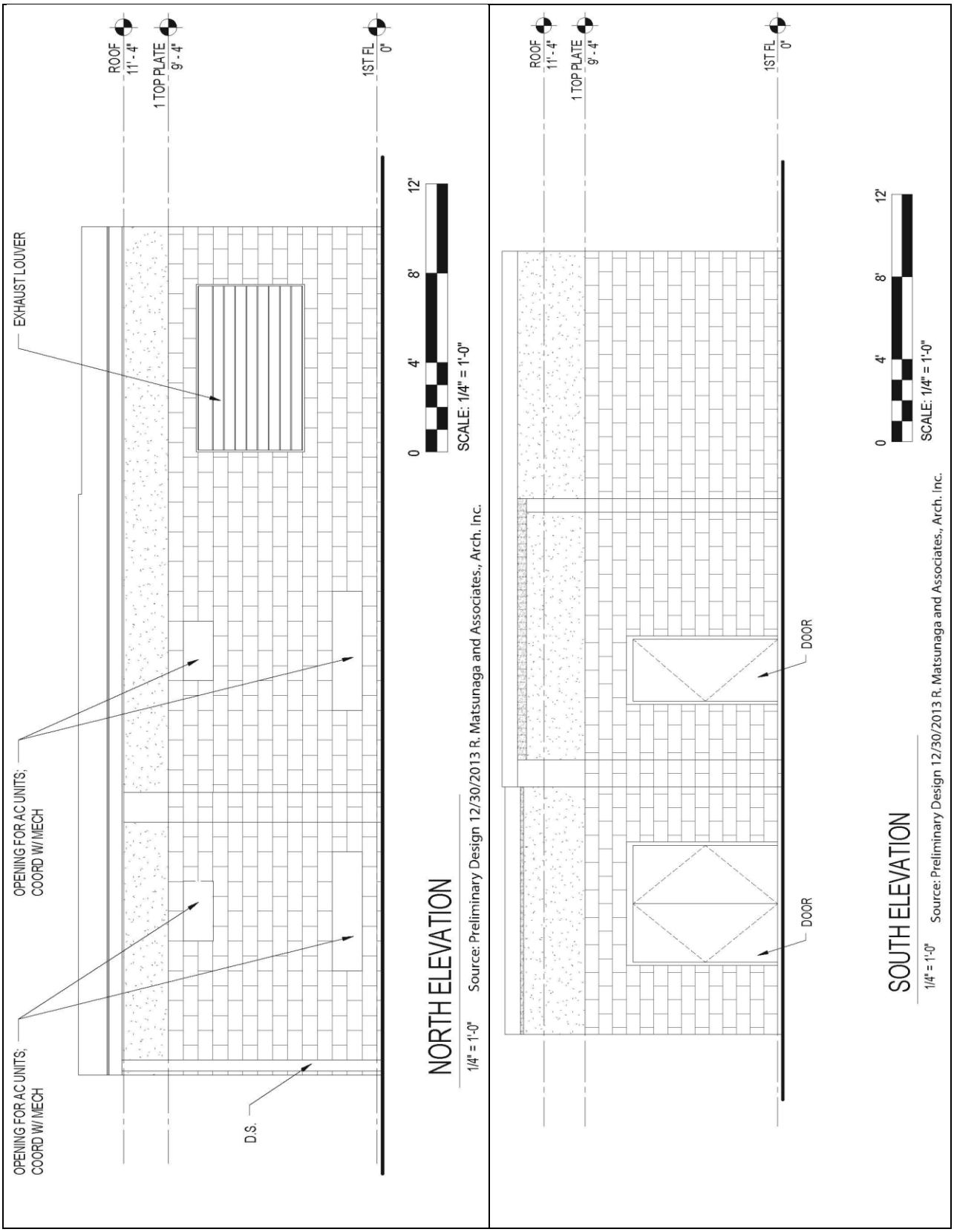

Figure 2-2: North and South Exterior Building Elevation

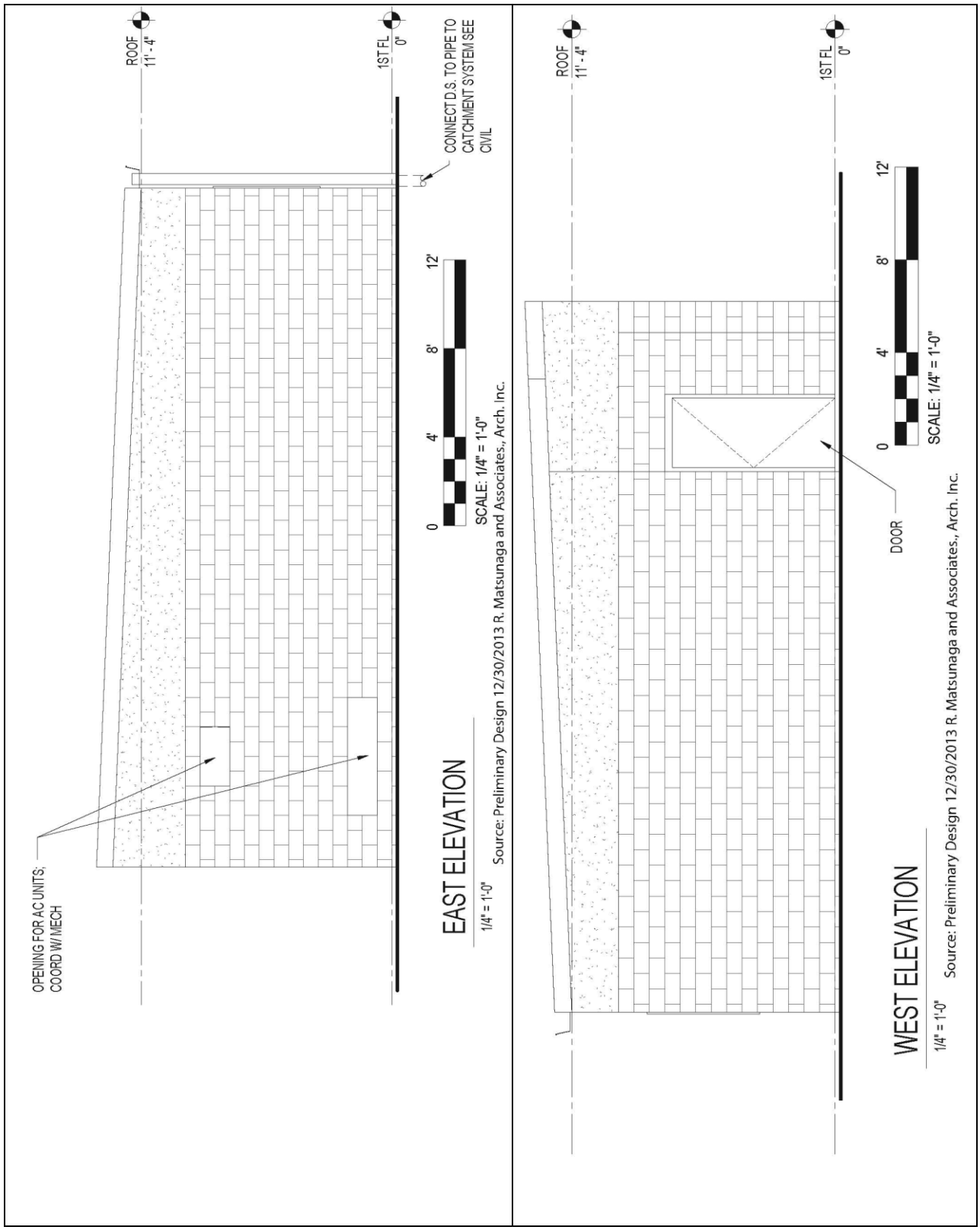

Figure 2-3: East and West Building Elevation

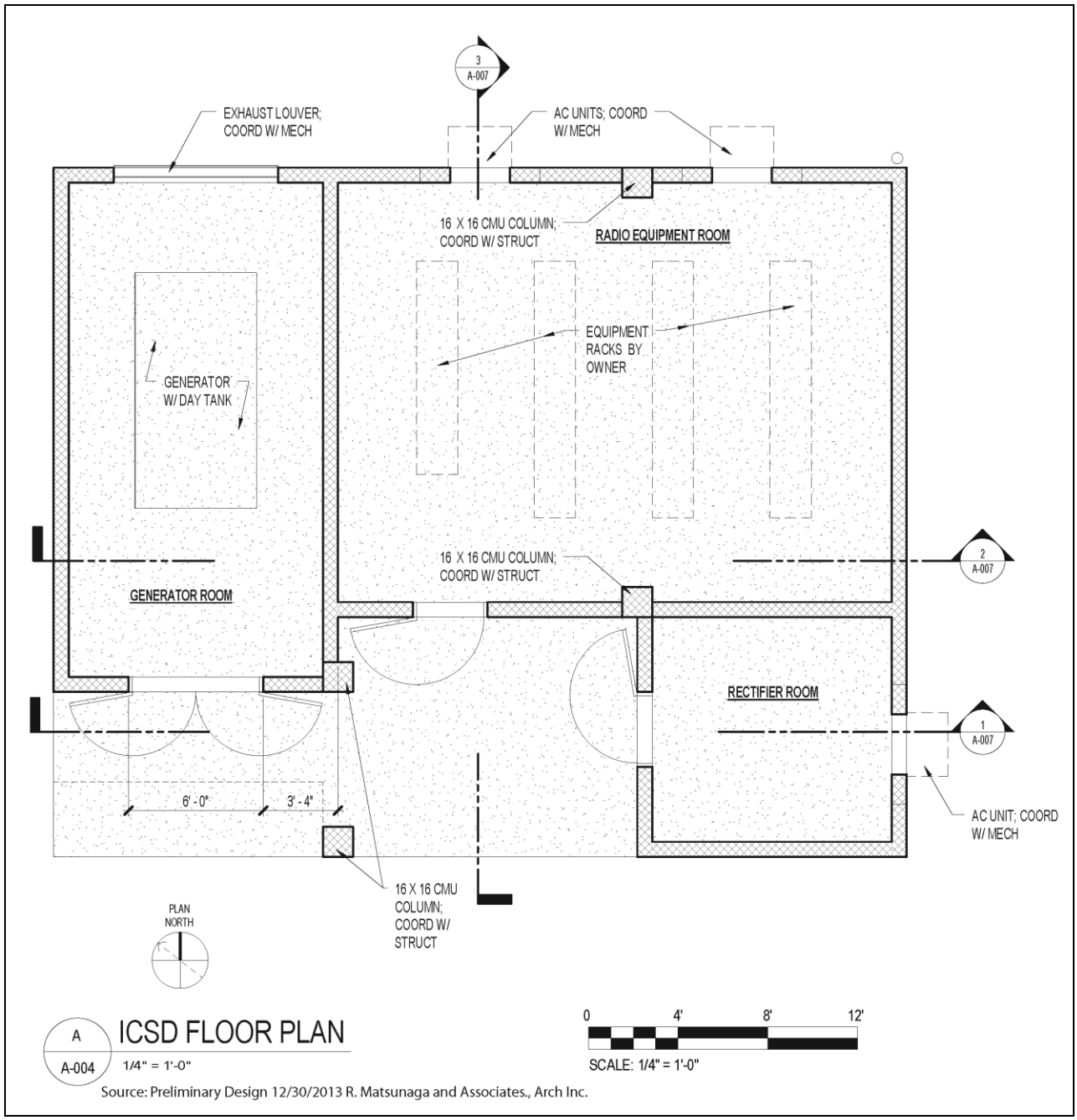

Figure 2-4: Building Floor Plan

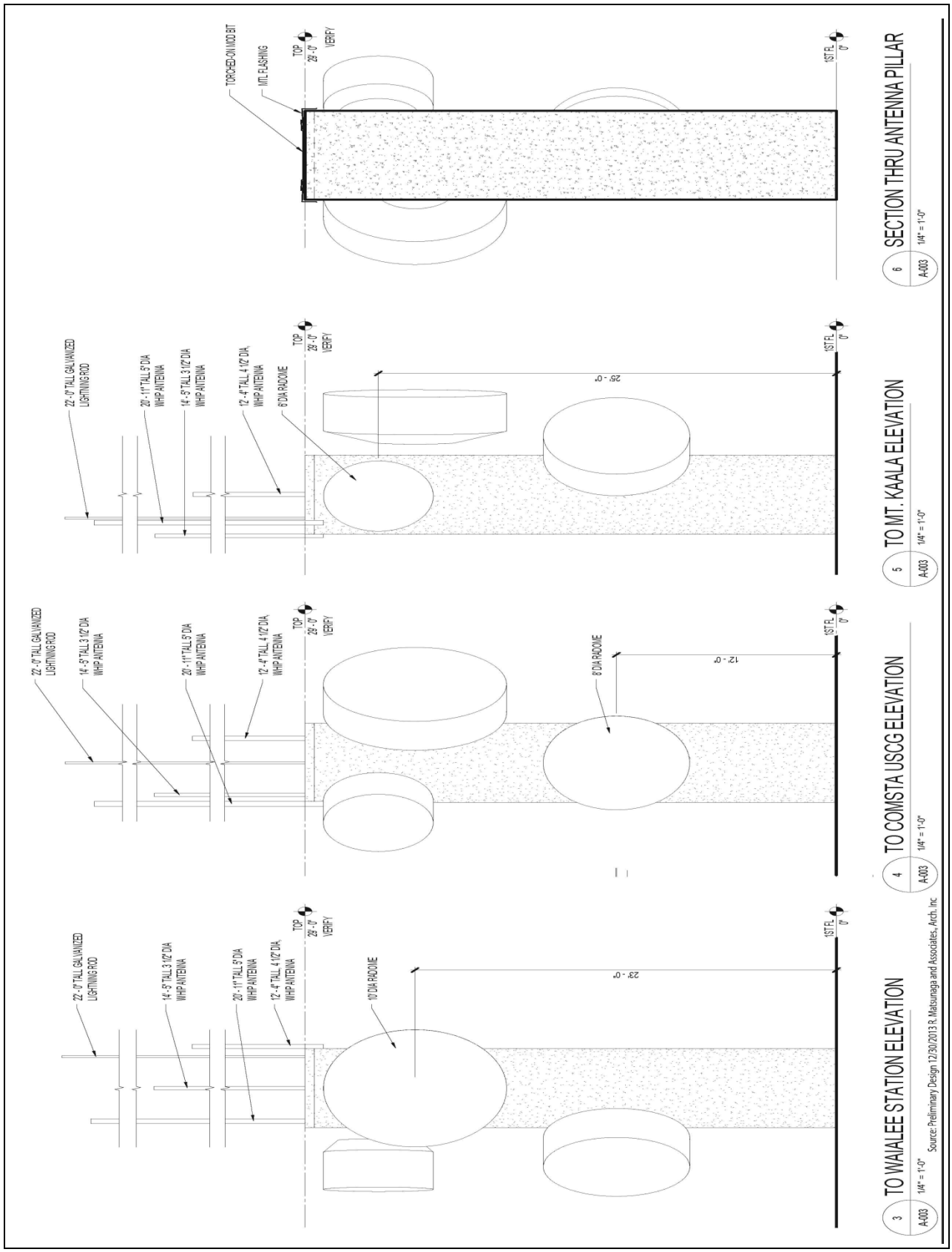

Figure 2-5: Concrete Pillar (Tower) Reconditioned with Communication Equipment

2.2 PROJECT SCHEDULE AND ESTIMATED COST

The source of funding for the project would be the State, through DAGS ICSD. The estimated cost of the proposed action is $2,300,000. Prior to construction, project design needs to be completed and permits need to be secured. Construction is anticipated to begin after permits are secured and would be completed in approximately 12 months.

2.3 ALTERNATIVES CONSIDERED

A No Action Alternative and Alternative 1 were reviewed to meet the purpose and need of this project. The alternatives are reviewed and evaluated below.

2.3.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no changes would be made to the project site.

The No-Action Alternative would result in the following:

- The existing site would remain in the existing condition. There would be no ICSD facility at this site. This could impede ICSD in fulfilling its responsibility to provide an efficient and effective statewide telecommunication system. This could negatively impact the numerous State agencies that rely on ICSD for communication services.
- The existing electric lines over the Army greenhouse would remain in place. The lines over the greenhouse are non-code conforming and would be a hazard that could potentially be life-threatening or damage the greenhouse in the event the lines were to fall onto the building.
- The existing rainwater collection, storage, and distribution system would continue to service DOFAW and Army nursery operations on the site. Although the system is in functioning condition, it has been in place for a number of years and will need repairs and/or replacement in the future.
- No impact or change to the existing natural man-made environment would occur, and as a consequence, the existing environmental setting would continue to prevail.

2.3.2 ALTERNATIVE 1

As an alternative to the proposed action a different ductline orientation was considered. A more direct route from the relocated utility pole to the HECO transformer would require trenching up a steep slope.

This underground utility configuration would result in the following:

- A more direct route would disturb less land; however, soil erosion/sloughing on this steep slope are a concern. Given the topography, this Alternative could require specialized construction equipment, possibly micro-tunneling or additional soil stabilization measures that could increase the construction cost to be greater than the preferred Alternative.

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3 AFFECTED ENVIRONMENT

This chapter reviews the affected environment and identifies potential impacts and mitigating measures.

Table 3-1. Summary of Environmental Impacts

Environment/ Resource	Discussion and Determination
Land Use and Land Tenure	The proposed action includes new communication installations and modifications to existing infrastructure on a parcel of land that contains multiple users including one other communication facility. The project was designed with the input of the other users of the site and designed to avoid any negative impacts on these users. No adverse impacts are anticipated.
Geology, Soils, and Topography	Trenching will occur for underground conduits and irrigation line; and utilities are located beneath new/existing pavements where possible. Grading will be performed to accommodate the new ICSD building, a vehicular turnaround, three replacement water tanks, and a utility pole. Best Management Practices (BMPs) will be employed during construction to control runoff, erosion, and dust. After the utility conduits are installed and the building and utility pole erected, the affected areas will be re-vegetated to hold the soils in place. No adverse impacts are anticipated.
Hydrology	There are no streams or bodies of water located near the project and the proposed action is not anticipated to increase storm water runoff. The new ICSD building will include a roof catchment system which will decrease the amount of rainfall runoff flowing off-site while increasing the amount of water available for the DOFAW and Army plant nurseries. Grass swales will be incorporated where possible to direct storm water to the existing underground drainage system. By implementing a roof catchment system, the amount of rainfall runoff flowing off-site is anticipated to be less than that from the existing site. BMPs will be employed during construction to control runoff. After the new ICSD building is constructed and the utility conduits are installed, disturbed areas would be re-vegetated. No adverse impacts are anticipated.
Archaeological and Cultural	There are no sensitive archaeological or cultural resources in the project site. The project will involve three historic buildings (DOFAW's upper and lower buildings and generator building) and one historic structure (Nike concrete tower). Minor work to DOFAW's upper and lower buildings will be conducted to install new electric and communication lines through the building walls. Modifications to the existing Nike concrete tower will be made to accommodate communication equipment. The generator building will be demolished because of its dilapidated condition and to allow for easier access to the new ICSD communications building and to provide more space for future site developments. No adverse impacts are anticipated.

Environment/ Resource	Discussion and Determination
Flora and Fauna	Certain preventive measures will be taken in order to mitigate the impacts to the ʻelepaio bird and Hawaiian hoary bat. All existing and new fencing will have a barbless top-strand to prevent bird or bat entanglements. During construction, special vegetation trimming methods will be utilized to minimize impacts to native snails and other critical habitats. No adverse impacts are anticipated.
Health and Safety	The proposed action does not pose any significant risk of generating health and safety impacts. The radio facility site is normally not manned except in emergency situations or for maintenance. No adverse impacts are anticipated.
Air Quality	Short-term air quality impacts would occur as part of construction activities. BMPs will be employed to minimize emissions from vehicles and dust during construction activities. After construction is complete, a generator will be used only for scheduled testing or maintenance and on occasions when power is lost at the site. Beyond this, the project will not increase pollution generating activities on the site. No adverse impacts are anticipated.
Noise	Short-term noise impacts would occur as part of construction activities. BMPs, including the use of mufflers, will be employed during construction to minimize these impacts. After construction is complete, the only noise producing equipment is the generator when power is lost to the site or during the brief and infrequent occasions this equipment is tested or maintained. No adverse impacts are anticipated.
Circulation and Traffic	The impacts from traffic during construction area expected to be minor. Proper notification and coordination would be provided to limit impacts on other users of the one-lane, gate-secured Mokulēʻia Road. After construction is complete, traffic to the site would remain at current levels. No adverse impacts are anticipated.
Infrastructure	The proposed action is not anticipated to generate a significant increase in demand for the infrastructure that exists on the project site, which includes electricity, irrigation lines, and drainage. The underground conduits will allow for the installation of telephone and communication service, when available; this would generate minimal new demand for these services and is not anticipated to have any negative impacts on the systems or other users. The proposed work to the rainwater collection, storage, and distribution system will be enhanced and create a positive impact to the irrigation system. No adverse impacts are anticipated.
Public Services and Facilities	The proposed action would not negatively affect the capacity of public services and facilities such as police and fire protection, emergency services, and parks. No adverse impacts are anticipated.

Environment/ Resource	Discussion and Determination
Visual and Aesthetic	The proposed action involves the installation of a new building (roughly 800 square feet), new antennas and dishes, and various site improvements. The new antennas and dishes will be mounted on an existing concrete pillar. The antennas at the site are currently not visible with the naked eye from nearby developed areas. No adverse impacts are anticipated.
Socioeconomic	The proposed project will not adversely affect residences or businesses in the area. No adverse impacts are anticipated.

3.1 LAND USE AND LAND TENURE

3.1.1 EXISTING CONDITIONS

Regional Context: The project is located at the Pahole Rare Plant Nursery (Pahole) site in the Waiʻanae Mountain Range in the Mokulēʻia Forest Reserve, along the Kuaokalā ridge in the Waiʻanae district, on the island of Oʻahu, Hawaiʻi. In its remote location, the project site is not within a residential community. The rural communities of Mokulēʻia and Waialua are the closest neighborhoods, located approximately 2.6 and 2.8 miles respectively to the north. See Figure 1-1, Vicinity Map.

The most direct access to the project site is via a gate-secured unnamed road which departs from Farrington Highway along the North Shore and connects to Mokulēʻia Road; accessing the site via this route requires passing through six secured gates. Alternatively, Mokulēʻia Road can be accessed from Farrington Highway on the Waiʻanae Coast via a four-wheel drive road that is also gate-secured at multiple points. On the North Shore side, in addition to the communication and plant nursery users, Mokulēʻia Road is used by private landowners, farmers, hunters, and visitors who hike or mountain bike the Mokulēʻia, Keālia, and Kuaokalā Trails and others who use the Peacock Flats, a campground, located directly off the road on the ascent to Pahole.

Existing Use: The Pahole site is a multiuse radio communications and plant nursery facility. The City has a radio broadcast facility in the upper or northern side of the site. This area includes three City radio towers (the tallest reaching 70 feet high), a 29-foot high Cold War era Nike concrete pillar with platform, an abandoned Cold War era generator room, an Army greenhouse, a DOFAW greenhouse, a shared Army/DOFAW building, a DOFAW storage building, and a City communication building. See Figures 3-2 and 3-3 for photographs of the existing site.

Figure 3-1: Existing Site Photographs (Northeast View)

Figure 3-2: Existing Site Photographs (Multiple Views)

DOFAW manages the Rare Plant Nursery, while the Army manages an Environmental Nursery. In addition to plant conservation and propagation, DOFAW's Rare Plant Facility is used as an educational resource providing hands-on education and in-kind work for learning institutions and community, civic service, and conservation groups.[10] In an effort to balance the requirements of the Army's training mission with its natural resource responsibilities, the Army conducts a plant reconnaissance and clip or unearth viable plant material to be grown at the Environmental Nursery.[11] Once the specimen has reached a stage where it can grow on its own without human care or input it is reintroduced to the same or similar natural habitat it was taken from.

At the top of Kuaokalā ridge, Mokulēʻia Road ends at the gated entrance to Pahole. A narrow paved driveway runs along the western edge of the site, and then curves to the east to a wide and level terrain. This level area contains a parking lot for both the communication facilities to the east and the nursery facilities to the north. Walkways, stairs, and dirt roads connect this level area with the communication facilities and the nurseries. Two dirt roads on the east and west provide vehicle access to the nurseries. The Pahole site is secured with a perimeter barbed wire fence.

Surrounding Land Use: The land use in the surrounding area is primarily undeveloped forest reserve. The 3.3-acre project site is within the 3,341-acre Mokulēʻia Forest Reserve. Due east, approximately 0.3 miles, is the 658-acre Pahole Natural Area Reserve.[12] Just south, 0.1 miles from the Pahole Site, is the 4,249-acre Makua Military Reservation and training area.[13] See Figure 3-3 for a map of surrounding land conservation and park areas.

Additional uses in the surrounding area include:

- Peacock Flats Campground, a public campground managed by the DLNR, is located along Mokulēʻia Road approximately 0.6 miles southeast of the project site.
- Various trail systems around the area including the Na Ala Hele Trail system and several mixed ownership trails within 0.3 miles of the project site are also present.
- There are several private residences located along Mokulēʻia Road approximately 1.9 miles north of the project site.

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10 State of Hawaiʻi Department of Land and Natural Resources, Division of Forestry and Wildlife 06/30/2004. Available as of 01/23/ 2014 at http://www.state.hi.us/us/dlnr/Templates/rare.dwt

11 United States Army. *Sustainability and Environmental Management.* Available as of 01/23/2014 at www.garrison.hawaii.army.mil/sustainability/NaturalResources.aspx

12 State of Hawaiʻi Department of Land and Natural Resources, Division of Forestry and Wildlife. 10/2003. "Final Environmental Assessment Kapuna Watershed Protection Project Pahole Natural Area Reserve."

13 United States Army Corps of Engineers, 09/2009 "Final Operational Range Assessment Program Phase I Qualitative Assessment Report Makua Military Reservation Oʻahu, Hawaiʻi."

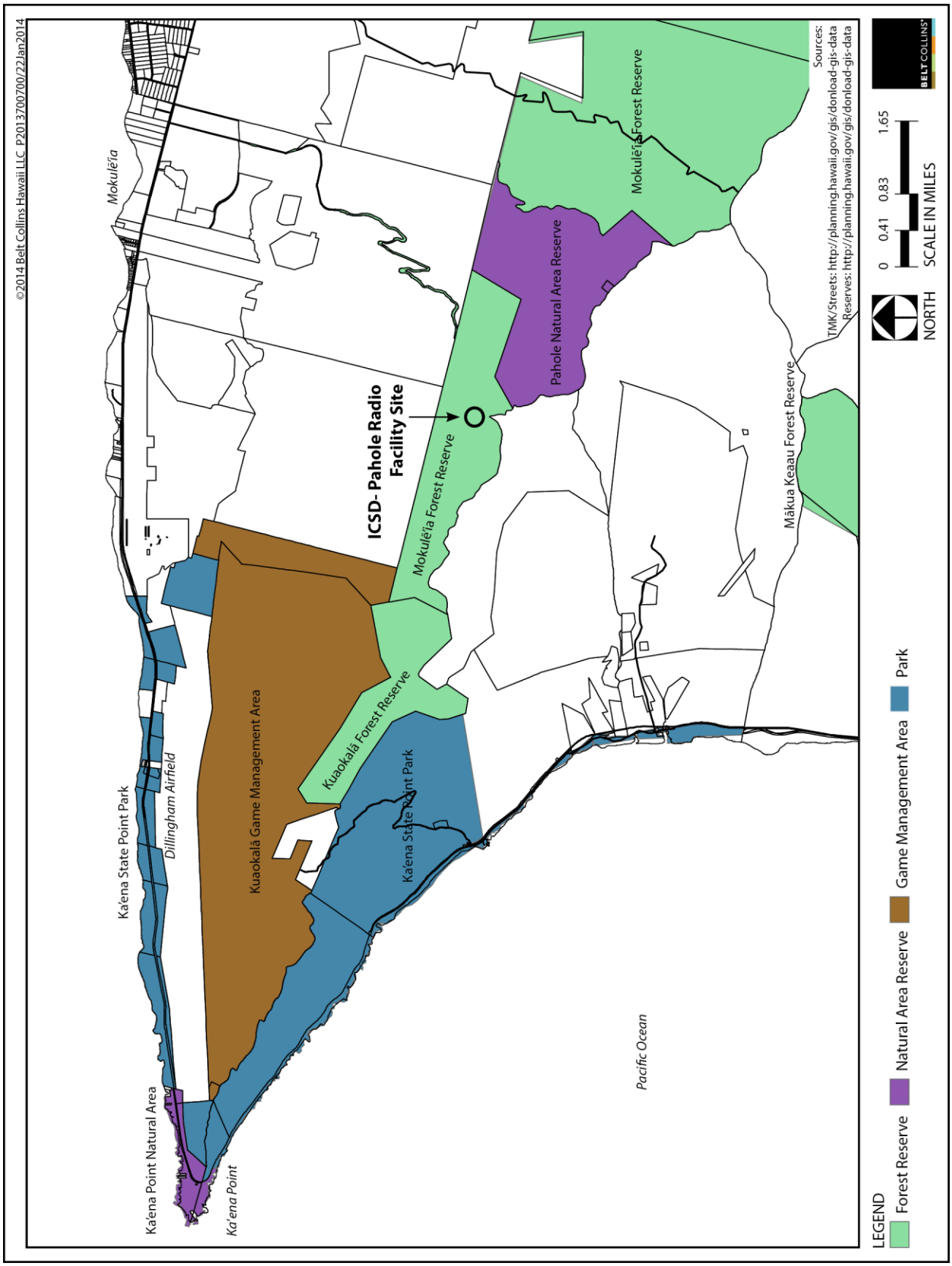

Figure 3-3: Pahole Surrounding Land Conservation and Park Areas

Land Ownership: The project site encompasses approximately 3.3 acres within TMK: (1) 6-8-001:004, which is approximately 587.6 acres in size. TMK (1) 6-8-001: 004 is owned by the DLNR, and the ICSD Radio Facility will be occupied under a lease agreement with the DLNR. See Figure 3-4 for the Tax Map Key.

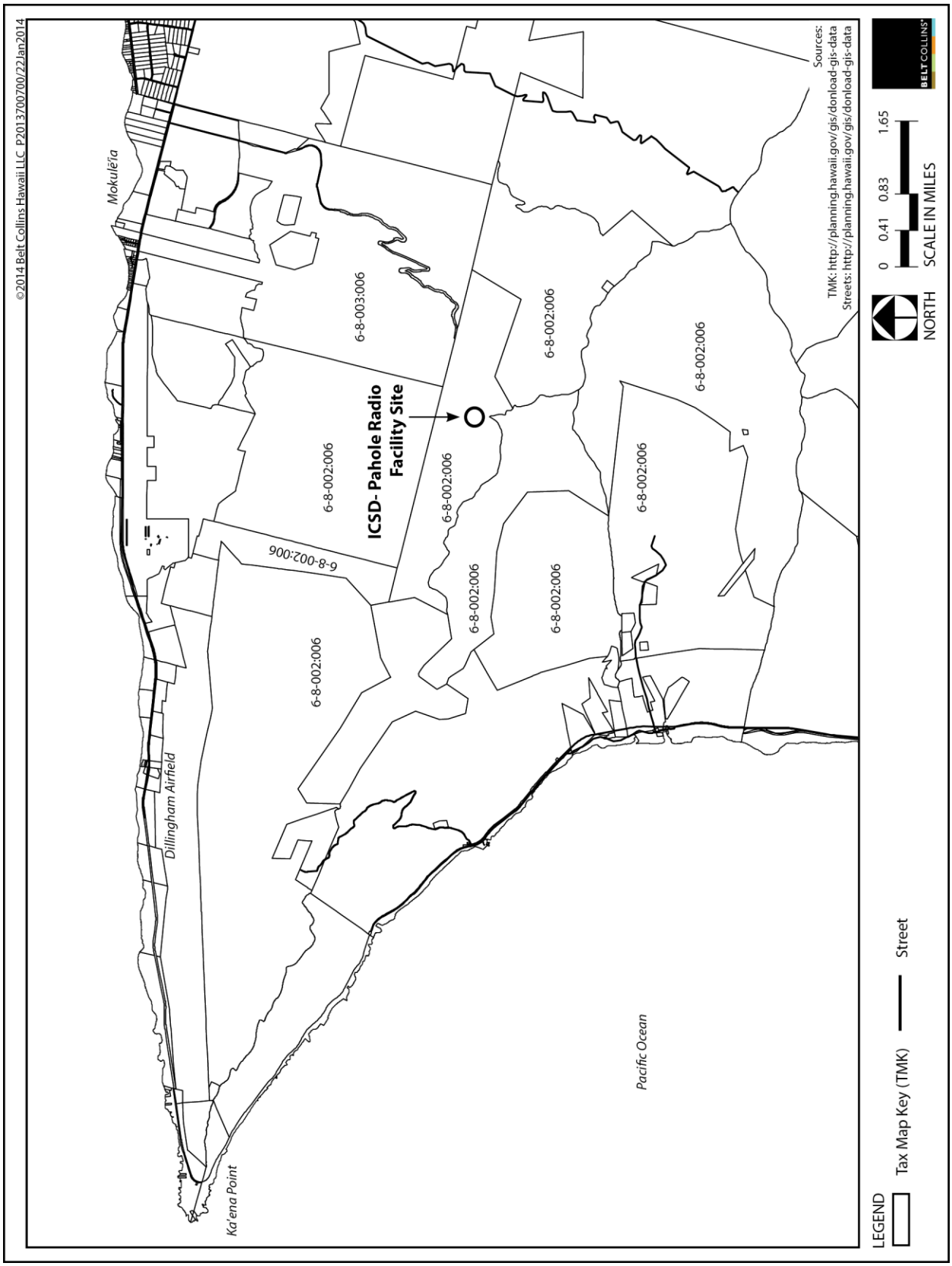

Figure 3-4: Tax Map Key

The Pahole site was previously owned by the Army and used as a Nike missile facility. The Nike missile program was developed during the 1950's and 60's in response to the Soviet Union's long-range strike capabilities that threatened the U.S. during the Cold War. A total of 264 Nike sites were built around the United States during this time, including 4 on the island of Oʻahu.[14]

3.1.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

Land use and land tenure impacts are not anticipated. The proposed action is consistent with the existing use on the Pahole site. Short-term impacts that are expected to occur during project construction would include traffic along the one-lane Mokulēʻia Road, which would be coordinated with other roadway users to ensure minimal disruption. The other users on the site have been consulted during the planning and design process and the project has been designed to ensure minimal disruption. Coordination with other users on the site will be conducted to minimize any impacts during construction. After construction is complete, activities associated with the project would be limited to periodic maintenance and emergency outage work.

Potential impacts to the Mokulēʻia Forest Reserve or the adjacent Pahole Natural Area Reserve and flora and fauna resources are discussed in Section 3.5 of this chapter.

3.2 GEOLOGY, SOILS, AND TOPOGRAPHY

3.2.1 EXISTING CONDITIONS

The project site is located in the Waiʻanae Mountain Range on the Kuaokalā Ridge, with a peak altitude of 2,030 feet above mean sea level. The Waiʻanae Mountain Range was created out of three groups of lava that erupted in the Tertiary period and possibly in the early Pleistocene era.[15] The principal ridgeline of the northern Waiʻanae Range narrows as it extends west-northwestward to Kaʻena Point. Conversely, in the opposite direction, farther east-southeastward toward the project area, the ridgeline widens and divides into larger more expansive valleys, with tributaries flowing to the north shore. Kawaihāpai Stream is located approximately 2,000 feet east of the project site. Steep topography and incised valleys surround the project area.

According to the Web Soil Survey developed by the U.S. Department of Agriculture, Natural Resources Conservation Service the soil series within the project site consists of Kemoo Silty Clay (KpF).[16] The KpF has slopes ranging from 35 to 70 percent slopes where the runoff is rapid and the erosion hazard is severe.[17] The soil association around the project site is Tropohumults-Dystrandepts (rTP). These soils are found in the Waiʻanae Mountain Range at elevations from 600

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14 State of Hawaiʻi, Department of Land and Natural Resources, Office of Coastal and Conservation Lands. 10/2013. "Final Environmental Assessment Department of Accounting and General Services Information and Communication Services Division Kamehame Ridge Radio Facility."

15 Stearns and Vaksvik. 1935. "Geology and Ground-Water Resources of the Island of Oahu, Hawaii". Prepared for U.S. Geological Survey. Reprinted in 2001.

16 U.S. Department of Agriculture. Natural Resources Conservation Service. *Web Soil Survey.* Available as of 01/23/2014 at http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

17 U.S. Department of Agriculture, Soil Conservation Service. 1972. "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai".

to 4,000 feet, on slopes ranging from 30 to 90 percent, and in areas with 30 to 75 inches of annual rainfall.[18]

In 2014, in preparation of the proposed project, Geolabs Inc. conducted a geotechnical investigation at various locations where construction and other groundwork activities will take place. The borings revealed the presence of saprolite, from the ground surface to a depth of approximately 51.5 feet, the maximum depth explored. Saprolite is generally composed of stiff to very stiff clayey silts, however, hard cobbles and boulders within the saprolite were encountered. These soils are consistent with Tropohumults-Dystrandepts association.[19]

Soil erosion/sloughing was observed on the dirt road leading to DOFAW's greenhouse and where the concentrated runoff left the dirt road, and where an assumed utility trench may have been installed.

3.2.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

Most of the proposed work is in previously disturbed areas. The installation of underground conduits into the Kemoo series and Tropohumults-Dystrandepts association soil types is not expected to have an impact since the trenching is relatively shallow in depth and backfilled with the same soils. Additionally, the ICSD Radio Facility will be located almost entirely within an existing asphalt concrete paved area, and the proposed improvements are mostly within existing pavement. Assembling the three new catchment water storage tanks will require grading; the exact design of this earthwork will be determined based on results from geotechnical tests. The excavated soil can be stockpiled and reused, if appropriate, as fill after the conduits have been installed. BMPs, in accordance with current City standards[20], will be implemented during construction to control soil erosion, surface runoff, and dust from the proposed action. In unpaved areas where ground disturbance occurs, the areas will be re-vegetated with appropriate vegetation.

3.3 HYDROLOGY

3.3.1 WATER RESOURCES

The annual average rainfall in the project area is 51 inches, with a range of 1.7 to 7.2 inches per month.[21] Consistent with general weather patterns on Oʻahu, heavier rainfall months occur during November to March and the lowest rainfall months occur during June and July. [22]

3.3.2 GROUND WATER

According to the Hawaiʻi Water Resource Protection Plan the Pahole site is located in the Mokulēʻia hydrological unit of the North Shore Aquifer Sector Area.[23] The Mokulēʻia aquifer is a high-level,

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18 U.S. Department of Agriculture, Soil Conservation Service. 1972. "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai".

19 Geolabs, Inc. February 5, 2014 "ICSD – Pahole Radio Facility Preliminary Geotechnical Recommendations."

20 City and County of Honolulu. 1999. "Rules Relating to Soil Erosion Standards and Guidelines".

21 Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte, 2013: Online Rainfall Atlas of Hawaiʻi. *Bull. Amer. Meteor. Soc.* 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.

22 Juvik et al. *Atlas of Hawaii. 1998. University of Hawaii Press. Honolulu*

dike-impounded aquifer. Basal groundwater is found predominately in the middle and lower members of the Waiʻanae Volcanic series. The main groundwater body in the area of this installation is the Waiʻanae high level confined aquifer. Occurrences of groundwater vary, but are generally found at 1,800 feet above mean sea level or lower in elevation.[24] The geotechnical investigations conducted by Geolabs in 2014 did not encounter any groundwater.

3.3.3 SURFACE WATER

There are no streams or surface water bodies within the Pahole site. According to the "Commission on Water Resource Management Surface –Water Hydrologic Units a Management Tool for Instream Flow Standards" prepared by the DLNR, Commission on Water Resource Management, the project site is situated in the Kawaihāpai watershed. The nearest streams to the project area are both classified as non-perennial, flowing into the Kawaihāpai watershed. Non-perennial or temporary streams are defined as either intermittent or ephemeral. Intermittent streams flow seasonally during the wetter months, while ephemeral streams only flow during and shortly after periods of precipitation.[25] The Mokulēʻia Stream is located nearly 800 feet to the northwest of the project area, while the Kawaihāpai Stream is approximately 2,200 feet to the east of Pahole.[26] See Figure 3-5 for a map of streams and watersheds.

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23 State Commission on Water Resource Management. June 2008. "Hawaii Water Plan: Water Resource Protection Plan."

24 State of Hawaiʻi, Department of Accounting and General Services. 2012. "Final Environmental Assessment, Information and Communication services Division Mt. Kaʻala Radio Facility Improvements Project."

25 McDonough et al. "Temporary Streams: The Hydrology, Geology, Geography, and Ecology of Non-Perennially Flowing Waters" *River Ecosystems: Dynamics, Management and Conservation."* Nova Science Publishers Inc. Available at http://palmerlab.umd.edu/mcdonough_et_al_2011_temporary_streams.pdf

26 Department of Land and Natural Resources Division of Aquatic Resources. 2004. DAR Streams shapefile. Available as of 11/18/13 at http://planning.hawaii.gov/gis/

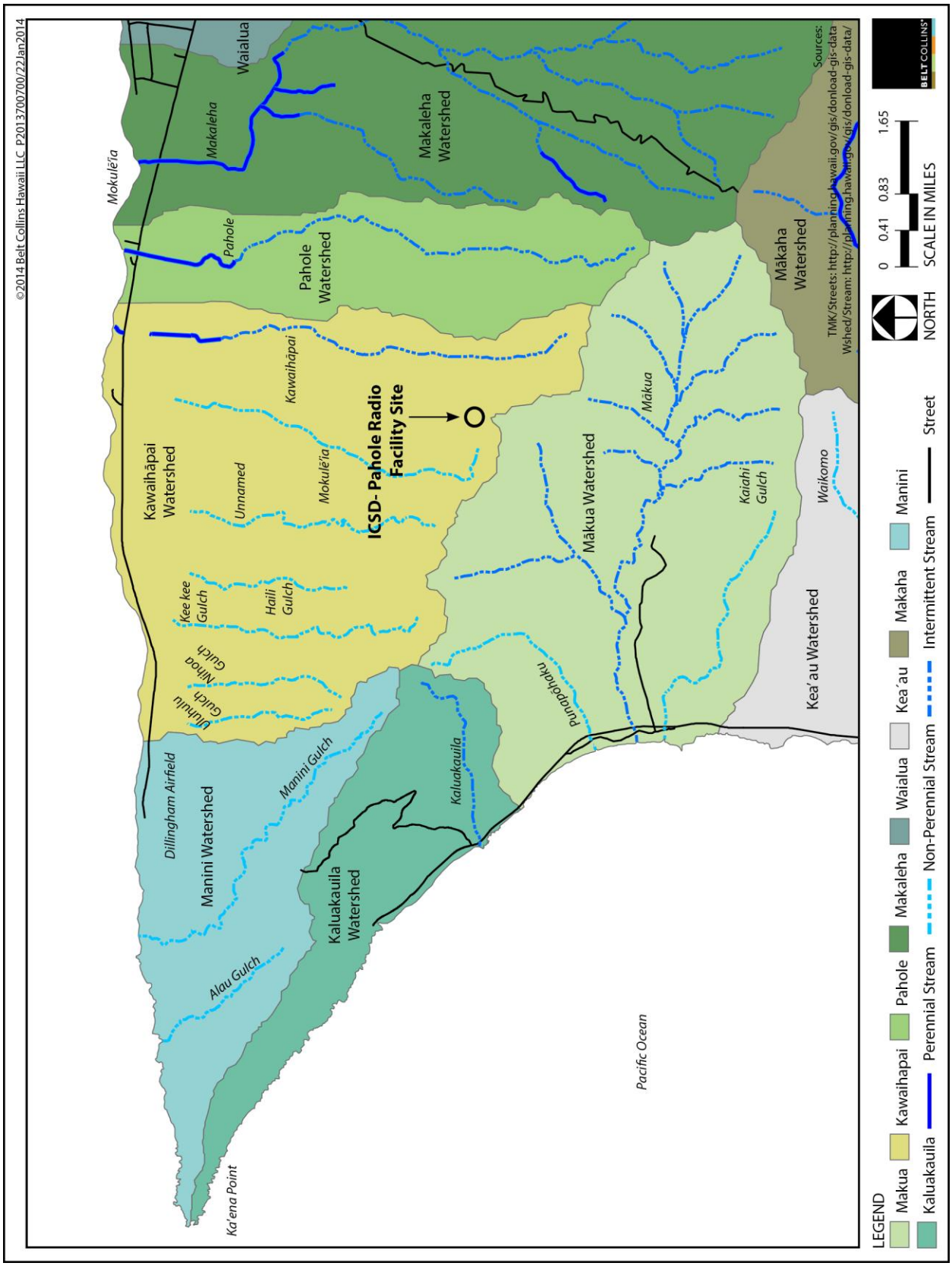

Figure 3-5: Streams and Watershed

3.3.4 POTENTIAL IMPACT AND MITIGATION MEASURES

Due to the absence of surface water sources in the project area, it is not anticipated that the proposed work would lead to discharges into waters of the United States (U.S.) or waters of the State. As described in Section 3.2.2, BMPs would be implemented during construction to control surface runoff and soil erosion; and, disturbed areas would be re-vegetated with appropriate vegetation. After construction is complete no impacts to water resources are anticipated.

3.4 ARCHAEOLOGICAL AND CULTURAL RESOURCES

3.4.1 ARCHAEOLOGICAL RESOURCES

This section summarizes the archaeological inventory survey (AIS) report prepared by International Archaeological Research Institute, Inc. for the project site. The report is based on field surveys conducted during November 2012 and March 2014 and a review of relevant documents and databases.[27] The report is included as Appendix B.

Historical activity in the Pahole area is largely explained by its mountain location. Pahole is within the Kawaihāpai ahupuaʻa (traditional sub-district land unit) in Waialua and a short distance (approximately 250 feet) from the Kahanahāiki Ahupuaʻa in the district of Waiʻanae.

While much is known about the traditional Hawaiian histories of the lower areas of Kawaihāpai and Kahanahāiki, there is little recorded about the mountain areas that encompass the Pahole site. The name Kawaihāpai means "the carried water" and refers to not only the name of the stream that once provided water to taro fields in the valley below, but also oral traditions about the miraculous appearance of water from the mountainside during an ill-fated period of drought. In the Post-Contact period, evidence of the varied land use, including the presence of goat pens, a school house, irrigation ditches, streams, springs, fishponds, salt beds, and gardens suggest there was an active community prior to the time of the land division in 1848. After the land divisions much of the low-lying, flatter areas of Kawaihāpai were used for sugar cane cultivation or cattle grazing. Although the introduction of the sugar economy and other agricultural activities established a new settlement in the area, there was no direct affect to the uplands including Pahole.

The relative absence of historical activities in the area around Pahole is documented in the findings from previous archaeological investigations. The only archaeological inventory survey in the nearby mountains was conducted in 1987 by Rudy Mitchell approximately 1.2 miles from the Pahole site. The only feature recorded was a large wall thought to be from the WWII era. Several more historical sites have been documented in the lower areas, with the closest site existing 1.3 miles from the project site. Information on these sites is included in Table 2 of Appendix B.

Between 1925 and 1927 the Mokulēʻia Army Air Field and Military Reservation was established. The 67 acres of land was used as military camping and an artillery firing point. In 1946 an additional 853 acres were acquired by Executive Order for future military use and the new area

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[27] International Archaeological Research Institute, Inc. December 2013. "Archeological Assessment for ICSD Radio Facilities Reconditioning at Pahole Rare Plant Facility Kawaihāpai Ahupuaʻa Mokuleʻia, Oʻahu, Hawai'i." Prepared for Belt Collins Hawaii LLC.

was renamed Dillingham Air Force Base (now called Dillingham Airfield). In January 1961 the Army installed a Nike-Hercules (Nike) Missile Launching site at the Dillingham Air Force Base. There were a total of four Nike missile launching sites on the island of Oʻahu with Dillingham Field designated as "OA-84." Portable missile launchers were located at the airfield with the control area with acquisition radar facilities located at the Pahole site. Both the missile launch site and acquisition radar facilities were closed down in March 1970.[28] The exact date of the first development on the Pahole site is unknown, though map records indicate the site was controlled by the military as long ago as 1938.[29]

Field work conducted for the report involved a pedestrian survey. The pedestrian survey at the Pahole site was oriented northeast to southwest with parallel transect lines approximately 6.5 to 13 feet apart. The pedestrian survey documented eight distinct manmade features in the project area. In addition to the existing buildings and concrete pillar the survey identified various remnant concrete foundations and footings. Although the exact historic significance of these remnant materials is unknown, given the location, appearance, and other characteristics it's believed that these features belonged to previously existing Nike radar towers/structures.

Three shovel test pits (STP) were excavated in areas of intact soil columns to document stratigraphic sequence and buried cultural deposits. STP 1 was located in the area where the new water storage tanks will be installed. STP 2 was placed northwest of the generator building adjacent to a paved road leading down to the Army Greenhouse. STP 3 was dug on the slope between the upper parking lot and the rare plant facilities. STP 3 was placed in an area where a portion of the utility lines will be buried.

See Figure 3-6 for the locations of the Pahole (OA-84) Nike-Hercules remnant structures/features and the locations of the STPs.

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28 Kaimipono Consulting Services LLC. November 2013. "Cultural Impact Assessment for ICSD Radio Facilities at Pahole Rare Plant Facility, Kawaihāpai Ahupuaʻa, Mokulēia, Oʻahu, Hawaiʻi." Prepared for Belt Collins Hawaii LLC.

29 United States Department of the Interior Geological Survey, 1938. "Topographic Map of the island of Oahu City and County of Honolulu Hawaii."

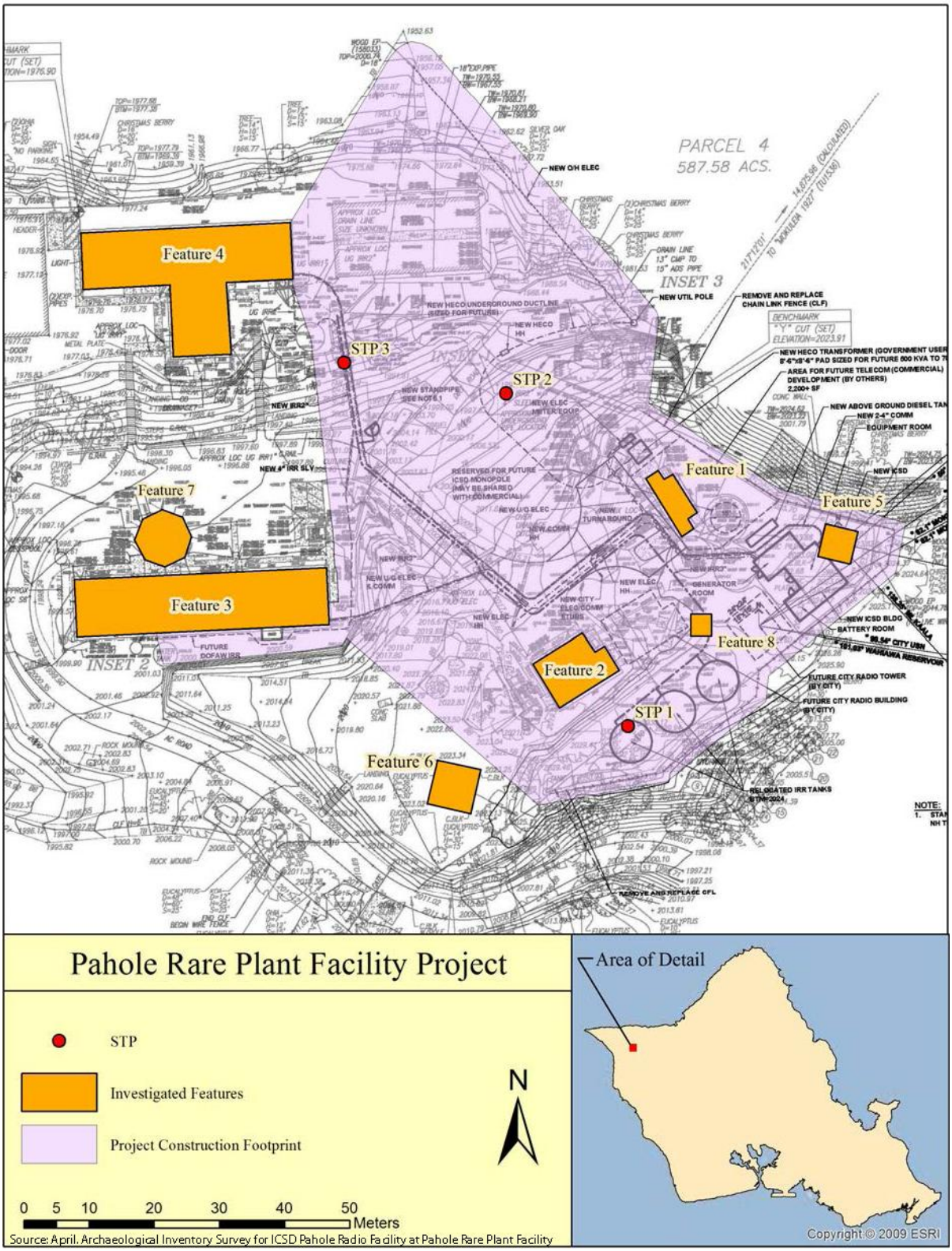

Figure 3-6: Locations of the Nike structures/foundations and locations of the shovel test pits (STP)

The report evaluated the significance of the eight features under Hawai‘i Administrative Rules 13-284-6, and found the site to be significant under Criteria a and d. The structures represent strategic U.S. military activities, specifically from January 1961 to March 1970, during the height of the Cold War. See Figures 3-7 through 3-13 for images of the remaining Nike structures identified in the AIS.

Figure 3-7: Feature 1, Nike-Hercules generator building; view northeast

Figure 3-8: Feature 1, Nike-Hercules generator building; view southeast

Figure 3-9: Feature 2, probable Nike-Hercules structure (Currently used by the City); view south

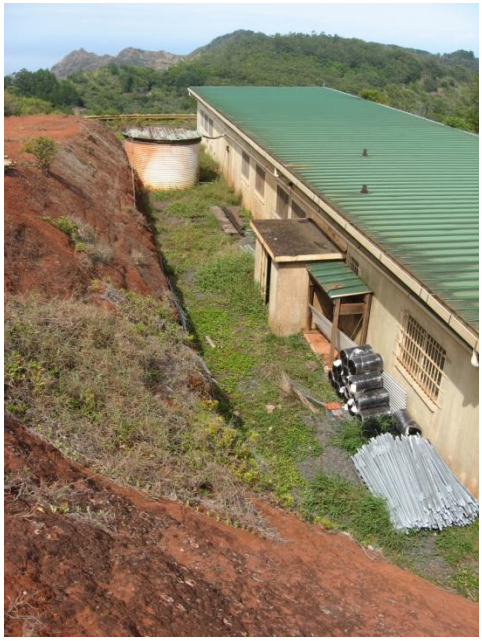

Figure 3-10: Feature 3, Nike-Hercules administrative building (DOFAW upper building)

Figure 3-11: Feature 4, Nike-Hercules mess hall/barracks (DOFAW lower building); view northwest

Figure 3-12: Feature 4, Nike-Hercules mess hall/barracks (DOFAW lower building); view north

Figure 3-13: Feature 5, Nike Hercules radar foundation; view northeast

3.4.2 CULTURAL RESOURCES

This section summarizes the Cultural Impact Assessment (CIA) prepared by Kaimipono Consulting Services for the project corridor. The CIA is based on ethnographic research (one oral history interview) and analysis, and a review of relevant cultural literature research. The CIA was conducted in accordance with State Environmental Council *Guidelines for Assessing Cultural Impacts*.[30] The report is included as Appendix C.

Following the Environmental Council Guidelines, the geographic extent of the CIA extended well beyond the project area to include the *ahupuaʻa* (traditional sub-district land unit) of Kawaihāpai and the *moku* (traditional district land unit) of Waialua.

Cultural literature research included traditional Hawaiian literature in the form *moʻolelo* (legends), *oli* (chants), and *mele* (songs). The ethnographic research included an interview with a cultural consultant familiar with the area, Thomas Shirai, a cultural practioner in the area from Haleʻiwa to

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30 State of Hawaiʻi. 1997. "Guidelines for Assessing Cultural Impacts." Adopted by the Environmental Council, November 11, 1997.

Kaʻena in the district of Waialua. Mr. Shirai's family once owned land in the Kawaihāpai ahupuaʻa. The consultant provided information on the history, presence, cultural importance, and use of land, culture, water, and marine resources in the area.

While there is substantial evidence that the ahupuaʻa of Kawaihāpai was part of an ancient Hawaiian life system, given the location of the project site, it is generally understood that this high mountain area would only be used occasionally for bird-feather gatherers, or logging for projects as ordered by the high chief.

3.4.3 POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed action would involve work within existing disturbed areas. Ground disturbance would be limited to trenching or grading for two underground communications conduits in the location where the water tanks will be located, a small area around the proposed ICSD building, where the relocated Hawaiian Electric Company (HECO) pole will be erected, and in areas where the irrigation lines will need to be buried.

Evaluation of historic properties is based on five criteria outlined by the Hawaiʻi State Register of Historic Places (HRHP) - HAR 13-284-6. The criteria are as follows:

a. Historic property reflects major trends or events in the history of the state or nation.

b. Historic property is associated with the lives of persons significant in our past.

c. Historic property is an excellent example of a site type.

d. Historic property has yielded or may be likely to yield information in prehistory or history.

e. Historic property has cultural significance to an ethnic group, including, but not limited to, religious structures, burials, and traditional cultural properties.

The AIS determined that the aforementioned eight features are eligible to the Hawaiʻi State Register under Criteria a and d. These features are remnants of the Nike Hercules radar acquisition site OA-84. Site OA-84 was one of four Nike sites on the Island of Oʻahu, a small subset of the 207 total Nike sites that were built in the U.S. from 1954 through 1963.[31] No further mitigation is recommended for the Nike structures left remaining at the Pahole site. The modifications to the upper and lower buildings are not expected to adversely impact the structures' historic character. To upgrade the electrical and communications system in the buildings, holes will be drilled through the walls to install the cables. The existing concrete pillar was previously modified from its original condition when the radar system was removed, therefore, further modifying and reconditioning is not expected to have an adverse impact. Although the generator building will be demolished this structure's historic importance has been preserved through photographs, maps, and other archival documentation. The STPs did not yield any cultural or archaeological artifacts.

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[31] Thelen, Ed. *Ed Thelen's Nike Missile Web Site*. http://ed-thelen.org/ 07 April 2014

The AIS concluded that based on archaeological records and modern development on the site it is not anticipated that any cultural materials would be encountered. If any unexpected find is uncovered during excavation, construction work would be halted in the immediate area of the find and the SHPD will be notified. While the CIA identified sites of cultural importance in the lower lying areas below Pahole, no sites of cultural importance were identified in or near the project site.

No adverse archaeological or cultural impacts are anticipated from the proposed action.

3.5 FLORA AND FAUNA

This section summarizes the biological report prepared by SWCA Environmental Consultants (SWCA) for the project site. The report is based on field surveys conducted during October 2013 and a review of relevant documents and databases.[32] The report is included in Appendix D.

3.5.1 FLORA

The report notes 67 plant species within the project area. Of these, 10 are native to the Hawaiian Islands (6 indigenous and 4 endemic). The 6 indigenous species recorded include *Cyperus polystachyos*, palaʻā (*Sphenomeris chinensis*), moa (*Psilotum nudum*), pūkiawe (*Leptecophylla tameiameiae*), naio (*Myoporum sandwicense*), ʻaʻaliʻi (*Dodonea viscosa*). The 4 endemic species found in the project area are loulu (*Pritchardia kaalae*), olopua (*Nestegis sandwicensis*), koa (*Acacia koa), and* ʻōhiʻa (*Metrosideros polymorpha*). Of the indigenous species, most of the koa and ōhiʻa, and all of loulu, pūkiawe, olopua and naio were plantings, artificially propagated. A complete list of plant species is included as part of Appendix D. Beyond the plant nurseries, no State or Federally-listed threatened, endangered, or candidate plant species, or rare native Hawaiian plant species were observed on the project site.

The project site is dominated by non-native species, mostly grasses and herbaceous species, scattered with shrubs and trees. There are large portions of molasses grass (*Melinis minutiflora*), Asian sword fern, (*Nephrolepis brownie*), perennial soybean (*Neonotonia wightii*), and wedelia (*Sphageticola trilobata*). There's also a great deal of Bermuda grass (*Cynodon dactylon*) and Spanish clover (*Desmodium incanum*) in the southern portion of the project area, with Sydney blue gum (*Eucalyptus saligna*) found more locally near the area where the irrigation tanks will be relocated.

The tree species are slightly more dispersed, occurring more randomly around the project site. However, as previously mentioned the two endemic trees, koa and ʻōhiʻa, while common, appear to be planted rather than existing by way of natural dispersion. Other plants found to be sparsely scattered throughout the project site, include ti (*Cordyline fruiticosa*), monstera (*Monstera deliciosa*), Spanish needle (*Bidens alba*), creeping indigo (*Indigofera spicata*), Christmas berry (Schinus terebinthifolius), Guinea grass (*Urochloa maxima*), and narrow-leaved plantain (*Plantago lanceolata*).

While the biological report and comprehensive survey focused on the project area, further research noted that along portions of the access road there are critical habitats for various listed plants. The

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32 SWCA Environmental Consultants. October 2013. "Biological Resource Assessment for Pahole Radio Facility Upgrades". Prepared for Belt Collins Hawaii LLC.

endangered *Bidens amplectens* is growing along a small portion of the access road, on the north side of the abutting mountain slope before the forestry gate approximately a mile from the project site at 1,235 feet in elevation. According to Talbert Takahama, a Pahole Natural Area Reserve (NAR) Specialist IV, there are about 50 of these plants growing in this location.[33] See Figure 3-14 for relative location of *Bidens amplectens*.

[33] SWCA Environmental Consultants. October 2013. "Biological Resource Assessment for Pahole Radio Facility Upgrades." Prepared for Belt Collins Hawaii LLC.

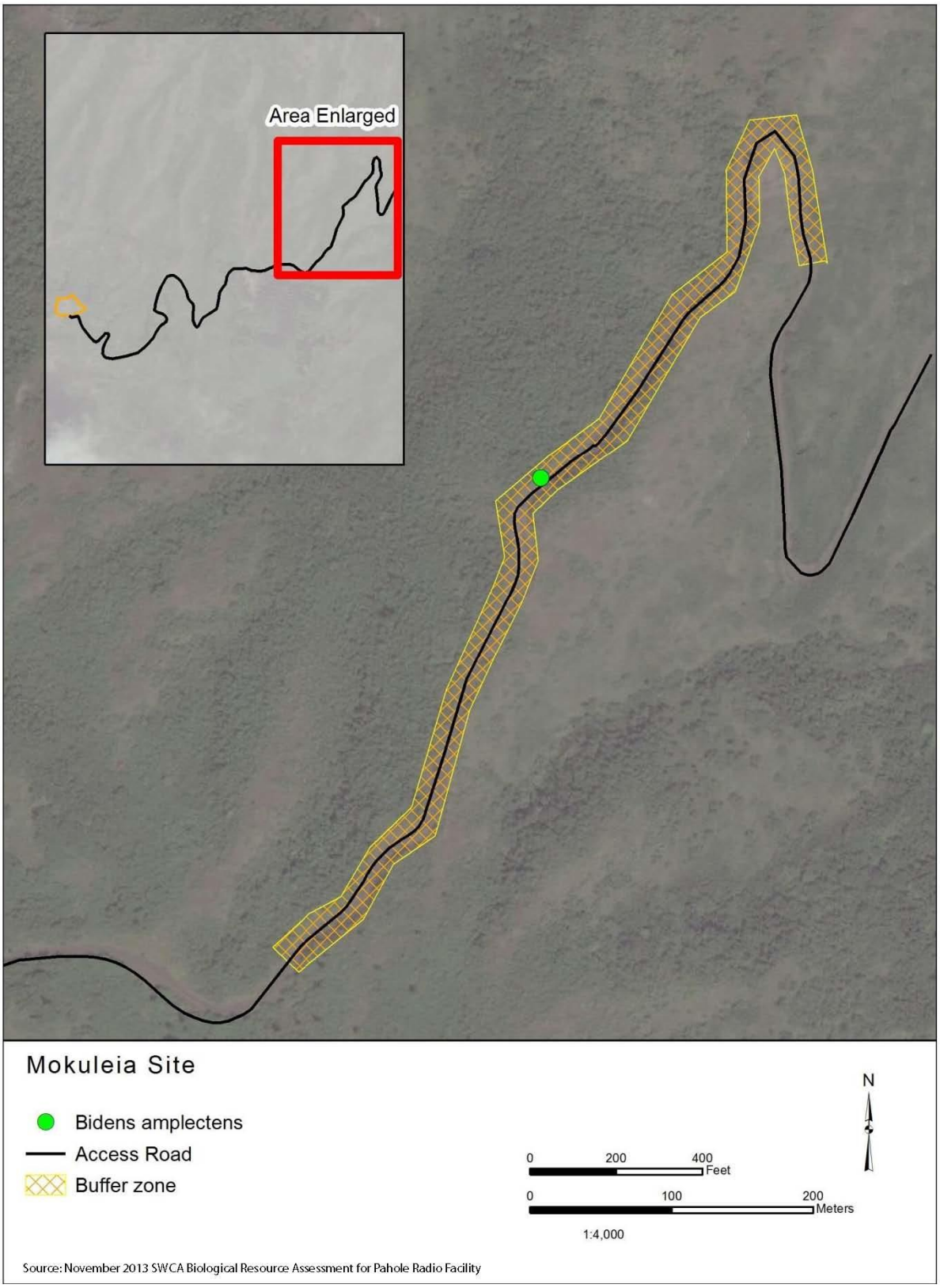

Figure 3-14: Relative Location of *Bidens amplectens*

The report notes that designated critical habitat areas for plants exist in areas near the project site. The nearest critical habitat is for *Euphorbia herbstii* and is located approximately 200 feet from the project site. Approximately 420 feet south of the site is a critical habitat area for mēhamehame (*Flueggea neowawraea*). Furthermore, small portions of the access road intersect or traverse other critical plant habitat units including haʻiwale (*Cyrtandra dentata*), hāhā (*Cyanea superba*), *Schiedea obovata*, *Delissea subcordata*, and kuluʻī (*Nototrichium humile*). In 2012, the U.S. Fish and Wildlife Service (USFWS) identified Lowland Mesic Unit 1 which encompasses 4,448 acres with a total of 41 listed plants. This unit is located southeast of the project site.

The biological report indicates that according to the experts at Pahole NAR, none of the listed plants that have critical habitat units overlapping the access road occur along the roadway.[34] See Figures 3-15 and 3-16 for critical habitats.

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[34] SWCA Environmental Consultants. October 2013. "Biological Resource Assessment for Pahole Radio Facility Upgrades." Prepared for Belt Collins Hawaii LLC.

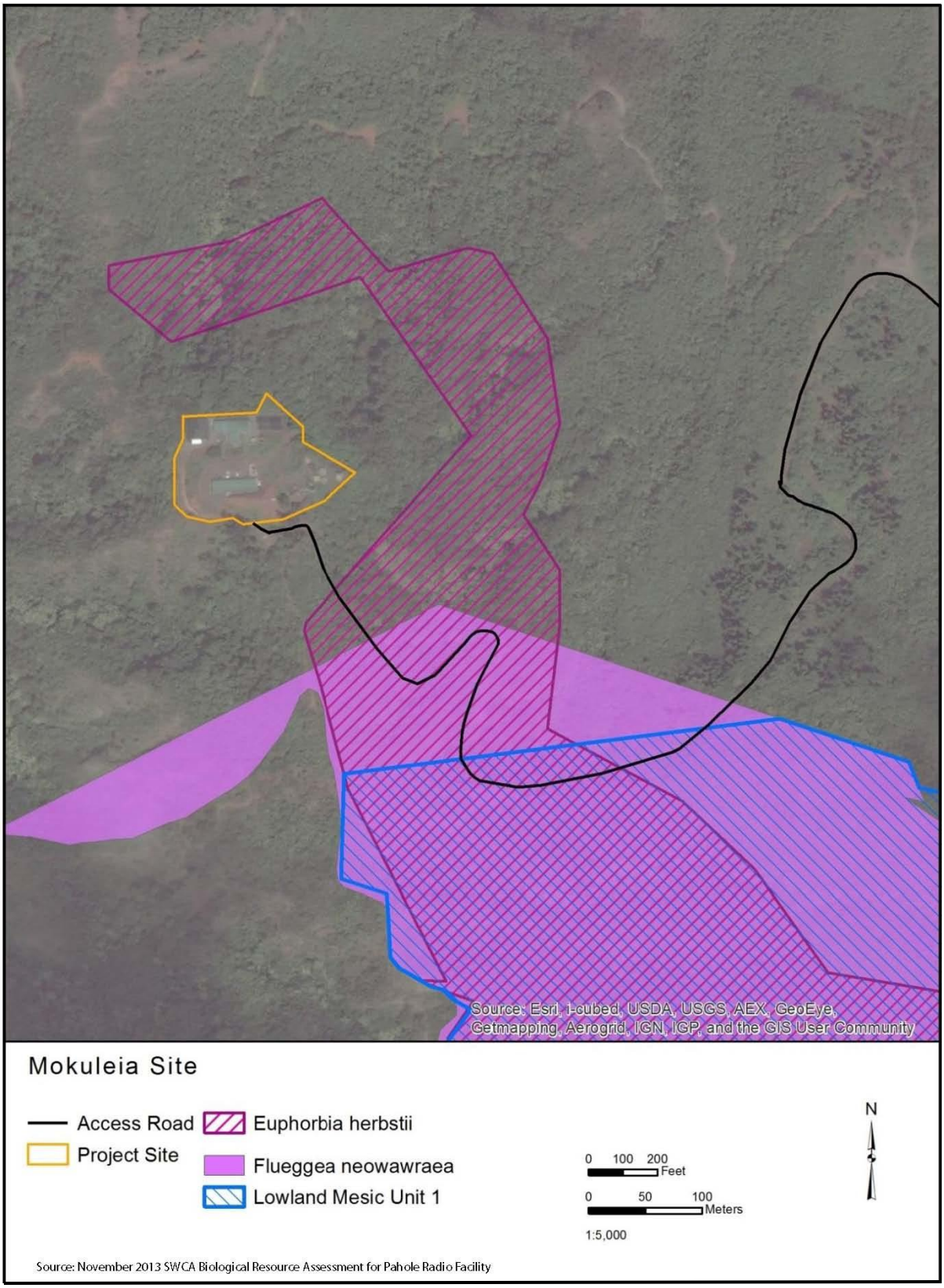

Figure 3-15: Critical Habitats for *Flueggea neowawraea*, *Euphorbia herbstii,* & Lowland Mesic Unit 1

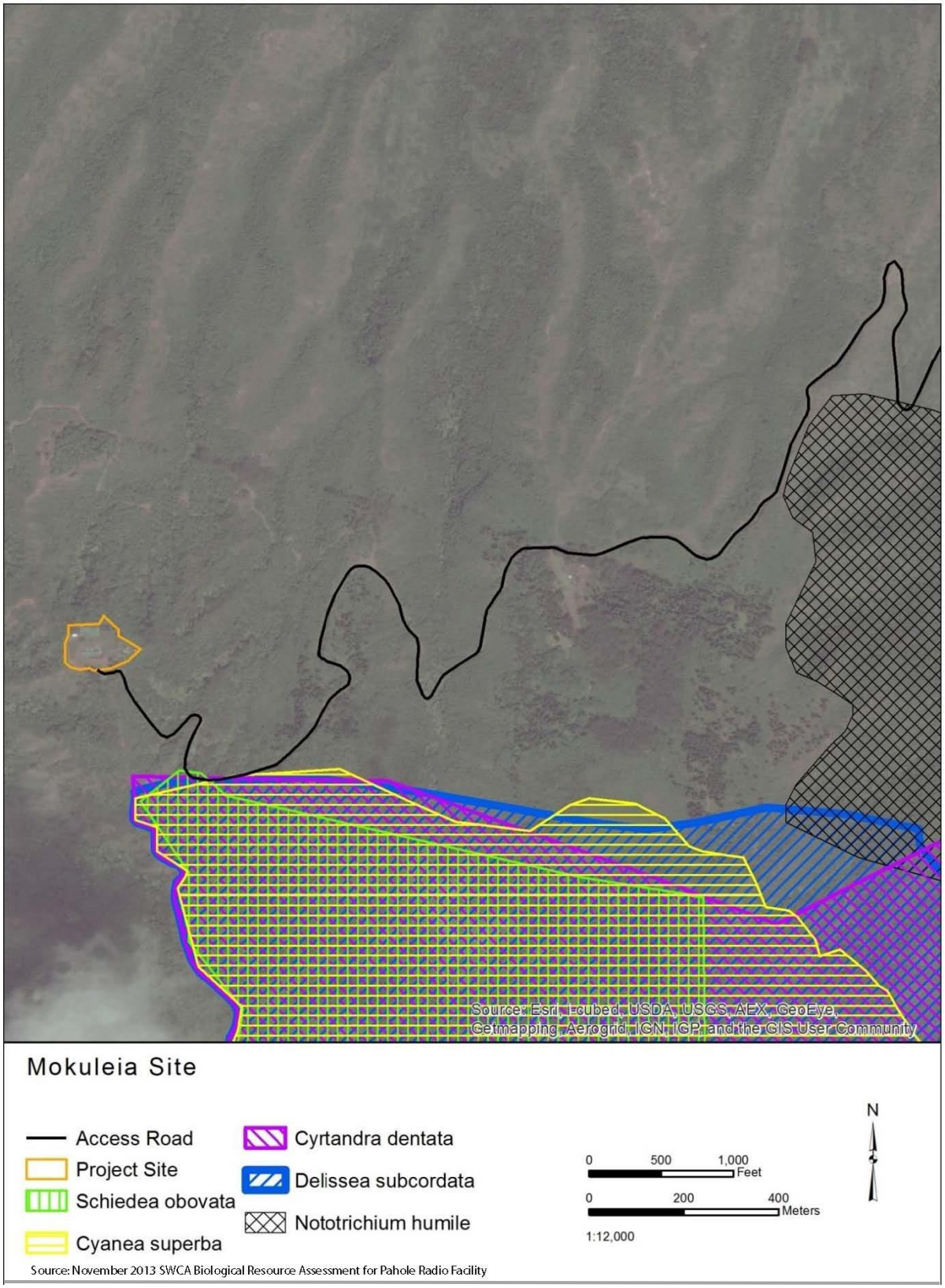

Figure 3-16: Critical Habitats for Multiple Plant Species

3.5.2 FAUNA

Avifauna: During the avifauna survey nine bird species were observed or heard in the project site. No State or Federally-listed threatened, endangered, or candidate bird species, or native Hawaiian bird species were observed on the project site. One Pacific golden plover (*Pluvialis fulva),* a bird species protected under the Migratory Bird Treaty Act of 1918 was observed in the project area.

In 2001, the USFWS designated critical habitat for the indigenous and State and Federally-listed endangered Oʻahu ʻelepaio (*Chasiempis ibidis*). USFWS included the project site in the critical habitat area.[35] No Oʻahu ʻelepaio were detected during the playbacks, which were conducted at six locations within the project site. See Figure 3-17 for a map displaying this information.

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35 U.S. Fish and Wildlife Service. 2001. "Determination of Critical Habitat for the Oahu Elepaio (Chasiempis sandwichensis ibidis): Final Rule".

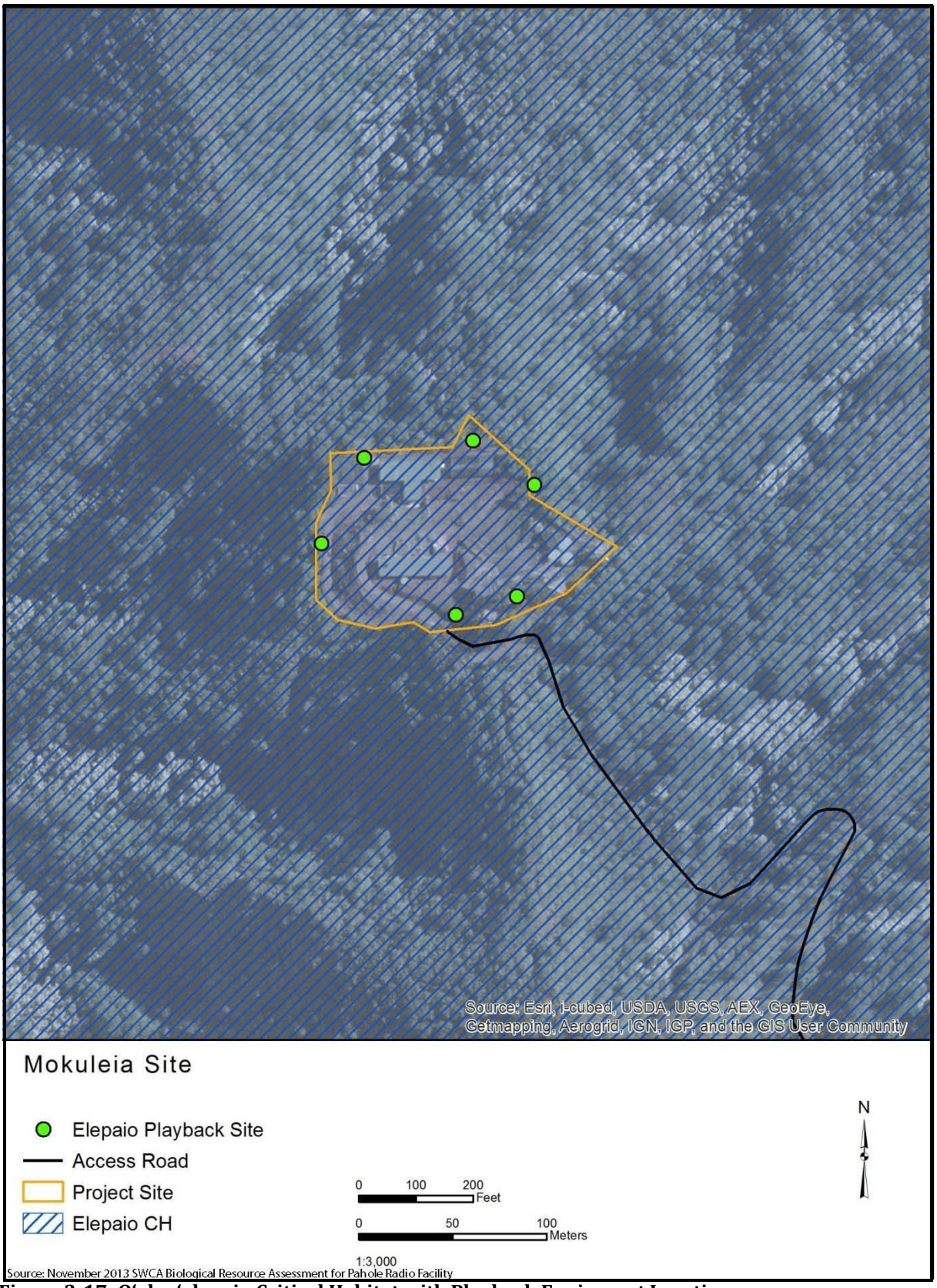

Figure 3-17: O'ahu 'elepaio Critical Habitat with Playback Equipment Locations

A bird playback is a digital audio device, with recorded calls or songs that is used to attract birds within observation distance. Typically, a playback is more effective on territorial bird species, during the nesting season. The target species will hear the playback and will usually react in different ways depending on the sex. For example, the male may attempt to locate and confront the intruder by guarding the edge of its territory while singing or it may stay silent close to its mate, in an effort to protect her from any rival males. On occasions the female bird will attempt to locate the source of the playback or may even try to solicit some attention.[36] ʻElepaio bird calls were broadcast for one minute followed by a two minute listening period. No ʻelepaio were heard during the listening period.

Since the Oʻahu ʻelapaio is highly territorial, the critical habitat is geographically expansive and not fragmented or significantly altered by human activity. Currently, the Oʻahu ʻelapaio is usually found in valleys along stream banks within dense vegetation and in mesic forests with a continuous canopy and thick understory.[37]

The last recorded Oʻahu ʻelepaio detection in the Mokulēʻia Forest Reserve was in 1991. A single male Oʻahu ʻelepaio was observed in the Pahole NAR in 2000. Given this information, the biological report has indicated the Oʻahu ʻelepaio are not expected to be present at the project site. [38]

Hawaiian Hoary Bat. A bat detector acoustic songmeter was left at the project site for 12 nights with detectors capturing 10 bat passes on 6 of the 12 nights. A bat pass is defined as two or more bat calls separated by less than 1 second. All bat detections were captured between 7:45 p.m. and 1:15 a.m. The recorded bat vocalizations were analyzed as search-phase calls, an indicator that these bats were passing through the project area airspace.

Land Mammals. During the survey no land mammals were observed on the project site. The report notes that feral dogs (*Canis familiaris*), feral cats (*Felis catus*), mice (*Mus musculus*), rats (*Rattus spp*.), and mongoose (*Herpestes javanicus*) likely occur on the site.

Amphibians or Reptiles. During the survey the only reptile observed on the site was a metallic skink (*Lampropholic delicata*). No other reptiles or amphibians were observed during the biological survey.

Invertebrates. Two native snail species of the same genus (*Tornatellides* spp., Subfamily: Tornatellidinae, Family: Achatinellidae) were found during the intentional general flora/fauna survey and second snail-focused survey. Several invasive snail species were found within the project site, including the rosy wolf snail (*Euglandina rosea),* the garlic snail (*Oxychiluus alliarius),* Asian tramp snail (*Bradybaena similaris*, and *Subulina octona).* None of the species are State or

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36 Sibley Guides. *The Proper Use of Playback in Birding*. Available as of 04/09/2014 at http://www.sibleyguides.com/2011/04/the-proper-use-of-playback-in-birding/

37 U.S. Fish and Wildlife Service. *Proposed Critical Habitat for the Oʻahu ʻElepaio.* Available as of 01/23/2014 at http://www.fws.gov/pacific/news/pdf/ElepaioCH.pdf

38 SWCA Environmental Consultants. October 2013. "Biological Resource Assessment for Pahole Radio Facility Upgrades." Prepared for Belt Collins Hawaii LLC.

Federally-listed threatened or endangered. The report notes that slugs are actively managed on-site to protect the native plants grown in the nurseries. While no slugs were observed during the survey they are expected to be present within the project area.

Several native insects were seen at the project including the common green darner or the giant Hawaiian darner *(Anax junius or A. strenuus)* and a caterpillar of an endemic moth *(Hyposmocoma sp.)*. Several incidental insects were observed within the project site including the Sonoran carpenter bee (*Xylocopa sonorina)*, the honey bee (*Apis mellifera)*, the western yellow jacket wasp (*Vespula pensylvanica),* gulf fritillary (*Agraulis vanilla),* the black witch moth (*Ascalapha odorata*), the purple-winged mantis (*Tenodera australasiae),* sow bugs (Order: Isopoda) and millipedes (Class: Diplopoda).

3.5.3 PROBABLE IMPACTS AND MITIGATION MEASURES

While the plant and wildlife habitats on the project site have been highly modified by humans and are now largely occupied by alien flora and fauna, there are several species of concern that exist in the area. Including several plant critical habitats that are located nearby the project site, the State and Federally-listed Hawaiian hoary bat which frequently passes through the project site may roost somewhere near the project area.

Flora. While no State or Federally-listed threatened, endangered, or candidate plant species were observed on the project site, there are specific places along the access route to the project site where such protected plant species exist and may begin to grow in the future. Given the extent of proposed work at the Pahole site, it is not anticipated that the construction vehicles will have contact with any of the vegetation along the access road. For further safeguarding and in cooperation with the USFWS, because it has been determined that a grouping of the endangered plant – *Bidens amplectens* – occur along the access road at an elevation of approximately 1,312 feet, all plant trimming will be avoided in this location. Furthermore, if vegetation needs to be cut along the access road at points intersecting any of the critical plant habitats, impact and disturbance should be minimized to the maximum extent practicable. All vegetation in these areas that need to be cut will be marked and surveyed by a biologist prior to trimming.[39]

Given the proximity of the project area to high-value conservation areas it is important to avoid inadvertent introduction of invasive species to the area. In order to reduce the likelihood of such introduction a number of measures will be taken: off-site sources of re-vegetation materials, including seed mixes, gravel, mulches, etc., will be certified weed-free or inspected prior to transporting to the project area; and any construction equipment, vehicles, and materials arriving from outside of the Island of Oʻahu will be thoroughly washed and inspected for excess debris, plant materials, and invasive or harmful non-native species prior to entering the site.

Fauna. No Oʻahu ʻelepaio are expected to be present at the project site and given the anticipated extent of the proposed construction in the project area no adverse impacts to either Oʻahu ʻelepaio or its critical habitat are expected. If the Oʻahu ʻelepaio is detected at the project site, a biologist will determine if any nests with fledglings are present. In this case, any potentially disturbing activity,

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[39] SWCA Environmental Consultants. October 2013. "Biological Resource Assessment for Pahole Radio Facility Upgrades." Prepared for Belt Collins Hawaii LLC.

such as the use of chain saws or other noisy machinery will only commence once the fledglings have left the nest or are no longer present. Additionally, if any trees need be cut along the access road in areas intersecting with the Oʻahu ʻelepaio critical habitat they will be flagged and surveyed by a biologist prior to disturbance.

The biological report suggests that other native bird species like the ʻapapane and Oʻahu ʻamakihi may be present at the project site or along the access road. All of the proposed construction activities may temporarily displace these birds; however, once construction is complete it's expected these birds would repopulate these areas. If construction activities are conducted during the Pacific golden plover migration period (September to May), it's possible similar impacts could occur. No long-term adverse impacts are expected.

Audio surveys detected the presence of endangered Hawaiian hoary bats as they crossed through the project site. According to the biological report, given the presence of certain tree species, bats may roost or forage near the project site and along the access road. Within the project area there are two particular tree species that create a suitable habitat for Hawaiian hoary bats, with ōhiʻa known as a suitable bat roosting tree and koa trees offering ample foraging cover.[40] In order to minimize the impacts to the Hawaiian hoary bat, the project will follow the recommendations developed by the USFWS:

- No trees taller than 15 feet should be removed or trimmed from June 1 through September 15, when immobile infantile bats may be roosting in these trees.
- Any fences that are erected should have barbless top-stranded wire to prevent entanglements and injury to the Hawaiian hoary bat. All existing fences at the project site should also be compliant. The top strand of barbed wire should be removed and replaced with barbless wire.

While native snails (*Tornatellides* spp.) were found during the biological survey work, no endangered Oʻahu tree snails were observed at the project site. To minimize impacts to native snails at the project site any removal of ti plants should be done by hand. Cut plants should be temporarily relocated next to other suitable habitats. An example of a host tree in the area would be the ōhiʻa. Based on expert consultation with Dr. Brenden Holland/Malacologist, the rock pile at the entrance to the project site will not be removed to minimize possible impacts to snail species.

3.6 HEALTH AND SAFETY

3.6.1 FLOOD HAZARD

The Flood insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Agency does not show floodways or riverine flood zones in or near the project site. The FIRM indicates that

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40 SWCA Environmental Consultants. October 2013. "Biological Resource Assessment for Pahole Radio Facility Upgrades." Prepared for Belt Collins Hawaii LLC.

the project site is located in an area where flood hazards have not been determined, but where flooding is possible.[41]

3.6.2 TSUNAMI EVACUATION ZONE

The Tsunami Evacuation Zone Maps were prepared by the City's Department of Emergency Management and other agencies in 2010. The maps were based upon updated scientific techniques and technology that were not available when the previous maps were prepared. Due the project site's mountain location, the project is located a significant distance inland from the tsunami evacuation zone.

3.6.3 EARTHQUAKE

Most earthquakes in Hawai'i are directly linked to volcanic activities and the islands' volcanic structure. The movement of magma from active volcanoes on the island of Hawai'i causes many small earthquakes every year. Larger tectonic quakes are caused by structural weakness at the volcano's base or movement deep within the earth's crust.[42]

In 2006, the State experienced the strongest recorded earthquake in 23 years. The 6.7-magnitude earthquake from west of the island of Hawai'i caused island-wide blackouts on Oahu and Maui. On Oahu, the earthquake caused automatic switches and operators to shut down the Kahe and Waiau power plants to protect the equipment.[43]

3.6.4 HURRICANE

Hurricane season in Hawai'i begins in July and lasts through November. Hurricanes in the Central Pacific generally originate in the areas off the coasts of southern Mexico and Central America. Few of these hurricanes make it near the Hawaiian Islands region, as most die off as they move northeasterly over cooler waters and less favorable atmospheric conditions. In the past 50 years, three hurricanes have made landfall in Hawaii, all on the island of Kaua'i. Hurricane Iniki in 1992 was the most destructive of these storms, the Category 4 hurricane (recorded wind speeds of 145 mph) directly hit Kaua'i causing 6 deaths and $2.2 billion in damages. Other hurricanes and tropical storms have caused damage through flooding, high winds, and high waves. [44]

3.6.5 NAVIGABLE AIRSPACE

The project site has three existing radio towers, (the tallest reaching 70 feet high) in use by the City. There's also a 29-foot concrete pillar (former NIKE platform) where the new ICSD antennas will be mounted.

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41 Federal Emergency Management Agency. 2011. Flood Hazard Areas shapefile and metadata. Obtained from http://planning.hawaii.gov/gis/download-gis-data/

42 U.S. Geological Survey. No date. *Earthquake Hazards*. Obtained from http://pubs.usgs.gov/gip/hazards/earthquakes.html

43 Hawaiian Electric Company. December 28, 2006. Investigation of 2006 Oahu Island-Wide Power Outage, PUC Docket Number 2006-0431.

44 City and County of Honolulu, Department of Emergency Management. No date. *Hurricanes in Hawaii.* Available at http://www1.honolulu.gov/dem/hurr1.htm as of 11/6/13.

3.6.6 ELECTROMAGNETIC RADIATION

Electromagnetic radiation (EMR) consists of waves of electric and magnetic energy moving together. The EMR emitted by radio waves and microwaves is referred to as radio frequency (RF) radiation and occurs at frequencies between 3 kilohertz and 300 gigahertz (GHz).[45] Examples of these include amplitude modulated (AM) radio stations, with frequencies ranging from 550kHz to 1,600 kHz, and frequency modulated (FM) radio stations with frequencies ranging from 88 MHz to 108 MHz.

The Federal Communications Commission (FCC) has established maximum permissible exposure (MPE) limits to electromagnetic radiation. A summary of the FCC's "Local Official's Guide to RF" is as follows:

> *The FCC's guidelines establish separate MPE limits for 'general population/uncontrolled exposure' and for 'occupational/controlled exposure.' The general population/uncontrolled limits set the maximum exposure to which most people may be subjected. People in this group include the general public not associated with the installation and maintenance of the transmitting equipment. Higher exposure limits are permitted under the 'occupational/ controlled exposure' category, but only for persons who are exposed as a consequence of their employment (e.g., wireless radio engineers, technicians). To qualify for the occupational/controlled exposure category, exposed persons must be made fully aware of the potential for exposure (e.g., through training), and they must be able to exercise control over their exposure. In addition, people passing though a location, who are made aware of the potential for exposure, may be exposed under the occupational/controlled criteria. The MPE limits adopted by the FCC for occupational/controlled and general/uncontrolled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.*[46]

More detailed information regarding FCC limits for EMR can be found on the FCC website at http://www.fcc.gov/oet/rfsafety/.

Existing sources of EMR on the project site include radio antennas in use by the City. The proposed action will install microwave dishes and whip antennas. This EMR generating equipment will be used to make up the Anuenue radio communication system. The Anuenue system includes multiple radio transmitters that operate in two broad categories: point-to-point microwave and land mobile radio (LMR). When in operation, the point-to-point microwave transmitters operate in the 7-8 GHz bands and transmit continuous frequency energy concentrated in a narrow beam that stays in a consistent direction. When in use the LMR systems operate at fixed frequencies in 100-900 megahertz bands and transmit intermittently, dependent of system traffic, in an omni-directional pattern with energy concentrated towards the horizon.

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45 U.S. Federal Communications Commission, Office of Engineering and Technology. No date. *Radio Frequency Safety.* Available at http://transition.fcc.gov/oet/rfsafety/rf-faqs.html#Q1 as of 11/6/13.

46 Federal Communications Commission. 06/02/2000. *A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance.* Available at http://www.natoa.org/documents/FCC_LSGAC_RF_Guide.pdf

While these new antennas utilize new technology, they are still classified as radio frequency EMR. Radio frequency EMRs should not be confused with ionizing radiation that is produced by X-rays, gamma rays, and particle beam energies. Ionizing radiations pose a greater risk to human beings and other biological systems because the particle expulsion can actually alter molecular properties and functionality. For instance, when an x-ray is activated it has enough quantum energy to expel an electron from a molecule, in effect destabilizing this molecule. This biological hazard can cause irreversible damage to living organisms.

Non-ionizing radiation, like radio frequency EMRs expel much less energy. While the energy produced is not enough to displace electrons in a molecule, it will agitate or vibrate the molecular structure, creating entropy, in the form of heat. Humans cannot detect the level of heat generated from such exposures and through normal thermoregulatory activity; mammals and birds can displace the added heat load.

An EA completed by the USCG for the installation of Anuenue microwave dishes and whip antennas at different Anuenue sites, similar to those that will be installed under the proposed action, concluded that EMR levels were within maximum permissible limits by the FCC. The EA noted that safety precautions were necessary for tower maintenance personnel to prevent exposure to potentially unsafe levels of EMR.[47]

3.6.7 HAZARDOUS AND REGULATED MATERIALS

In May 2012, Quinn Consultants, Inc. conducted a Targeted Hazardous Material Survey of the project area, targeting three buildings. Of the thirty-seven samples that were collected for suspect asbestos-containing materials (ACMs), only two materials tested positive for asbestos, the asbestos-cement ceiling in the pesticide room, and the caulking/joint material on the exterior concrete masonry unit (CMU) walls in Building G3 (DOFAW storage facility). Fourteen of the eighteen samples that were collected for suspect lead-containing and lead-based paints tested positive for lead-based paint (exceeding 5,000 milligrams(mg) per kilogram(kg) of lead), all of which were found in Building G3.[48]

In December 2013, Myounghee Noh & Associates, L.L.C. conducted a Surface Soil Screening Survey and a Targeted Hazardous Material Survey directly in the areas where the project construction and improvements will occur.

Surface Soil Screening Survey. Trace amounts of hazardous metals, polychlorinated biphenyls, residual fuels, volatile organic compounds, and semi-volatile organic compounds, were found to be below Tier 1 Environmental Action Levels (EAL) for unrestricted land use. One sample collected in the area where the new water tanks will be built contained levels of lead above Tier 1 EAL but well

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47 U.S. Coast Guard. 2009. "Final Environmental Assessment, Anuenue Radio Facility Upgrade, Mauna Kapu, Oahu, Hawaii."

48 Quinn Consultants, Inc. May 2012. "NIKE Site Lead Paint and Asbestos Testing."

below the EAL for industrial and commercial land uses, a level not considered to be harmful for a construction worker directly exposed to groundwork.[49] The report is included in Appendix E.

Targeted Hazardous Material Survey. Of the thirty-six samples that were collected for suspect ACMs, three samples tested positive for asbestos. The three samples that tested positive for asbestos came from the former generator room, including the white drywall ceiling panel and the light gray and black caulking on the exterior door frames and walls. Twenty-three paints were identified and tested for lead. After analysis, seventeen lead-containing paints (LCPs) were discovered. Twelve of those LCPs exceeded 5,000 mg/kg, the threshold for LBP. The samples that tested positive for lead came from the former generator building and DOFAW's lower building. Inside the former generator room, two samples of the acoustical ceiling tiles were found to contain measurable amounts of arsenic (2,200 mg/kg and 2,700 mg/kg).[50] The report is included in Appendix F.

DOFAW staff noted that there is one abandoned Underground Storage Tank (UST) located within the future City Radio Building footprint.

3.6.8 PROBABLE IMPACTS AND MITIGATION MEASURES

Flooding is expected to have minimal or no adverse impact due to the project area's location away from flood hazard areas. Due to the project area's high elevation, tsunamis pose no risk to the project. The undergrounding of utilities and improvements to buildings would reduce the risk of adverse impacts to the ICSD communications and Anuenue operations from earthquakes and hurricanes. In cases of natural disasters and extreme weather events, the proposed action would improve the reliability of the IRF and Anuenue, which emergency response, disaster management, and civil defense utilize for their communication needs during these events.

The proposed action includes retrofitting an existing 29-foot concrete pillar with new antenna gear. The existing concrete pillar was at one time part of a larger radar acquisition tower that was partially disassembled sometime after the Nike program was terminated. The installation of new whip antennas and lightning rod to the concrete pillar will extend the overall height to 51 feet. Since the project modifications will result in the structure height being slightly shorter than the former Nike tower height, no impacts to navigable airspace are anticipated. The City currently uses radio towers, a short distance away that are approximately 20 feet higher than the expected height of the new ICSD radio tower with lightning rod and whip antennas attached. Since the proposed action is not building a new tower or extending an existing tower a 7460-1 or Notice of Construction is not required. See Figure 2-5 for details regarding the pillar and antenna dimensions.

A previous study, involving similar EMR emitters, completed for DAGS concluded that distances required to keep personnel safe from adverse EMR emissions were less than 20 feet for all emitter

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49 Myounghee Noh & Associates, L.L.C. December 2013. "Surface Soil Screening Survey Report ICSD Pahole Radio Facility, Mokuleia, Hawaii."

50 Myounghee Noh & Associates, L.L.C. December 2013. "Targeted Hazardous Material Survey Report for Information and Communication Services Division Pahole Radio Facility Renovations and Other Improvements Mokuleia, Hawaii."

types. The only hazardous area for the microwave emitters was directly in front of the antennas.[51] At the Pahole project site, the microwave dishes will be attached to the existing concrete pillar, in the far eastern corner of the project area, facing away from any direct human activities. The lowest microwave dish antenna will be mounted with its centerline at 12 feet above ground level and its bottom rim at 8 feet above ground level. Given the location and direction of where the antennas are positioned, the Pahole Radio Facility will not produce an EMR hazard to people or animals beyond the project site fence line.

Regarding the presence of lead, asbestos, and arsenic the contractor will prepare a hazard control and management plan in accordance with all Federal, State, and local regulations to address potential impacts from any construction activities in the areas where asbestos, arsenic and LCP and LBP materials may exist. Appropriate measures will be taken to dispose of any asbestos, arsenic, or lead-containing waste in accordance with Federal and State regulations. BMPs will be implemented during construction to control fugitive dust, erosion, and surface runoff.

The project will not impact the existing underground storage tank.

3.7 AIR QUALITY

3.7.1 EXISTING CONDITIONS

The Clean Air Branch of the DOH, as part of its statewide pollution control responsibilities, monitors ambient levels of Carbon Monoxide (CO), Sulfur Dioxide (SO_2), and Particulate Matter (M10 and 2.5), Ozone (O_3).[52] The nearest monitoring station to the Pahole site is located approximately 12 miles south in the Ko'Olina Golf Course (West Beach Station), where between 2007 to 2011 readings did not exceed Federal and State standards for SO_2, NO_2, PM_{10}.[53] Unfortunately, the West Beach Monitoring Station closed down at the end of March, 2011 and data for that year was inconclusive. The next closest monitoring station (Kapolei), is approximately 13 miles south of the project site. Here, in the Kapolei Business Park, between 2007 to 2011 readings did not exceed Federal and State standards for CO, SO_2, PM_{10}, $PM_{2.5}$.

In the vicinity of the project site there are no major air pollution generators. Air pollution generated by existing uses at the site is limited to vehicles accessing the site and maintenance equipment such as weed (string) trimmers, primarily from DOFAW and Army operations, and back-up generators on site, which are seldom used.

3.7.2 PROBABLE IMPACTS AND MITIGATION MEASURES

During construction, an increase in emissions would occur as result of construction vehicles and equipment accessing and working on the site. Short-term impacts associated with installation of the underground conduits, construction, and relocation of various structures would include dust created by the excavation, stockpiling, and hauling of soil. BMPs will be employed during

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51 State of Hawai'i, Department of Accounting and General Services. 2012. "Final Environmental Assessment, ICSD Waiākea Radio Facility, Construction of a New Radio Facility."

52 State of Hawai'i Department of Health. 2012. "Annual Summary 2011 Air Quality."

53 State of Hawai'i Department of Health. 2012. "Annual Summary 2011 Air Quality."

construction to minimize air quality impacts. These measures would likely include periodically watering down disturbed material and unpaved construction areas, use of dust screens, and managing the amount of areas uncovered.

No adverse air quality impacts are anticipated from the proposed action after construction.

3.8 NOISE

3.8.1 EXISTING CONDITIONS

Ambient noise at the project site is normally limited to natural sounds from wildlife and weather. Maintenance vehicles and on-site back-up generators are occasional noise sources. The nearest noise sensitive receptor to the project site is the Peacock Flats campground located approximately 0.6 miles north of the site off of Mokulēʻia Road. The closest residences are approximately 1.5 miles north of the site.

3.8.2 PROBABLE IMPACTS AND MITIGATION MEASURES

During construction, short-term, temporary noise is expected to occur. Some of the noisy equipment that may be used includes backhoes, compaction equipment, flatbed trucks, bulldozers, and diesel power generators. Noise suppressant devices, such as mufflers, will be used to help reduce objectionable noise levels. The Oʻahu ʻelepaio is not expected to frequent the site since it has been over a decade since a lone male was observed within the Pahole NAR. If an Oʻahu ʻelepaio is spotted during construction a biologist will be consulted to identify the appropriate impact mitigation measures. The closest developed area is approximately 0.6 miles away from the project site and from that distance noise impacts during construction are unlikely to be significant. Construction would occur over a 12 month period. Construction activities will comply with the State DOH, Chapter 11-46, Community Noise Control regulations. Compliance with these regulations will be part of the project's construction contract and responsibility of the selected contractor.

No noise impacts are anticipated from the proposed action after construction completion.

3.9 CIRCULATION AND TRAFFIC

3.9.1 EXISTING CONDITIONS

The project site is accessed by the paved, one-lane, gate-secured Mokulēʻia Road. Mokulēʻia Road connects to the access road within the project site that ends at the far edge of the City communications building. Access to the Army and DOFAW buildings is via concrete walkways/ stairways and a small dirt road that is connected to the intermediate access road and parking lot.

Access to Mokulēʻia Road is restricted by a secured gate directly off of an unnamed road that links to Farrington Highway. Traffic on Mokulēʻia Road is limited to those accessing the facilities on the project site, landowners, and those accessing the area's public lands for hiking, hunting, bicycling, or camping.

3.9.2 PROBABLE IMPACTS AND MITIGATION MEASURES

The proposed action is expected to generate minimal short-term impacts during construction associated with vehicles traveling to and from the project site. Before construction activities begin, notice of the upcoming construction activities would be made available to other users of Mokulēʻia Road. After construction is complete, traffic related to the IRF would be limited to periodic maintenance and emergency outage trips.

A paved turnaround will be constructed in order to facilitate vehicular movements for the ICSD facility, City radio facility and future commercial development. The HECO transformer and meter/equipment would also be located adjacent to the turnaround to provide for easier HECO access.

3.10 INFRASTRUCTURE

3.10.1 WATER AND SEWER

The project site does not have any potable water system. All needed drinking water is brought to the site.

The irrigation water source is from DOFAW building's roof catchment system, which is piped to the adjacent 11,000 gallon water tank. Water from the lower tank is then pressurized, via a pump, and fed to the three storage tanks (2-18,000 gallon tanks and 1-20,000 gallon tank) near the project area. Water from the three storage tanks is then distributed, by gravity, to the DOFAW and Army nurseries. All existing irrigation lines are two inches in diameter. The existing water pressure at the nurseries is approximately 23 pounds per square inch (psi).

There is an existing self-composting toilet adjacent to DOFAW's upper storage building. The self-composting toilet is managed by a private contractor and there are no plumbing connections to this toilet facility. The DOH has no records of cesspool or individual wastewater systems installations within the Pahole site. However, DOFAW staff noted that there may have been cesspools associated with DOFAW's upper building and DOFAW's greenhouse when the Army previously used the Pahole site as a NIKE missile facility.

3.10.2 ELECTRICITY, TELEPHONE, AND CABLE

HECO provides overhead service to the Pahole site. A pole mounted transformer and HECO meters are located near DOFAW's lower building. Direct buried cable from the HECO pole provides service to DOFAW, City, and Army facilities.

Currently, there is no communication service (telephone or cable) to either the DOFAW or Army facilities.

3.10.3 FUEL AND GAS LINES

The only fuel lines on the project site connect an above-ground fuel storage tank to a generator, located inside the City's communication building, covering a distance of less than five feet.

3.10.4 DRAINAGE

Storm water runoff generated on the Pahole site generally sheet flows in a northerly or westerly direction. Runoff in the northerly direction flows into Kawaihāpai Stream, an intermittent stream, approximately 2,000 feet northeast of the site. Runoff flowing in the westerly direction discharges into Mokulēʻia Stream, a non-perennial stream that begins approximately 800 feet to the east of the site. Both the Kawaihāpai and Mokulēʻia Streams flow towards the north, which eventually outlets at Mokulēʻia Beach.

Storm water runoff on the east-side of DOFAW's upper building enters a pipe that directs the water under the access road to an inlet headwall near Building G3. From the headwall, the storm water flows in a pipe and discharges down slope near the new HECO utility pole location.

There is a drain line beneath the Army's greenhouse that outlets to the north of the greenhouse. The purpose of this line is unknown; but it is speculated to be a remnant of the Army's drainage system when the site was used as a Nike missile facility.

There are concrete ditches along both sides of the dirt access road leading to DOFAW's greenhouse. The upslope (east-side) ditch is connected to a drain line and outlets to the west, near the bottom of the access road. The west-side ditch directs runoff away from the lower portion of the access road and out the same drain line.

3.10.5 PROBABLE IMPACTS AND MITIGATION MEASURES

During the project's construction phase, two of the existing water storage tanks will be disassembled, leaving one water storage tank operational, providing the plant nurseries an adequate supply of water. Three new water storage tanks will be assembled in a different area, southwest of where the existing water storage tanks are currently located. Once the new water storage tanks have been assembled and filled with a sufficient amount of water, the remaining water tank that was left operational in the old location will be disassembled. The new water lines will be restored to their original input and output points. The existing water catchment system and new storage tanks will continue to operate as normal. DOFAW requested that a standpipe with a two and a half inch hose be provided next to the paved roadway that is downhill from the future turnaround area. A hydrant curb guard will protect the standpipe from passing vehicles. The standpipe will provide an additional source of water for DOFAW to use at their discretion. All new irrigation lines will be three inches in diameter except for the two inch irrigation lines that will exist beyond the standpipe connection. This configuration will help maintain good water pressure needed to distribute the irrigation water.

The proposed action does not involve the construction of a water or sewer system at the project site. Water and wastewater needs during construction would be handled by the contractor and would likely involve the provision of bottled water and portable toilets. After construction is complete, activity at the site would be limited to periodic maintenance and emergency outage trips.

The proposed action does not involve any changes to the electrical, telephone, and cable systems that would impact users off-site. Existing HECO overhead (OH) high-voltage lines are suspended above the existing plant nursery building; which is not code compliant. Installation of a new utility pole is proposed to reroute the OH lines and provide a minimum 10-feet horizontal clearance

between the nearest OH line and the Army nursery building. Therefore, the new pole will be relocated with a 15-foot clearance from the centerline of the OH lines to the nursery building to provide for the 10-foot clearance to the nearest line. The new pole would be located at the base of the slope, to minimize any impact of DOFAW's helicopter operations; and as far away as possible from the dirt road that provides access to the Army nursery and DOFAW's lower building.

Although the project will increase the electrical demand at the Pahole site, HECO's existing high voltage overhead system can adequately service the increased demand. The existing pole mounted transformer, however, would be undersized. To accommodate DOFAW, ICSD, and the City's future power requirement, a new HECO pad mounted transformer will be installed near the project site. To accommodate possible future commercial development at the Pahole site, the project will install a larger concrete pad; on which a 500KVA to 700 KVA transformer could be installed.

Once the project's antennas are installed, an underground conduit will be installed to the ICSD equipment room. Two underground communications conduits will be provided from the ICSD equipment room to provide for future communications service within the Pahole site; one for the City, with a stubout provided near the City's future radio building; and another for DOFAW/Army, with connections to their two buildings. The undergrounding of electrical lines within the project site would decrease the vulnerability of the lines to severe weather events.

The project initially required that communications service be brought to the Pahole Site. However, as extending Hawaiian Telecom communications services to the Pahole site was found to be cost prohibitive, ICSD decided that communications service to the Pahole site will be via microwave communication to/from the project's antennas.

The proposed action will not disrupt the fuel line connection from the existing above-ground tank to the City's communication building.

Storm water runoff generated from the project will generally follow existing drainage flow patterns. The new ICSD building will include a roof catchment system that connects to a 1,000 gallon roof runoff leader tank, located on the north side of the building. A grass swale will be included around the new ICSD building to improve drainage. By implementing a roof catchment system, the amount of rainfall runoff is anticipated to be less than that of the existing site. Where practical, the runoff will be diverted away from new and existing facilities with the use of graded swales. BMPs will be implemented during construction to control surface runoff and soil erosion from the proposed action.

3.11 PUBLIC SERVICES AND FACILITIES

3.11.1 POLICE, FIRE, AND EMERGENCY SERVICES

The Honolulu Police Department's Patrol District No. 2 provides services to the Wahiawa and North Shore area. The district is divided into Sector 1 (Waipiʻo, Mililani, Mililani Mauka), Sector 2 (Wahiawa and Schofield) and Sector 3 (Waialua and North Shore). The district station is located at

330 North Cane Street in Wahiawa.[54] DLNR Division of Conservation and Resource Enforcement provides police services within Conservation districts and in forest reserves, which includes the project site and surrounding areas.[55]

The project site is within the DOFAW Fire Team Primary Response Area. The Honolulu Fire Department (HFD) Battalion No. 5 provides secondary fire protection services to the area where the project site is situated. The nearest HFD fire station to the project area is Waialua Fire Station No. 14 on Haleʻiwa Road.[56] See Figure 3-18 for fire response areas.

The City Department of Emergency Management provides ambulance services throughout Oʻahu through its Emergency Medical Services (EMS) Division. The project site is within the EMS Waialua Emergency Services Response Area. HFD also co-responds with first responder emergency services.[57]

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54 Honolulu Police Department, No date. *Patrol Districts.* Available as of 12/26/13 at http://www.honolulupd.org/department/index.php?page=patrol_districts

55 State of Hawaiʻi. Department of Land and Natural Resources. No date. "Division of Conservation and Resource Enforcement, Strategic Plan 2009-2014."

56 Department of Land and Natural Resources, Division of Forestry and Wildlife. No date. *Fire Response Maps*. Available as of 11/20/13 at http://dlnr.hawaii.gov/forestry/fire/response-maps/

57 City and County of Honolulu, Department of Emergency Services. 2013. *Honolulu Emergency Services Department Unit Locations and Response Areas.* Available as of 12/26/13 at http://www1.honolulu.gov/esd/ems/redicustomerservicenumber.pdf

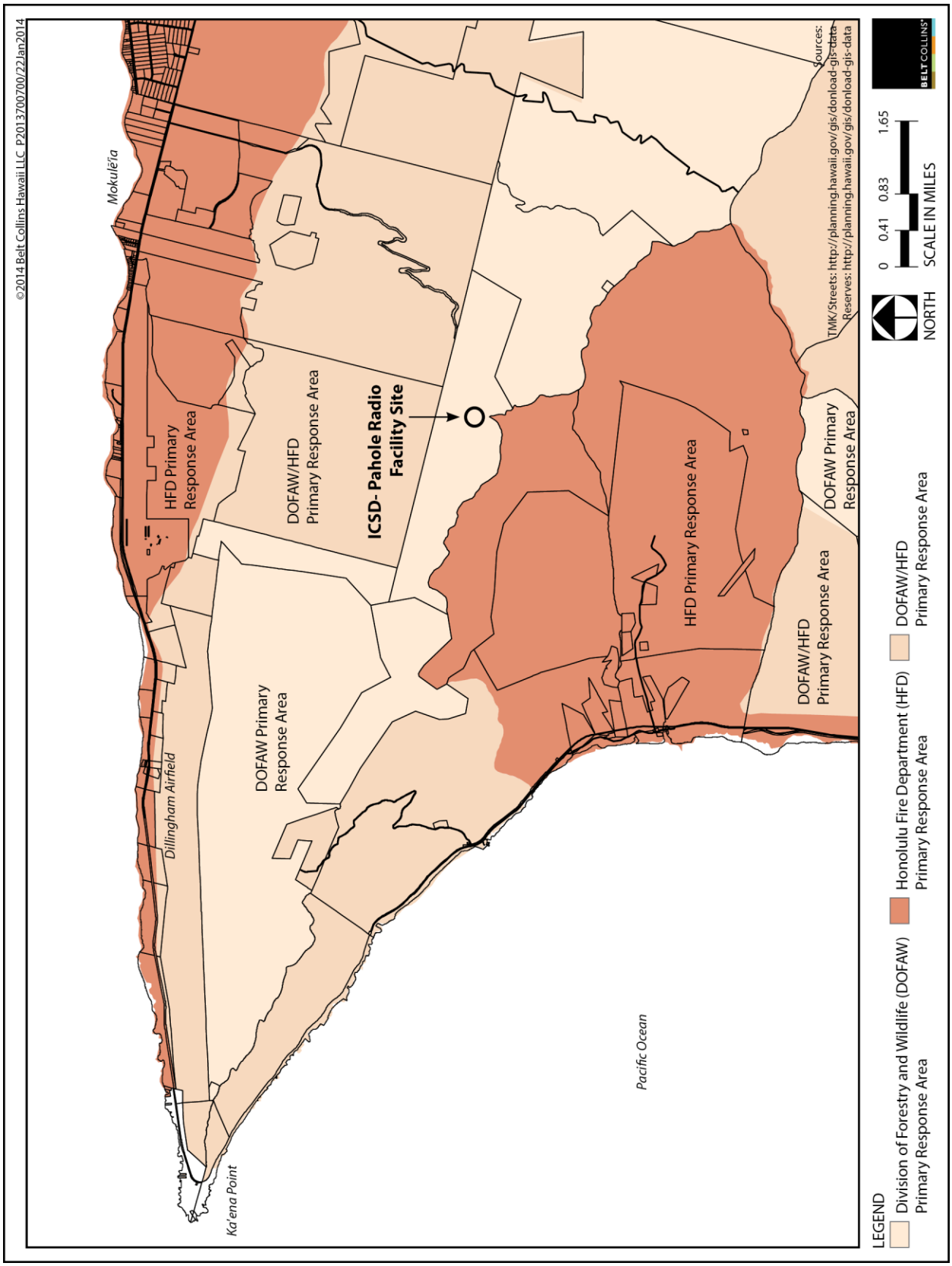

Figure 3-18: Fire Response Areas.

3.11.2 PARKS AND RECREATION AREAS

Parks and recreation areas in the vicinity of project include Peacock Flats Campground, Mokulēʻia trail, and Na Ala Hele Trails. The State-run Peacock Flats Campsite, located off of Mokulēʻia Road is 0.6 miles from the project site and offers overnight accommodations and hiking trails.[58]

3.11.3 SOLID WASTE

Approximately 14 miles from the project site, the City has the Waimanalo Gulch Landfill and Honolulu Program of Waste Energy Recovery (H-POWER) refuse to energy plant in the Campbell Industrial Park to accommodate solid waste disposal. Solid waste generating on the Pahole site is limited to materials replaced during maintenance/repair activities and personal waste from personnel performing maintenance or emergency repair activities. This waste is disposed of off-site at appropriate waste disposal facilities.

3.11.4 PROBABLE IMPACTS AND MITIGATION MEASURES

The proposed action would not significantly increase activity at the project site; therefore it is not expected to generate an increase in demand for police, fire, emergency response, parks, and recreation areas. Impacts to accessing Peacock Flats and the hiking trails may occur with construction equipment being brought to and from the site, but should be minimal. Notice of any construction traffic impacts would be provided. Demolition and construction debris from the trenching, grading, and building would be disposed of in accordance with State and City requirements. Soil excavating during trenching and grading will be used for fill where possible, to minimize waste. The main sources of debris would include the excavated material from trenching and grading, concrete and asphalt material removed during trenching activities for the underground conduit, and material removed as part of the former generator building demolition. The impact on the area's solid waste facilities is anticipated to be minor. Measures will be taken to recycle waste, if possible. After construction is complete, the proposed action is not expected to generate an increase in solid waste.

3.12 VISUAL AND AESTHETIC RESOURCES

3.12.1 EXISTING CONDITIONS

The project is located at the Pahole Rare Plant Nursery site in the Waiʻanae Mountain Range in the Mokulēʻia Forest Reserve, along the Kuaokalā ridge in the Waiʻanae district, on the island of Oʻahu, Hawaiʻi

Pahole occupies a high point in the northern Waiʻanae Mountain Range, perched along the Kuaokalā ridge with views of Dillingham Airfield to the north. The highest and most visible structures on the project site are the towers, which are by design above the tree-level. Due to the relative isolation of the site, the towers are only readily visible from the lower portions of the Mokulēʻia Road. The existing towers can be seen from portions of the North Shore with the use of high power binoculars. In terms of views from public facilities, given the contours of the mountain ridges, it's impossible to see any of the existing structures from Peacock Flats or the neighboring hiking trails. The *North*

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58 State of Hawaiʻi Department of Land and Natural Resources. *Wiki Permits Peacock Flats Campsite B*. Available as of 01/23/2014 at https://camping.ehawaii.gov/camping/all,details,31707.html

Shore Sustainable Community Plan identifies mauka views of the Waiʻanae Mountains as important.[59]

3.12.2 PROBABLE IMPACTS AND MITIGATION MEASURES

The proposed action involves the installation of new microwave dishes and whip antennas. The project modifications will include cutting the overhang of the concrete flat top on the existing 6' 9" diameter concrete pillar, where the new antennas are to be mounted. After this procedure, the total height of the proposed microwave transmitters and standard whip antennas will total 51 feet high. This tower structure will be shorter than the former Nike tower. A lightning rod will extend 22 feet above the pillar, along with three whip antennas that add an extra 12' 4," 14' 5," and 20' 11" to the overall height. Given the thin diameter of the lightning rod and whip antennas these communication devices are not expected to have an adverse impact on the visual and aesthetic resources. Furthermore, the largest dish, located at the top of this retrofitted pillar measures 10 feet in diameter, adding an extra 39 inches of visible man-made material to the landscape. From any of the before mentioned vantage points this additional equipment is expected to have no adverse visual impacts. The construction of the new ICSD communications building and the relocation of the water tanks and utility pole are not expected to be seen from a downhill viewing position. There are no lights at the project site that would be seen at night.

3.13 SOCIO-ECONOMIC SETTING

3.13.1 EXISTING AND ANTICIPATED CONDITIONS

The Pahole project site is within the North Shore Sustainable Communities Plan area of the City. While it is accessible by road, the Pahole Rare Plant Facility is marked as "Government Property – No Trespassing." It is not visible to the naked eye from residential areas on the North Shore. It is about 0.6 miles from Peacock Flats, a campground site within the Mokulēʻia Forest Reserve. The Keālia Trail and Mokulēʻia Access Road which is accessible from the North Shore are open to hikers and bikers. Access routes from the Waiʻanae Coast side pass through protected areas, hunting areas, and military sites. Access to the area by the Mount Kaʻala Tracking Station Road is by permit only.

Given the project site's remote location, the natural resource importance of the areas surrounding the site, and the area's importance for communication facilities, the communities potentially affected by the project are the public and private communication users and the natural resources.

3.13.2 PROBABLE IMPACTS AND MITIGTION MEASURES

The proposed action is not expected to impact the regional population, housing, or economic conditions. Construction and operations can be accommodated within the site with minimal or no disruption of its ongoing activity. No social impact is anticipated.

During construction, work would be created in the construction trades, material and supply vendors, and related fields. Induced effects would occur as firms and workers in these industries spend income gained from work on the project. The impact on employment and wages is expected

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59 City and County of Honolulu, Department of Planning and Permitting. 2011. "North Shore Sustainable Communities Plan." Prepared by Townscape, Inc.

to have a small increase in direct jobs and economic activity. These economic impacts are small, short-lived, and beneficial. The project would cost an estimated $2,300,000 in 2013 dollars. By supporting reliable information systems for agencies of the State, the project has a beneficial impact to the people of Hawai‘i. Improved communications will affect State agencies' operations in both normal and emergency conditions. After construction, the project would not involve a significant increase in personnel activities at the site for maintenance and emergency outage activities.

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4 LAWS, PLANS, POLICIES, AND CONTROLS

4.1 STATE POLICIES AND STATUTES

4.1.1 HAWAIʻI STATE PLAN

The Legislature in 1978 adopted the Hawaiʻi State Planning Act (State Plan), Hawaiʻi Revised Statutes (HRS), to establish direction and provide long-range planning for the State. The State Plan consists of a series of broad goals, objectives, and policies that serve as guidelines for future long-term growth and development. It further (1) provides a basis for determining priorities and allocating limited resources; (2) seeks to improve coordination of Federal, State, and County plans, policies, programs, projects, and regulatory activities; and, (3) establishes a system for plan formulation and program coordination to provide for an integration of all major State and County activities.

The proposed action supports and is consistent with the following State Plan objectives and policies:

> ***226-10.5 Objectives and Policies for the Economy – Information Industry***
>
> *(b)(1) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawaii to accommodate future growth in the information industry.*

The proposed action would improve the State's telecommunication system and would provide for the future needs of State agencies and other public partners.

> ***226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.***
>
> *(b)(3) Take into account the physical attributes of areas when planning and designing activities and facilities.*

The proposed action would construct new facilities and equipment on a site that has been used for communication purposes dating back to the 1950's. The proposed development, particularly the installation of the underground conduits and building construction, has been designed to minimize work in undisturbed areas and to minimize runoff and erosion impacts.

> ***226-13 Objectives and policies for the physical environment--land, air, and water quality.***
>
> *(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.*

The IRF at Pahole is part of the State's telecommunication system, which services Federal, State, and County natural and man-induced disaster efforts. The proposed action would increase the reliability of the IRF at Pahole and the State's telecommunication system.

226-14 Objective and policies for facility systems--in general.

(b)(1) Accommodate the needs of Hawai'i's people through coordination of facility systems and capital improvement priorities in consonance with state and County plans.

The proposed action is part of DAGS – ICSD plans for fulfilling their responsibilities to provide and maintain a statewide telecommunication system for Federal, State and County agencies.

226-18.5 Objectives and policies for facility systems--telecommunications.

(c)(3)Promote efficient management and use of existing telecommunications systems and services;

The proposed action would install new and improved facilities to better meet the telecommunication needs of public agencies. The improvements would ensure the functionality and reliability of the new IRF at Pahole and the State's telecommunication system.

226-26 Objectives and policies for socio-cultural advancement--public safety.

(a)(2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic wellbeing of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.

The proposed action would improve the functionality and reliability of the telecommunication system that serves State, Federal, and County emergency management agencies.

226-26 Objectives and policies for socio-cultural advancement--public safety.

(d)(1) Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times.

The proposed action would improve the functionality and reliability of the telecommunication system that serves the State, Federal, and County agencies responsible for civil defense, police, security, and other critical services.

4.1.2 STATE LAND USE LAW

The Hawai'i State Legislature adopted the State Land Use Law in 1961 to protect Hawai'i's valuable lands from development that resulted in short-term gains for a few and long-term losses to the income and growth potential of the State's economy. Accordingly, the Legislature established an overall framework of land use management. HRS Chapter 205 placed all lands within the State in one of four land use districts: Urban, Agricultural, Conservation, or Rural (the Rural District was added in 1963), and established the State Land Use Commission (LUC) to administer the designated land use districts. The project site is located in the Conservation District. See Figure 4-1 for a State Land Use Map.

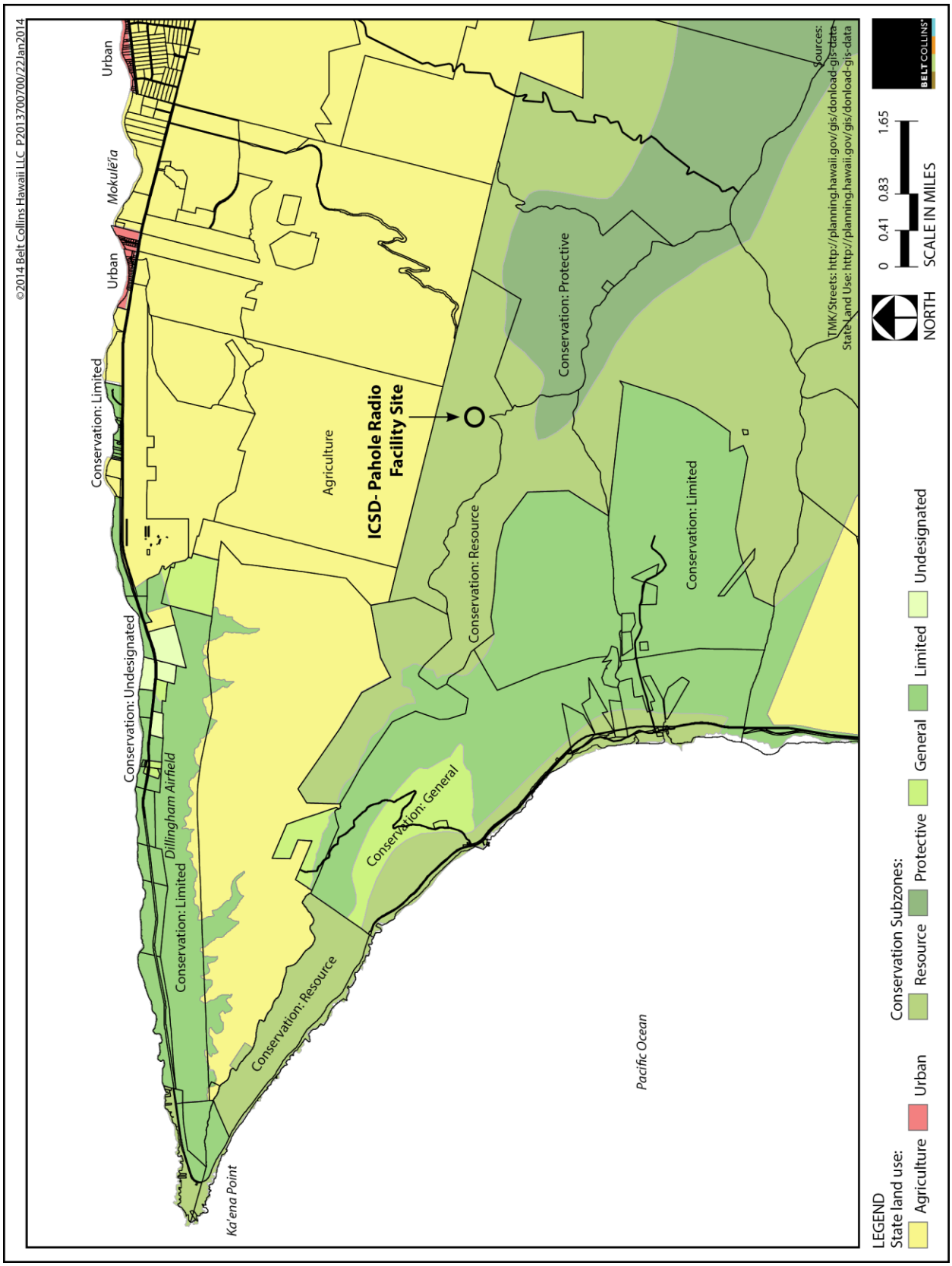

Figure 4-1: State Land Use Map

Conservation District lands are administrated by the State Board of Land and Natural Resources and uses within the Conservation District are governed by rules established by the DLNR. Hawai'i Administrative Rules (HAR) 13-5 establishes regulations for Conservation District lands for the "purpose of conserving, protecting, and preserving the important natural and cultural resources through appropriate management and use to promote their long-term sustainability, and the public health safety and welfare".[58] Conservation District lands are further classified into one of five subzones: Protective, Limited, Resource, General, and Special. The subzones form a hierarchy of lands containing the most sensitive resources and having the greatest restrictions on use to the least sensitive and fewest restrictions, with Protective being the most sensitive and General the least sensitive. The Special subzone is used for areas with unique development qualities that complement the area's natural resources. The project site is located in the Resource subzone. The objective of this subzone is to ensure the sustainable use of the natural resources of those areas.

The Agricultural Lands of Importance to the State indicate that the project site is not an important agricultural area and, therefore, its agricultural potential is low.[59] The nearest important agriculture lands are located in lower elevation, flatter lands at distances starting approximately one-mile away.

Under the HAR, Title 13: "Department of Land and Natural Resources," Subtitle 1: "Administration," Chapter 5: "Conservation District," Subchapter 3: "Subzones," Section 13-5-13: "Resource (R) subzone" the following is stated:

(a) In addition to land use identified herein, all identified land uses and their associated permit or site plan approval requirements listed for the protective and limited subzones also apply to the resource subzone, unless otherwise noted.

(b) Identified land uses in the protective subzone and their required permits (if applicable), are listed below:

(4) Identified land uses beginning with letter (D) require a board permit, and where indicated, a management plan.

P-6 Public Purpose Uses

(D-1) Not for profit land uses undertaken in support of a public service by an agency of the county, state, or federal government, or by and independent non-governmental entity, except that an independent non-governmental regulated public utility may be considered to be engaged in a public purpose use. Examples of public purpose uses may include but are not limited to public roads, marinas, harbors, airports, trails, water systems and other utilities, energy generation from renewable sources, communication systems, flood or erosion control projects, recreational facilities, community centers, and other public purpose uses, intended to benefit the public in accordance with public policy and the purpose of the conservation district.

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58 State of Hawai'i, Department of Land and Natural Resources. 2011. *Hawai'i Administrative Rules 13-5*.

59 State of Hawai'i, Department of Agriculture. 1977. *Agricultural Lands of Importance to the State of Hawai'i*.

P-14 Telecommunications

(D-1) New telecommunications facility. A management plan approved simultaneously with the permit, is also required.

Per HAR 13-5-22, the identified use requires a Conservation District Use Permit (CDUP) with a Management Plan for board approval.

4.1.3 STATE ENVIRONMENTAL POLICY

HRS Chapter 344 establishes an environmental policy that (1) encourages productive and enjoyable harmony between people and their environment, (2) promotes efforts that will prevent or eliminate damage to the environment and biosphere, (3) stimulates the health and welfare of humanity, and (4) enriches the understanding of the ecological systems and natural resources important to the people of Hawaiʻi.

The proposed project is consistent with the following section of the State Environmental Policy as follows:

HRS 344-3(1) Conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State's unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which humanity and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawaii.

The proposed action calls for improvements to State communication facilities that provide statewide communications services. The project would benefit the general welfare through improving critical and general governmental services in the State. The existing site was selected to avoid disturbing a new potentially undeveloped area. Impacts to natural resources associated with this project are expected to be temporary and will cease to exist once construction is completed. BMPs, along with recommendations from the biologist will minimize effects on the natural environment at the project site and along the access road.

Section 344-4 – Guidelines:

2. Land, water, mineral, visual, air, and other natural resources

B. Promote irrigation and waste water management practices which conserve and fully utilize vital water resources.

The project will be consistent with these guidelines because part of the proposed work includes constructing new catchment water tanks and relocating the irrigation system that will be used for the plant nurseries located at Pahole. The upgrading and modification of the catchment water tanks and irrigation lines will help maintain an efficient method of water dispersion without using potable water for irrigation.

3. Flora and fauna

A. Protect endangered species of indigenous plants and animals and introduce new plants or animals only upon assurance of negligible ecological hazard.

B. Foster the planting of native as well as other trees, shrubs, and flowering plants compatible to the enhancement of our environment.

There are several BMPs that will be used during the construction phase of this project to minimize impact to endangered species of plants and animals that may be present near the site. Where re-vegetation is performed after a construction activity replanting will include native plant species, as appropriate. More details regarding these BMPs and recommendations can be found in Chapter 3.

4.1.4 STATE HISTORIC PRESERVATION PROGRAM

The SHPD, HRS 6E, is intended to conserve and develop the historic and cultural property within the State for the public good. The legislation declares that it shall be the public policy of the State to provide leadership in preserving, restoring, and maintaining historic and cultural property, and to conduct activities, plans, and programs in a manner consistent with the preservation and enhancement of historic and cultural property. Chapter 6E-8 requires that a proposed State project which may affect historic property or a burial site conduct consultation with the SHPD and that the project shall not commence until the SHPD has given written concurrence.

Section 3.4 of this document, entitled "Archaeological and Cultural Resources," describes the archaeological and cultural studies that have been conducted for the project site. There are no archaeological sites of significance within the project site. The project will demolish a generator building, modify two buildings by drilling holes in the wall to install the electric and communications lines, and modify a concrete tower by removing the platform and installing antennas. These features are all eligible for inclusion on the HRHP because they are more than 50 years old and constructed during the cold war era. Consultation with SHPD has begun in accordance with Chapter 6E-8, which includes consultation with SHPD Architecture Branch.

4.1.5 HAWAIʻI COASTAL ZONE MANAGEMENT PROGRAM

The Hawaiʻi Coastal Zone Management (CZM) Program was promulgated in 1977 in response to the Federal CZM Act of 1972. Per HRS 205A-1, the areas encompassed by the CZM are all the lands and waters of the State. The next sections assess the project in relation to the objectives and policies of the CZM Program.

4.1.5.1 Recreational Resources

The proposed project will not interfere with, nor obstruct public efforts to meet the CZM objective and policies relating to providing coastal recreational opportunities accessible to the public.

4.1.5.2 Historic Resources

Studies have been conducted to investigate and identify archaeological and cultural resources that might be impacted by the proposed project. Results of the studies are described in Section 3.4 of this document and no adverse impacts on archaeological or cultural resources are anticipated.

4.1.5.3 Scenic and Open Space Resources

The proposed action involves the construction of a new ICSD building; reconditioning an existing tower to install microwave dishes and antennas; relocation of water storage tanks and irrigation

lines; relocation of a utility pole; and installation of underground utility conduits. The project will not interfere with nor obstruct public efforts to meet the CZM objective and policies relating to the protection, preservation, and restoration or improvement of the quality of coastal scenic and open space resources. Section 3.12 of this document discusses visual and aesthetic resources.

4.1.5.4 Coastal Ecosystems

The proposed project is located a long distance inland from the shoreline and would not adversely impact valuable coastal ecosystems, including offshore reefs.

4.1.5.5 Economic Uses

The CZM objective and policies pertaining to economic uses is to provide for public or private facilities and improvements important to the State's economy in suitable locations. Modern telecommunications systems are vital to protecting and maintaining the health and welfare of the residents and visitors in the State. A safe and protected environment is an important component to a prosperous economy. The project co-locates a needed public communication facility with other communication facilities, thus making the most efficient use of a developed area that is suitable for such communication facilities.

4.1.5.6 Coastal Hazards

Due to the proposed project's mountain location, there is no risk to the proposed project from coastal hazards.

4.1.5.7 Managing Development

The proposed project will not interfere with public efforts to improve the development review process, communication, and public participation in the management of coastal resources and hazards.

4.1.5.8 Public Participation

The proposed project is engaged in public participation by virtue of this EA preparation and public comment/response process. Through this State environmental review process, information and public awareness are generated on the project and its affected environment.

4.1.5.9 Beach Protection

Due to the proposed project's mountain location, there is no risk of adverse impacts to beaches for public use and recreation.

4.1.5.10 Marine Resources

The proposed project site is located several miles from the ocean and contains no streams or other surface water bodies that connect to the ocean. BMPs will be employed during construction to control runoff and erosion.

The proposed project would not obstruct public efforts to implement the State's ocean resources management plan.

4.2 CITY AND COUNTY OF HONOLULU

4.2.1 GENERAL PLAN

The City's General Plan (last amended in 2002) is comprised of 11 sections: Population; Economic Activity; Natural Environment; Housing; Transportation and Utilities; Energy; Physical Development and Urban Design; Public Safety; Health and Education; Culture and Recreation; and Government Operations and Fiscal Management.

The sections on Natural Environment and Public Safety sections are relevant to this EA and are presented and discussed in Table 4-1.

Table 4-1. Applicable Sections of the General Plan

NATURAL ENVIRONMENT
OBJECTIVE B: To preserve and enhance the natural monuments and scenic views of O'ahu for the benefit of both residents and visitors.
Policy 1: Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea.
COMMENT: Radio communication systems require line-of-sight between facilities; therefore locations above surrounding topography are necessary, which are often prominent mountain locations. Since communication facilities already exist at the Pahole site, the proposed action would limit the potential need to utilize an undeveloped site.
PUBLIC SAFETY
OBJECTIVE B: To protect the people of O'ahu and their property against natural disasters and other emergencies, traffic and fire hazards, and unsafe conditions.
Policy 4: Cooperate with State and Federal agencies to provide tsunami warning and protection for O'ahu.
Policy 5: Cooperate with State and Federal agencies to provide protection from war, civil disruptions, and other major disturbances.
Policy 8: Provide adequate search and rescue and disaster response services.
Policy 11: Develop civil defense plans and programs to protect and promote public health, safety, and welfare of the people.
COMMENT: The proposed action will improve the functionality and reliability of the State, County, and Federal communication systems. These communication systems provide mission support for emergency rescue, civil defense, emergency medical services, police, fire, and critical government operations.

4.2.2 CITY DEVELOPMENT PLANS

The City Charter requires the establishment of development plans with conceptual schemes for accomplishing the objectives and policies of the City's General Plan. The City has created eight development plans that include land use maps, statements establishing land use standards and

principles, statements establishing urban design principles and controls, and statements establishing priorities necessary to guide major development activities. Based on the City's policy to guide development to specific regions, the plans for 'Ewa and the Primary Urban Center, to which most development is to be directed, are titled "Development Plans," and the plans for the remaining six communities, where growth is to remain relatively stable, are titled "Sustainable Communities Plans."

While Pahole is situated along the ridge line of the Waiʻanae Mountain Range the project site is located within the North Shore Sustainable Communities Plan (SCP). The project's conformance and consistency with relevant policies are discussed in the sections below.

4.2.2.1 North Shore Sustainable Communities Plan

The area covered by the North Shore SCP is often times identified as "the country." The Plan's policies focus on maintaining the rural character and land conservation with growth limited to "infill" areas within or adjacent to built-up areas. One of the overarching goals in the North Shore SCP is to maintain the region's population at 1.7 percent of the island-wide population through the year 2025.[60]

Figure 4-2 shows the Land Use Map from this community plan. The Pahole project area is designated as "Preservation" which is consistent with the policies and objectives under the State Land Use Conservation Zone classification. The project's conformance and consistency with relevant policies are addressed as follows:

Section 3.1 - Open Space and Natural Environment

Section 3.1.1 - Policies

- *Protect and enhance significant natural features and ecologically sensitive lands, including mountain areas, shoreline areas, wetlands, fishponds, natural gulches, streams and drainageways. Provide protective buffer zones and setbacks around biologically sensitive areas to minimize habitat disturbance.*
- *Protect forested areas and promote expansion of these areas through reforestation to ensure the long-term preservation of native species, watershed protection and aesthetic enhancement. Possible candidate sites that may be eligible for future Natural Area Reserves should be protected, including the Central Koʻolau Mountains, Upper Makaleha adjacent to Pahole Natural Area Reserve, and areas adjacent to Kaʻena Point.*

Project developments will not adversely impact the natural features surrounding the Pahole project area or Pahole Natural Area Reserve. The project has been designed to minimize the possibility of natural resource impacts. Construction will be limited to approximately 3.3 acres of previously developed land and BMPs will be employed during construction to minimize impacts. Following the recommendations provided in the biological report and comments from the USFWS, several precautionary measures will be used to minimize the risks to native or Federally listed species that

60 City and County of Honolulu, Department of Planning and Permitting. 2011. North Shore Sustainable Communities Plan. Prepared by Townscape, Inc.

traverse the project area. As described in Section 4.1.2 of this chapter, a CDUP with a Management Plan will be obtained to further ensure these forested areas are preserved.

Section 3.1.1 - Policies

- *Limit visual impacts from utility installations. Ensure that permitted utility installations are developed and/or managed in ways that maintain or enhance the natural, cultural, and scenic resource qualities of the surrounding landscape.*

The proposed project is not visible with the naked eye from nearby developed areas.

Section 3.1.2.1 - Mountain Areas

- *Maintain, protect and restore native forests and ecosystems within the State Conservation District and lands designated Preservation on the North Shore Sustainable Communities Plan Land Use Map. Ensure the protection of State conservation lands, especially those on the Ka'ena coastline and Mokulē'ia foothills*
- *Identify and protect endangered species habitats, native ecosystems, and other important ecologically sensitive areas, including the natural area reserves and forest reserves, from such threats as fire, alien species, feral animals, and human activity.*

The proposed project will not adversely affect native forests and ecosystems within the State Conservation District and lands designated Preservation on the North Shore SCP Land Use Map. Several critical habitats in the area have been identified, including the O'ahu 'elepaio bird habitat that encompasses the Pahole project area. Other critical habitats (listed in Section 3.4 of this document) cross over or abut the Mokulē'ia access road. Implementing BMPs along with recommendations listed in the biological report and the USFWS will ensure that during construction, impacts to the surrounding habitats and ecosystems are mitigated. A CDUP with a Management Plan will be obtained to further ensure these protected endangered species habitats, native ecosystems, and other important ecologically sensitive areas are preserved.

Section 3.1.2.7 - Scenic Resources and Scenic Views

- *Views of the Wai'anae and Ko'olau Mountains, The Pacific Ocean and shoreline, Waialua and Hale'iwa Towns from Kamehameha Highway and Kaukonahua Road as one enters the North Shore.*
- *Mauka (mountain) views of the Wai'anae Mountains from Farrington Highway, Kaukonahua Road, Kamehameha Highway, and Weed Junction.*
- *Stationary views from the shoreline between Ka'ena Point and Makaleha Beach.*
- *Views of the Wai'anae Mountain Range and agriculture fields from Crozier Drive.*
- *Site new antennas, telecommunication equipment and alternative energy systems in appropriate locations to minimize their impact on visual resources. Encourage site clustering and techniques that blend the equipment into the natural landscape.*
- *Discourage the use and installations of overhead utility lines and poles. Strong considerations should be given to placing replacement and new transmission lines underground. Undergrounding utility lines will enhance viewplanes and increase highway safety. Whenever possible, relocate or place underground overhead utilities that significantly obstruct public*

views. If unavoidable, locate any future overhead utilities on the mauka (mountain) side of the public coastal highway.

The proposed project will not have a significant impact on existing mauka (mountain) views from valley or coastline locations. Most of the improvements are not visible from the shoreline, roadways, or developed areas. The utility lines will be placed underground.

Section 3.4 - Historic and Cultural Resources

- *Preserve and protect significant cultural and historic features from earlier periods*

Eight historic features built in the early 1960's were identified at the project site. The project will involve DOFAW's upper and lower buildings, a generator building, and a concrete tower structure, all of which were built to support the Nike missile program during the Cold War. These features are considered historic based on their age and military significance. Holes will be drilled through the outer walls of the upper and lower DOFAW buildings for the installation of new electric and communication lines. These minor modifications will not impact the historic character or the overall facade of the buildings. The rectangular concrete platform will be removed from the top of the Nike concrete tower structure and antennas will be fastened to the remaining concrete column. The Nike tower structure was previously modified when the radar acquisition equipment was removed. The additional modifications are not expected to further displace or adversely impact the remaining historic value of this structure. The Nike era generator building will be demolished due to its poor condition and location to the project's future installations. The generator building has been photographed, mapped, and documented in other ways in an effort to maintain an accurate record of its historic existence at the Pahole site. See Section 3.4 of this document for more discussion.

Section 4.8 – Public Safety Facilities

Section 4.8.1 – Policies

- *Promote an integrated approach to public safety on the North Shore, which will enable police, fire, ocean safety, civil defense, and emergency medical efforts to share resources and information, as appropriate.*
- *Provide adequate staffing and facilities to ensure effective and efficient delivery of basic government service and protection of public safety.*

The installation of the new ICSD communication facilities will provide integral assistance to Federal, State, and local agencies to help maintain and improve police, fire, ocean safety, civil defense, and emergency medical efforts.

Section 4.9 – Other Community Facilities

Section 4.9.1 – Policies

- *Encourage co-location of antennae; towers should host the facilities of more than one service provider to minimize their proliferation and reduce visual impacts.*
- *Mount antennae onto existing buildings or structures so that public scenic views and open spaces will not be negatively affected. However, except for the occupant's personal use, antennae on single-family dwelling roofs in residential districts are not appropriate.*

The project involves the construction of a new public communication facility co-located with existing communication facilities. Furthermore, the project was designed to minimize the project's footprint and to maximize opportunities for possible installation of future communication facilities at the site. The proposed project will underground utility conduits to house other communication lines for future users. This action will encourage co-location of antennas and other related communication devices. In an effort to maintain the same visual impacts, the ICSD dish antennas will be mounted on an existing concrete pillar that was once a part of the Cold War Era Nike facility. By reconditioning this already existing tower-like structure the proposed project minimizes the impact to public scenic views and open spaces.

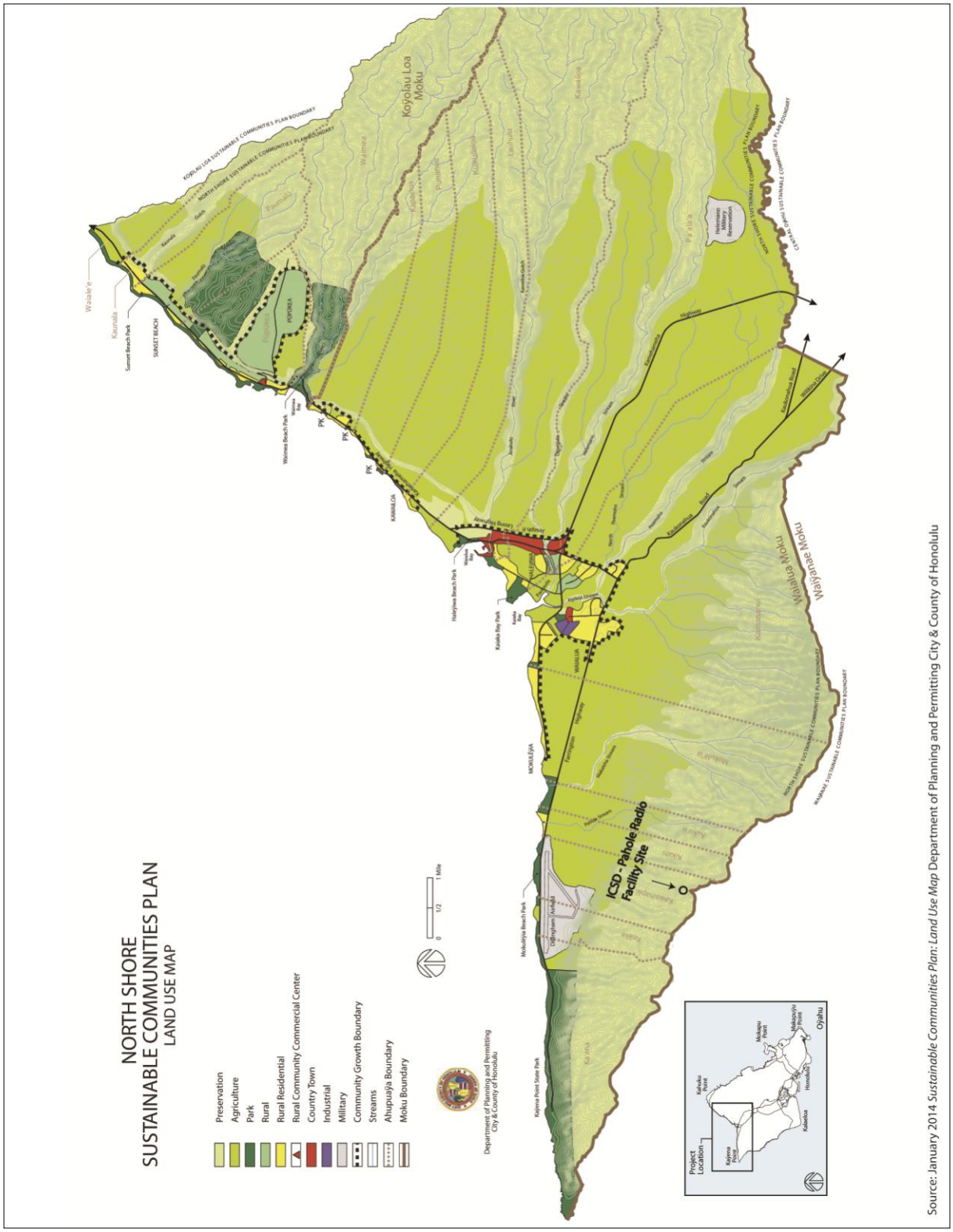

Figure 4-2: North Shore Sustainable Communities Plan Land Use Map

4.2.3 CITY LAND USE ORDINANCE

The City's Land Use Ordinance map designation of P-1, Restricted Preservation, reflects the City's zoning designation within State Conservation District lands. See Figure 4-3.

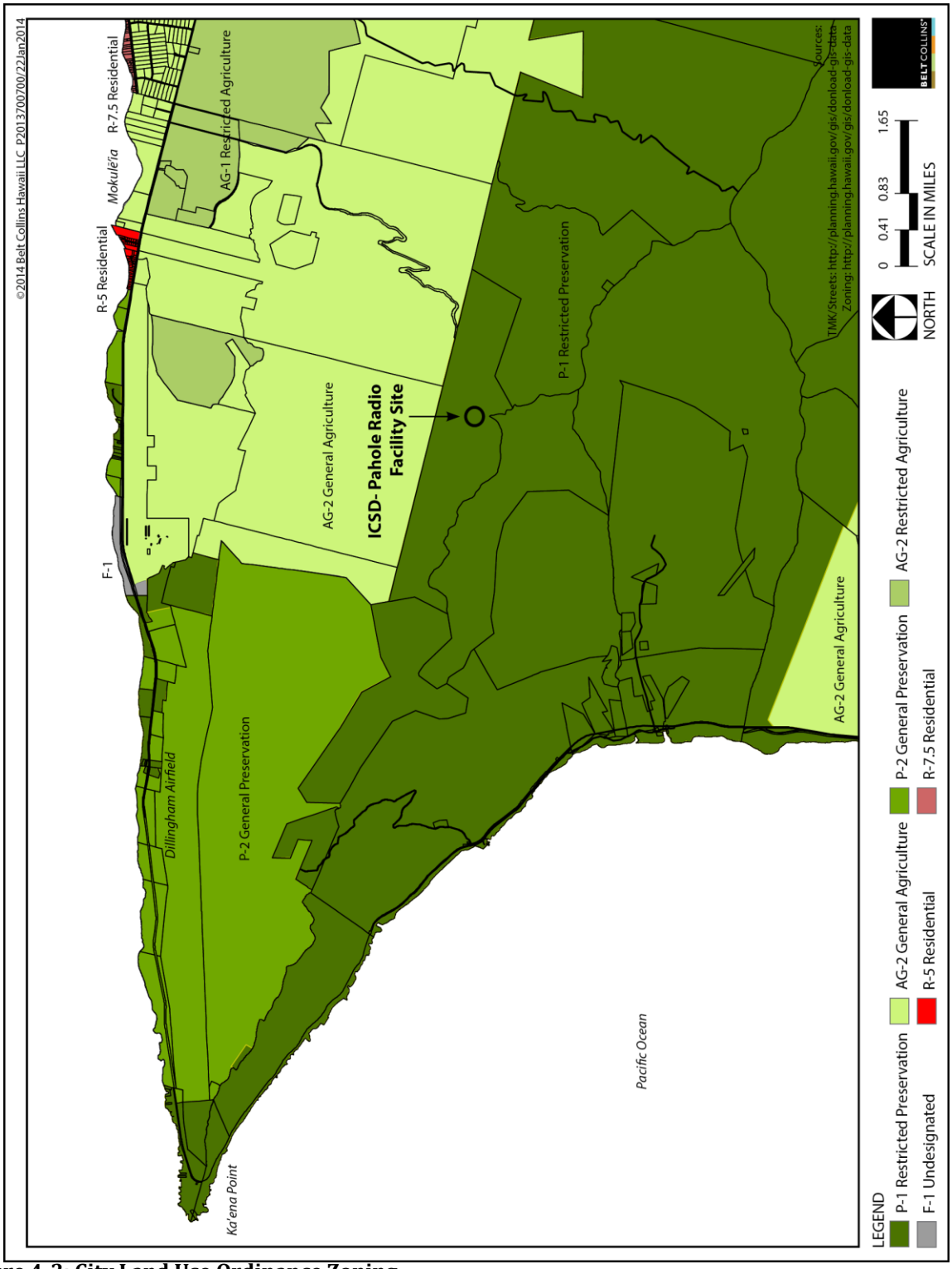

Figure 4-3: City Land Use Ordinance Zoning

4.2.4 SPECIAL MANAGEMENT AREA

The SMA on O'ahu is administered by the City. The SMA map shows the project site is located approximately 3 miles inland from the SMA and, therefore, would not be subject to Chapter 25, Revised Ordinances of Honolulu (ROH) governing SMAs.

4.2.5 SUMMARY OF REQUIRED PERMITS AND APPROVALS

Per Chapter 18, ROH, the proposed action by a State government agency is exempt from building, electrical, plumbing, and sidewalk permits, except when permits are specifically requested by the State agency. Chapter 14, ROH, which covers grading, grubbing, and stockpiling, does not provide State agency work a similar exemption. In addition to the required City permits and approvals, DAGS intends to acquire all permits that would otherwise be required if the action where not undertaken by a State agency. Table 4-2 provides a summary of the permits and approvals applicable for the proposed project.

Table 4-2. Summary of Required Permits and Approvals

Construction Activity	Required Permit/ Approvals	Approving Agency
Earthwork and installation of underground lines.	Grading permit; electrical code review	City Department of Planning and Permitting (DPP)
Building Construction	Building permit	DPP
Utility pole and conduits	Electrical code review	DPP
Building and utility installments	CDUP & Management Plan	OCCL

5 ANTICIPATED DETERMINATION

This Draft EA demonstrates that the proposed action will have no significant adverse impact on the environment and that an Environmental Impact Statement is not warranted. A FONSI is, therefore, anticipated for this proposed action.

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6 FINDINGS AND REASONS SUPPORTING ANTICIPATED DETERMINATION

The following findings and reasons indicate that the proposed action will have no significant adverse impact on the environment based on the 13 significance criteria provided in the HAR 11-200-12, and as a result supports the anticipated FONSI determination.

- *Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.*
  The flora, fauna, archaeological, and cultural impact studies conducted for this proposed action indicate that with the implementation of identified mitigation measures there will be no significant adverse impacts on natural or cultural resources.

- *Curtails the range of beneficial uses of the environment.*
  The proposed action involves the construction of a communication facility on a site with existing communication facilities. Other project improvements have been designed with the input of other site users. No uses are being displaced or curtailed by the proposed action.

- *Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS.*
  As demonstrated in this document, the proposed action is consistent with Hawai'i's long-term environmental policies and guidelines as expressed in Chapter 344, HRS.

- *Substantially affects the economic or social welfare of the community or state.*
  The proposed action is expected to improve the reliability and functionality of the State's communication system, which will assist the State, County, and Federal agencies in their delivery of public services to the community. Moreover, the construction activity associated with the proposed action will create jobs and infuse business and personal income into the local economy. No negative effects on the social welfare of the local community are anticipated.

- *Substantially affects public health*.
  The proposed action will not utilize hazardous materials or construction methods that would affect public health. The noise, air, and water quality regulations of the DOH will be followed. The proposed action will be implemented in accordance with State and City standards.

- *Involves substantial secondary impacts, such as population changes or effects on public facilities.*
  The proposed action involves the construction on a new communication facility and upgrades to existing facilities. Once completed the project will not change the existing uses of the project site or substantially increase the activity at the site. The project will not result in a significant increase in demand for public facilities. No increase in residential population or public facility demands are expected by this proposed action.

- *Involves a substantial degradation of environmental quality.*

  The proposed action involves earthwork for grading and installation of underground conduits primarily in areas that are disturbed. The proposed action was designed to minimize the footprint of construction activities. BMPs will be employed during construction to control erosion and runoff. Therefore, no substantial degradation of environmental quality is expected.

- *Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.*

  The proposed action involves improvements to existing facilities and construction of a new facility in order to meet current State standards, public user demands, and technological changes. The proposed action will be designed to provide for future expansion of communication equipment and/or users.

- *Substantially affects a rare, threatened, or endangered species, or its habitat.*

  The Hawaiian hoary bat was found to traverse the site on occasion. During construction, special vegetation trimming methods will be utilized to minimize impacts to Hawaiian hoary bats, Oʻahu ʻelepaio, and native snails.

- *Detrimentally affects air or water quality or ambient noise levels*.

  During construction, the effects of dust and runoff will be mitigated by establishing and following BMPs. Construction noise will be mitigated by scheduling start and curfew times per DOH requirements. The nearest noise sensitive receptors are located at the Peacock Flats Campground approximately 0.5 miles from the project site. Once construction is completed, no detrimental effects are expected from the proposed action.

- *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.*

  The proposed action is situated outside of the flood plain and is at a great distance from the shoreline and tsunami evacuation zone. There are no streams or other water bodies that will be impacted in or near the project site.

- *Substantially affects scenic vistas and viewplanes identified in county or state plans or studies*.

  The proposed action involves the reconditioning of an existing tower to harness new microwave dishes and antennas, which would result in no increase in height of the existing tower. Given their slender dimensions, the addition of the lightning rod and whip antennas will be difficult to see with the naked eye beyond the project fence line. Project building and site improvements would not be visible from outside of the fenced site. The proposed action will not affect scenic vistas or viewplanes identified in City or State plans. There are no lights at the project site that are visible at night.

- *Requires substantial energy consumption.*

  Although the project will increase the electrical demand at the Pahole site, HECO's existing high-voltage overhead system can adequately service the increased demand. The proposed action involves the construction of a new communication facility and the installation of new microwave antennas.

7 COMMENTS

The agencies and interested parties contacted as part of the pre-consultation process are as follows:

Federal Agencies

- Environmental Protection Agency, Region IX, Pacific Islands Office
- U.S. Army Corps of Engineers, Pacific Ocean Division
- U.S. Department of Homeland Security, U.S. Coast Guard, 14th Coast Guard District
- U.S. Department of the Interior, U.S. Fish and Wildlife Service
- U.S. Department of Transportation, Federal Aviation Administration

State Legislature

- Senator Donovan M. Dela Cruz, State Senate District 22
- Representative Lauren Kealohilani Cheape, State House District 45

State Agencies

- Department of Defense
- Department of Accounting and General Services
- Department of Hawaiian Home Lands
- Department of Health
- Department of Land and Natural Resources
- Office of Conservation and Coastal Lands
- Office of Hawaiian Affairs
- State Historic Preservation Division
- Office of Planning
- Land Use Commission

City Council

- Councilmember Ernest Y. Martin, Council District 2

City Agencies

- Department of Design and Construction
- Department of Emergency Management
- Department of Emergency Services

- Department of Environmental Services
- Department of Planning and Permitting
- Office of Information Management and Technology

Other Interested Parties

- North Shore Neighborhood Board/Mokulēʻia Community Association
- The Nature Conservancy of Hawaiʻi
- Hawaiʻi Historic Foundation
- Oceanic Time Warner Cable

The agencies and interested parties that provided comments as part of the pre-consultation process are listed below. Copies of the comment and the response letters are included in Appendix A of this document.

- City and County of Honolulu, Department of Design and Construction
- City and County of Honolulu, Department of Planning and Permitting
- State of Hawaiʻi, Department of Land and Natural Resources
- State of Hawaiʻi, Department of Health, Compliance Assistance Ombudsman
- State of Hawaiʻi, Office of Planning
- U.S. Department of Interior, Fish and Wildlife Office
- Oceanic Time Warner Cable

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APPENDIX A

Pre-Consultation Comment Letters and Responses

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

RECEIVED
2013 NOV 13 PM 2:36
BELT COLLINS HAWAII

In reply, please refer to:
File:

November 7, 2013

Ms. Joanne Hiramatsu
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Regarding: Environmental Assessment Pre-Consultation Proposed Information and Communication Services Division Pahole Radio Facility at Pahole Rare Plant Nursery Site

Dear Ms. Hiramatsu:

I have reviewed your plans to upgrade the Pahole radio facility at the Pahole plant nursery. At this time, I have no comments, but will reserve comments after reviewing the environmental assessment.

Sincerely,

Genevieve Salmonson
Department of Health
Compliance Assistance Ombudsman
919 Ala Moana Blvd., Room 219
Honolulu, Hawaii 96814

Promoting Lifelong Health & Wellness

BELT COLLINS

February 21, 2014
2012.70.0400 / 13P-026

Ms. Genevieve Salmonson
State of Hawaii
Department of Health
Compliance Assistance Ombudsman
919 Ala Moana Boulevard, Room 219
Honolulu, HI 96814

Dear Ms. Salmonson:

Environmental Assessment Pre-consultation
Proposed Information and Communication Services Division
Pahole Radio Facility at Pahole Rare Plant Nursery Site
Tax Map Key: (1)-6-8-001:004 Waialua

Thank you for your November 7, 2013 response stating that the Department of Health, Compliance Assistance Ombudsman, does not have any pre-consultation comments to offer on the proposed Information and Communication Services Division Radio Facility at Pahole Rare Plant Nursery Site.

If you have any questions, please feel free to call me at 521-5361, ext. 309, or you can email me at jhiramatsu@bchdesign.com.

Sincerely yours,
BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JFT/JEH:ajk

cc: Mr. David DePonte – ICSD

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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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

RECEIVED
2013 NOV 22 PM 12: 46
BELT COLLINS HAWAII

November 21, 2013

Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819

Attn: Joanne Hiramatsu

Dear Ms. Hiramatsu:

Subject: Environmental Assessment Preconsultation Proposed Information and Communication Services Division Pahole Radio Facility at Pahole Rare Plant Nursery Site Tax Map Key: (1)-6-8-001:004 Waialua District, Oahu, Hawaii

The Department of Design and Construction does not have any comments to offer on the environmental assessment preconsultation.

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 (537362)

BELT COLLINS

February 21, 2014
2012.70.0400 / 13P-023

Mr. George I. Atta, FAICP, Director
City and County of Honolulu
Department of Planning and Permitting
650 South King Street, 7th Floor
Honolulu, Hawai'i 96813

Dear Mr. Atta:

Environmental Assessment Pre-consultation
Proposed Information and Communication Services (ICSD) Division for
Pahole Radio Facility at Pahole Rare Plant Nursery
Site Tax Map Key: (1)-6-8-001:004 Waialua

Thank you for your December 3, 2013 comment letter regarding the Information and Communications Service Division Pahole Radio Facility proposed improvements and installations. The pending Draft Environment Assessment (DEA) will incorporate the comments you have provided and further detail the proposed project's consistency with the issues you have brought to our attention.

The DEA will include a discussion of how the proposed project is consistent with Objective B and applicable policies of Section VIII Public Safety in the City and County of Honolulu's General Plan. The DEA will include a discussion of visual impacts, day and night, and will include a listing of required permits and approvals.

Should you have any questions, feel free to contact me at 521-5361, ext. 309, or you can email me at jhiramatsu@bchdesign.com.

Sincerely yours,
BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JFT/JEH:ajk

cc: Mr. David DePonte - ICSD

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
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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:/planning.hawaii.gov/

RECEIVED
2013 DEC -3 PM 3:30
BELT COLLINS HAWAII

Ref. No. P-14188

November 27, 2013

Ms. Joanne E. Hiramatsu, Director of Planning
Belt Collins Hawaii, LLC
2153 N. King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

Subject: Early Consultation Request for Proposed Information and Communication Services Division Pahole Radio Facility at Pahole Rare Plant Nursery Site; TMK: (1) 6-8-001:004 (por), Waialua, Oahu, Hawaii

Thank you for the opportunity to provide comments on the Department of Accounting and General Services (DAGS) Information and Communication Services Division's (ICSD) proposal to upgrade their ICSD Radio Facility at the Pahole Plant Nursery located in Waialua, Oahu.

We have reviewed the documents submitted to our office by letter dated November 12, 2013, and have the following comments to offer.

1. The entire state is defined to be within the Coastal Zone Management Area, see Hawaii Revised Statutes (HRS) §205A-1 (definition of "coastal zone management area"). The Draft Environmental Assessment (Draft EA) should include a discussion of the proposed project's ability to meet the objectives and policies set forth in HRS §205A-2.

2. The construction project may have nonpoint pollution impacts on coastal waters. Please review the Hawaii Watershed Guidance, which provides a summary and links to management measures that may be implemented to minimize coastal nonpoint pollution impact. Specifically, please examine the section on Urban Areas/Site Development (page 109) and Urban Runoff Management Measures (page 120). The Hawaii Watershed Guidance can be viewed or downloaded from the Office of Planning website at http://files.hawaii.gov/dbedt/op/czm/initiative/nonpoint/HIWatershedGuidanceFinal.pdf.

3. The Draft EA should include the Coastal Zone Management Act, HRS Chapter 205A, in the list of "Relationship to Land Use Plans, Policies, and Controls."

If you have any questions regarding this comment letter, please contact Josh Hekekia of our Hawaii CZM Program at 587-2845.

Sincerely,

Jesse K. Souki
Director

BELT COLLINS

February 21, 2014
2012.70.0400 / 13P-025

Mr. Jesse K. Souki, Director
Office of Planning
State of Hawai'i
235 South Beretania Street, 6th Floor
Honolulu, Hawai'i 96813

Dear Mr. Souki:

Environmental Assessment Pre-consultation
Proposed Information and Communication Services Division (ICSD)
Pahole Radio Facility at Pahole Rare Plant Nursery Site
Tax Map Key: (1)-6-8-001:004 Waialua

Thank you for your November 29, 2013 comment letter regarding the Information and Communications Service Division Pahole Radio Facility proposed improvements and installations. The pending Draft Environment Assessment (DEA) will incorporate the comments you have provided and further detail the proposed project's consistency with the issues you have brought to our attention. At this time, we have the following responses to your comments.

The DEA will include a discussion of HRS §205A-1 Coastal Zone Management Area and the proposed project's ability to meet the objectives and policies set forth in HRS §205A-2.

We will review the *Hawaii Watershed Guidance* and address management measures applicable to this project. The DEA will include a discussion of Coastal Zone Management Act, HRS, Chapter 205A, from the list of "Relationship to Land Use Plans, Policies, and Controls."

If you have any questions, please feel free to call me at 521-5361, ext. 309, or you can email me at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JFT/JEH:ajk
cc: Mr. David DePonte - ICSD

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai`i 96850

RECEIVED
2013 DEC -3 PM 3:30
BELT COLLINS HAWAII

In Reply Refer To:
2014-TA-0050

DEC 0 2 2013

Ms. Joanne E. Hiramatsu
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, HI 96819-4554

Subject: Technical Assistance for Environmental Assessment Pre consultation for Proposed Information and Communication Services Division Pahole Radio Facility at Pahole Rare Plant Nursery Site, Oahu

Dear Ms. Hiramatsu:

The U. S Fish and Wildlife Service (Service) received your letter on November 5, 2013, requesting our assistance and comments pertaining to the Hawaii Department of Accounting and General Services (DAGS) Information and Communication Services Division (ICSD) project in the forthcoming Environmental Assessment (EA). The proposed work will include construction of a new communications building, installation of underground electric and telephone lines, a paved vehicular turnaround, and relocation of the nursery water catchment system. Space will also be set aside for the City and County of Honolulu to construct a new radio tower and building. We understand the project will require a Conservation District Use Permit from the State of Hawaii. A flora and fauna survey will be included in the EA to identify listed species that may be impacted from construction of the proposed improvements.

Specifically, you requested if permits, approvals, or other issues relating to this project will need to be addressed in the forthcoming EA. Your letter identified the presence of the state and federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the flora and fauna draft survey.

We have reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program as it pertains to listed species and designated critical habitat in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*). Our data indicate the endangered Oahu elepaio (*Chasiempis sandwichensis*) may also be present in the vicinity of the proposed project site and federally designated critical habitat for the Oahu elepaio surrounds the proposed project footprint. Critical habitat – Lowland Wet – Unit 9 also surrounds the proposed project footprint. The Oahu – Lowland Wet – Unit 9 critical habitat was designated for the following

TAKE PRIDE IN AMERICA

43 species: *Adenophorus periens*, *Chamaesyce rockii*, *Cyanea acuminate*, *Cyanea calycina*, *Cyanea crispa*, *Cyanea grimesiana* ssp. *grimesiana*, *Cyanea humboldtiana*, *Cyanea koolauensis*, *Cyanea lanceolata*, *Cyanea purpurellifolia*, *Cyanea st.-johnii*, *Cyanea truncate*, *Cyrtandra dentate*, *Cyrtandra gracilis*, *Cyrtandra kaulantha*, *Cyrtandra polyantha*, *Cyrtandra sessilis*, *Cyrtandra subumbellata*, *Cyrtandra viridiflora*, *Cyrtandra waiolani*, *Gardenia mannii*, *Hesperomannia arborescens*, *Huperzia nutans*, *Isodendrion longifolium*, *Labordia cyrtandrae*, *Lobelia gaudichaudii* ssp. *koolauensis*, *Lobelia oahuensis*, *Melicope hiiakae*, *Melicope lydgatei*, *Myrsine juddii*, *Phyllostegia hirsute*, *Phyllostegia parviflora*, *Plantago princeps*, *Platanthera holochila*, *Platydesma cornuta* var. *cornuta*, *Psychotria hexandra* ssp. *oahuensis*, *Pteralyxia macrocarpa*, *Pteris lidgatei*, *Sanicula purpurea*, *Tetraplasandra gymnocarpa*, *Trematolobelia singularis*, *Viola oahuensis*, and *Zanthoxylum oahuense*.

Additionally, numerous species of state and federally endangered plant species are grown within the U. S. Army Environmental nursery and the Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) Pahole Rare Plant Nursery, both located at the construction site. We offer the following recommendations to assist you in the preparation of the EA:

Hawaiian hoary bat

The Hawaiian hoary bat roosts in both exotic and native woody vegetation and, while foraging, will leave young unattended in "nursery" trees and shrubs when they forage. If trees or shrubs suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed. To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Site clearing should be timed to avoid disturbance to Hawaiian hoary bats in the project area.

Oahu elepaio

We recommend working with qualified biologists to obtain the most updated information on Oahu elepaio territories in the area. In areas of proposed site clearing and fencing, we recommend a qualified biologist survey to ensure any trees occupied by Oahu elepaio or their nests are not cleared or removed prior to any work being done. Territories may have shifted, added or dropped out from where they may have previously been. In addition, we recommend you avoid conducting potentially disturbing activity, such as the use of chain saws or other machinery, in the vicinity of known Oahu elepaio nests during the breeding season. Rotor wash from helicoptors have the potential to adversely affect elepaio. If helicopter work is proposed for transporting construction supplies to and from the project site, we recommend the helicopter stay at or above the height of the conductors and power lines. Oahu elepaio breeding season is usually mid-February through May, but active nests have been found January through July.

Critical Habitat for Oahu elepaio and Oahu Lowland Wet Unit 9

Although existing manmade features and structures within the boundaries of critical habitat (such as buildings, roads, paved areas, communication facilities and their regularly maintained rights-of-ways) are excluded, we recommend the EA address impacts to critical habitat by minimized

vegetation clearing to avoid effects to the ecosystem which supports the above mentioned plant species and Oahu elepaio. The Service also considers the spread of non-native invasive species to be a major threat to critical habitat and threatened and endangered species because of their potential to become established and thereby alter existing terrestrial ecosystems. We recommend the EA address construction activities and transportation of equipment that have the potential to introduce and expand non-native invasive species (*i.e.*, microbes, plants, vertebrates, and invertebrates). Pathways for the introduction and spread of non-native invasive species via the proposed action could be, but are not limited to, construction equipment and materials, personal protective equipment, vehicles/vessels and their contents, shipping material, and other sources that provide conditions for transport of non-native invasive species. The Service recommends that any proposed work evaluate the potential of movement and dispersal of invasive species due to planned activities, and adopt measures to prevent or reduce impacts from invasive species. These measures could include activities such as washing trucks before use in the area and visual inspection of equipment and supplies for vegetation, soil, insects and other possible contaminants.

We recommend the EA address the need to provide a continuous supply of water the U. S. Army Environmental nursery and the Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) Pahole Rare Plant Nursery, both located at the construction site. Staff from these organizations and other conservation partners will need access during the proposed construction and the EA should address this issue.

The City and County of Honolulu will have an area set aside for construction and we recommend they follow the actions included in the final EA when erecting their radio tower and building.

We appreciate your efforts to conserve Hawaii's protected species. If you have questions regarding this letter, please contact Vickie Caraway, Fish and Wildlife Botanist, (phone 808 792-9424, fax 808 792-9581).

Sincerely,

Aaron Nadig
Acting Team Manager – Oahu, Kauai, Northwestern Hawaiian Islands and American Samoa

BELT COLLINS

February 21, 2014
2012.70.0400 / 13P-024

Mr. Aaron Nadig
Action Team Manager – Oahu, Kaua'i
Northwestern Hawaiian Islands and American Samoa
United States Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850

Dear Mr. Nadig:

Environmental Assessment Pre-Consultation
Proposed Information and Communication Services Division (ICSD) for
Pahole Radio Facility at Pahole Rare Plant Nursery Site
Tax Map Key: (1)-6-8-001:004 Waialua

Thank you for your December 2, 2013 comment letter on the pre-consultation for the Draft Environmental Assessment (DEA) regarding the Information and Communications Service Division Pahole Radio Facility proposed improvements and installations project. The pending DEA will incorporate the comments you have provided and further detail the proposed project's consistency with the issues you have brought to our attention.

The DEA will address mitigation measures for the endangered plants and animals, specifically the Hawaiian hoary bat and the Oahu elepaio. Other than the rare plants being propagated in the nursery, no endangered plants were found in areas that would be disturbed by the construction of the radio facility upgrades.

The water system servicing the Pahole Rare Plant Nursery will be improved to provide irrigation water for the existing facility.

Should you require additional comments or have any questions, feel free to contact me at 521-5361, ext. 309, or you can email me at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JFT/JEH:ajk
cc: Mr. David DePonte - ICSD

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com

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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

Department of Land and Natural Resources
State of Hawaii

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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

December 2, 2013

Belt Collins Hawaii LLC
Attention: Ms. Joanne E. Hiramatsu
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

via email: jhiramatsu@beltcollins.com

Dear Ms. Hiramatsu,

SUBJECT: Environmental Assessment Preconsultation, Proposed Information and Communication Services Division, Pahole Radio Facility at Pahole Rare Plant Nursery Site

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) Engineering Division; and (4) 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

November 6, 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: Environmental Assessment Preconsultation, Proposed Information and Communication Services Division, Pahole Radio Facility at Pahole Rare Plant Nursery Site
LOCATION: Tax Map Key: (6)-8-001: portion 004, Waialua District, O`ahu, Hawai`i
APPLICANT: Department of Accounting and General Services (DAG) Information and Communication Services Division (ICSD) by its consultant, Belt Collins Hawaii LLC

Transmitted for your review and comment on the above-referenced document.

We would appreciate your comments on this document. Please submit any comments by November 29, 2013. 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: Nov 7, 2013

cc: Central Files

Comments:
The correct TMK is: (1) 6-8-001:004, under Mokuleia Forest Reserve. A set aside of land to ICSD would allow for site improvements such as: a new communication building, paved vehicular turnaround and utility improvements to serve electric and telephone lines purposes.

55914

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

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

RECEIVED
STATE PARKS

'13 NOV -7 A11:06

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 6, 2013

MEMORANDUM

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII
2013 NOV 14 PM 2:16
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: Environmental Assessment Preconsultation, Proposed Information and Communication Services Division, Pahole Radio Facility at Pahole Rare Plant Nursery Site
LOCATION: Tax Map Key: (6)-8-001: portion 004, Waialua District, O`ahu, Hawai`i
APPLICANT: Department of Accounting and General Services (DAG) Information and Communication Services Division (ICSD) by its consultant, Belt Collins Hawaii LLC

Transmitted for your review and comment on the above-referenced document.

We would appreciate your comments on this document. Please submit any comments by November 29, 2013. 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: Daniel S. Quinn
Date: 11/14/13

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

November 6, 2013

RECEIVED
LAND DIVISION
2013 NOV 18 PM 2:51
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

MEMORANDUM

FR:
~~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

TO:
~~FROM:~~ Russell Y. Tsuji, Land Administrator
SUBJECT: Environmental Assessment Preconsultation, Proposed Information and Communication Services Division, Pahole Radio Facility at Pahole Rare Plant Nursery Site
LOCATION: Tax Map Key: (6)-8-001: portion 004, Waialua District, O`ahu, Hawai`i
APPLICANT: Department of Accounting and General Services (DAG) Information and Communication Services Division (ICSD) by its consultant, Belt Collins Hawaii LLC

'13 NOV 07 AM 11:05 ENGINEERING

Transmitted for your review and comment on the above-referenced document.

We would appreciate your comments on this document. Please submit any comments by November 29, 2013. 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: 11/18/13

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/SteveMolmen
RE:PaholeRadioFacilityEAPreconsultation
Oahu.940

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 Flood Zone D. The National Flood Insurance Program does not have any regulations for developments within Zone D.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) 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:

( ) Mr. Mario Siu Li at (808) 768-8098 or Ms. Ardis Shaw-Kim at (808) 768-8296 of t he 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.
( ) Ms. 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 water demands and infrastructure required to meet project needs. Please note that projects within State lands requiring water service from the Honolulu Board of Water Supply system will be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

( ) 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 Ms. Suzie S. Agraan of the Planning Branch at 587-0258.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER
Date: 11/18/13

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 6, 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

2013 NOV -7 PM 12:37

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Environmental Assessment Preconsultation, Proposed Information and Communication Services Division, Pahole Radio Facility at Pahole Rare Plant Nursery Site
LOCATION: Tax Map Key: (6)-8-001: portion 004, Waialua District, O`ahu, Hawai`i
APPLICANT: Department of Accounting and General Services (DAG) Information and Communication Services Division (ICSD) by its consultant, Belt Collins Hawaii LLC

Transmitted for your review and comment on the above-referenced document.

We would appreciate your comments on this document. Please submit any comments by November 29, 2013. 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: W. Roy Hardy
Print Name: W. ROY HARDY
Date: 11/12/13

cc: Central Files

BELT COLLINS

February 21, 2014
2012.70.0400 / 13P-022

Mr. Russell Y. Tsuji
Land Administrator
State of Hawaii
Department of Land and Natural Resources
Land Division
P.O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Tsuji:

Environmental Assessment Pre-consultation
Proposed Information and Communication Services Division for
Pahole Radio Facility at Pahole Rare Plant Nursery Site
Tax Map Key: (1)-6-8-001:004 Waialua

Thank you for your December 2, 2013 pre-consultation comments on the proposed Information and Communication Services Division Radio Facility Upgrade at the Pahole Rare Plant Nursery site.

The tax map key will be modified in the in Draft Environmental Assessment as indicated by the Land Division. We will also get a right-of-entry from your office to allow for site improvements. We acknowledge that the project site is located in Flood Zone D, according to the Flood Insurance Rate Map. We understand that Division of State Parks and the Commission of Water Resources Management have no comments to offer at this time.

If you have any questions, please feel free to call me at 521-5361, ext. 309, or you can email me at jhiramatsu@bchdesign.com.

Sincerely yours,
BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JFT/JEH:ajk

cc: Mr. David DePonte – ICSD

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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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

RECEIVED
2013 DEC -4 PM 1:35
BELT COLLINS HAWAII

KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2013/ELOG-2146 (mh)

December 3, 2013

Ms. Joanne E. Hiramatsu
Director of Planning
Belt Collins Hawaii LLC
2153 North King Street, Suite 200
Honolulu, Hawaii 96819-4554

Dear Ms. Hiramatsu:

This is in response to your letter of November 4, 2013, regarding an Environmental Assessment Pre-consultation for the proposed Information and Communication Services Division Pahole Radio Facility at Pahole Rare Plant Nursery site. We offer the following comments:

1. The Draft Environmental Assessment (DEA) should include a discussion of how the proposed project is consistent with Objective B and applicable policies of Section VIII Public Safety in the City and County of Honolulu's General Plan.

2. The DEA should also include a discussion of visual impacts, day and night.

3. The DEA should further include a complete listing of required permits and approvals.

Should you have any questions, please call Matt Higashida at 768-8045.

Very truly yours,

George I. Atta, FAICP
Director

GIA:js

BELT COLLINS

February 21, 2014
2012.70.0400 / 13P-023

Mr. George I. Atta, FAICP, Director
City and County of Honolulu
Department of Planning and Permitting
650 South King Street, 7th Floor
Honolulu, Hawai'i 96813

Dear Mr. Atta:

Environmental Assessment Pre-consultation
Proposed Information and Communication Services (ICSD) Division for
Pahole Radio Facility at Pahole Rare Plant Nursery
Site Tax Map Key: (1)-6-8-001:004 Waialua

Thank you for your December 3, 2013 comment letter regarding the Information and Communications Service Division Pahole Radio Facility proposed improvements and installations. The pending Draft Environment Assessment (DEA) will incorporate the comments you have provided and further detail the proposed project's consistency with the issues you have brought to our attention.

The DEA will include a discussion of how the proposed project is consistent with Objective B and applicable policies of Section VIII Public Safety in the City and County of Honolulu's General Plan. The DEA will include a discussion of visual impacts, day and night, and will include a listing of required permits and approvals.

Should you have any questions, feel free to contact me at 521-5361, ext. 309, or you can email me at jhiramatsu@bchdesign.com.

Sincerely yours,
BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JFT/JEH:ajk

cc: Mr. David DePonte - ICSD

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
Belt Collins Hawaii is an Equal Opportunity Employer

Transmittal

OCEANIC TIME WARNER CABLE
200 Akamainui Street • Mililani HI 96789
(808) 625 - 2100

RECEIVED 2013 DEC -9 PM 3:25 BELT COLLINS HAWAII

Date: December 5, 2013 RE: PROJECT LOCATION/WORK ORDER

To: Belt Collins Hawaii, LLC
2153 North King St, Suite 200
Honolulu, HI 96819

Utility Improvements
ICSD Radio Facility at
the Pahole Radio Facility
E-20114

Attention: Ms. Joanne Hiramatsu

GENTLEMEN: We are sending you the following:

- ☐ Pole / Conduit Application
- ☐ Permit Applications
- ☒ For your use
- ☐ Preliminary / Final Drawings
- ☐ Return Prints
- ☐ Other

Copies	Sht / Appl. #	Description

The Above is transmitted:

- ☐ For Your Approval
- ☐ For Review and Comment
- ☒ For Your Use / Records
- ☐ As Requested
- ☐ As Approved
- ☐ Other

Comments / Remarks: Thank-you for notifying Oceanic TWC of the above plans. Oceanic does not have any system there that would be affected. Should you have any further questions, pls call me at 625-8456 and refer to reference number E-20114.

Thank-you,

CC: Xmit

Signed: Dean Yonezawa
Title: OSP Engineer (Dean Yonezawa)

BELT COLLINS

February 21, 2014
2012.70.0400 / 13P-027

Mr. Dean Yonezawa
Oceanic Time Warner Cable
200 Akamainui Street
Mililani HI 96789

Dear Mr. Yonezawa:

Environmental Assessment Pre-consultation
Proposed Information and Communication Services Division
Pahole Radio Facility at Pahole Rare Plant Nursery Site
Tax Map Key: (1)-6-8-001:004 Waialua
Reference Number E-20114

Thank you for your December 5, 2013 response stating that Oceanic Time Warner Cable does not have any system located at the proposed Information and Communication Services Division Radio Facility project area at Pahole Rare Plant Nursery site that would be affected.

If you have any questions, please feel free to call me at 521-5361, ext. 309, or you can email me at jhiramatsu@bchdesign.com.

Sincerely yours,

BELT COLLINS HAWAII LLC

Joanne E. Hiramatsu
Director of Planning

JFT/JEH:ajk

cc: Mr. David DePonte – ICSD

Belt Collins Hawaii LLC | 2153 North King Street, Suite 200 | Honolulu, HI 96819-4554 USA
Tel: 808.521.5361 | Fax: 808.538.7819 | www.beltcollins.com | honolulu@beltcollins.com
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APPENDIX B

Archaeological Inventory Survey

— DRAFT —

Archaeological Inventory Survey for ICSD Pahole Radio Facility at Pahole Rare Plant Facility, Kawaihāpai Ahupuaʻa, Mokulēʻia, Oʻahu, Hawaiʻi

Tax Map Key (1) 6-8-001:004

Prepared for:

Dept. of Accounting and General Services
Division of Public Works
State of Hawaiʻi
Honolulu, Hawaiʻi 96819

Under Contract to:

Belt Collins Hawaii LLC
2153 North King St., Suite 200
Honolulu, HI 96819-4554

INTERNATIONAL ARCHAEOLOGICAL RESEARCH INSTITUTE, INC.
APRIL 2014

IARII 201223

— Draft —

ARCHAEOLOGICAL INVENTORY SURVEY FOR ICSD PAHOLE RADIO FACILITY AT PAHOLE RARE PLANT FACILITY, KAWAIHĀPAI AHUPUAʻA, MOKULĒʻIA, OʻAHU, HAWAIʻI

TMK (1) 6-8-001:004

by

Christopher Filimoehala M.A.

Prepared for

Dept. of Accounting and General Services
Division of Public Works
State of Hawaiʻi
Honolulu, Hawaiʻi 96819

Under Contract to:

Belt Collins Hawaii LLC
2153 North King St., Suite 200
Honolulu, HI 96819-4554

International Archaeological Research Institute, Inc.
2081 Young Street
Honolulu, Hawaiʻi 96826

April 2014

ABSTRACT

At the request of the Department of Accounting and General Services – Information and Communication Services Division and under contract to Belt Collins Hawaii, International Archaeological Research Institute, Inc., completed an archaeological inventory survey of the 3.3 acre Pahole Rare Plant Facility, Mokulēʻia, Oʻahu (TMK [1] 6-8-001:004). Fieldwork included a pedestrian survey of the project area and a limited number of shovel test pits. No archaeological sites were documented; however, a complex of historic building from the former Integrated Fire Control (IFC) component of the Dillingham Air Force Base (AFB) Nike-Hercules guided missile battery was identified. The missile battery was in operation from 1961-1970. Extant structures include the IFC administrative building, mess hall/barracks, generator building, an acquisition radar base, building of unknown function, and other building foundations.

The project will involve the installation of new utility lines to the administrative building and mess hall/barracks, reconditioning of the radar base, and demolition of the generator building. With regards to the administrative building and mess hall/barracks, the electrical panels are on the inside walls and the electrical engineer will need to either drill through the walls or route the lines through windows. Modifications to the buildings will be no different than what currently exists. The reconditioning of the radar base will involve the attachment of microwave antenna dishes, whips, and a lightning rod. Consultation is currently underway with the SHPD Architecture Branch to determine what additional work, if any, needs to be done for a determination on possible effects for these structures.

No further mitigation is recommended for the Nike-Hercules battery structures for this project. It is suggested that the modifications to the administrative building and mess hall/barracks will have no adverse effect to these structures. Similarly, reconditioning of the radar base, which had previously been modified from its original condition by the removal of the radar, is suggested to have no adverse effect. Mitigation of the demolition of the generator building has been accomplished through the current photographic, mapping, and archival documentation. However, future construction or alteration work at the Pahole Rare Plant Facility may warrant an architectural survey and recording of the extant structures.

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I. INTRODUCTION

At the request of the Department of Accounting and General Services (DAGS) – Information and Communication Services Division (ICSD) and under contract to Belt Collins Hawaii LLC, International Archaeological Research Institute, Inc. (IARII) prepared this archaeological inventory survey of the Pahole Rare Plant Facility (PRPF), Mokulēʻia, Oʻahu (Figs. 1 and 2). PRPF is operated by the State of Hawaii Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW). The project area is 3.3 acres. The research was carried out as an initial step for compliance with federal and state requirements to identify and evaluate possible impacts to significant archaeological and historical resources in advance of construction activities for DAGS ICSD improvements of the PRPF.

SCOPE OF WORK

This archaeological assessment includes a review of the literature and records at the State Historic Preservation Division (SHPD) and other repositories to obtain information on known archaeological sites, and also to evaluate the possible likelihood for the presence of unknown archaeological remains within the Mokulēʻia project area. Background research also includes review of historical records, including maps and documents, and also previous archaeological studies in the vicinity. A site visit was carried out on November 19, 2012, in order to examine the facility and the areas to be affected by ICSD improvements, and an archaeological inventory survey was completed on March 27, 2014.

This report concludes with historic preservation recommendations based on a synthesis of archaeological and historical findings as these relate to ICSD construction plans.

NATURE OF THE UNDERTAKING

Twelve construction activities are associated with DAGS ICSD improvements at PRPF. These are as follows:

- Construct new 800+ square foot ICSD communications building with generator room, equipment room, and rectifier room.
- Recondition an existing concrete pillar to accommodate new microwave antenna dishes, whips, and a lightning rod.
- Install a new above ground diesel tank.
- Relocate Hawaiian Electric Company (HECO) high voltage overhead service.
- Install new HECO transformer and remove existing pole mounted transformer.
- Install new underground electrical conduits and communication ducts.
- Demolish a 370+ square foot generator building.
- Construct a paved vehicular turnaround adjacent to the ICSD site.
- Assemble three replacement catchment water storage tanks in the southeast periphery of the project site

- Install an underground irrigation line to connect the water storage tanks to DOFAW's irrigation system and install a standpipe on this irrigation line.
- ICSD building to include a roof runoff catchment system and a 1,000 gallon leader runoff tank connected to DOFAW's irrigation system.
- Replace the chain link fence around the project site.

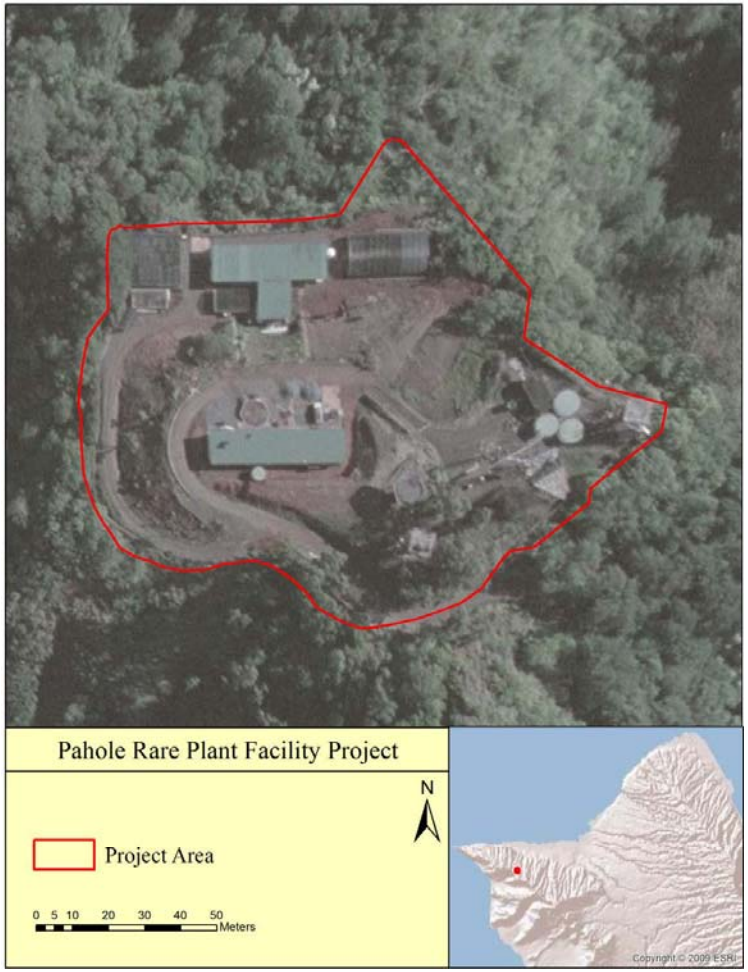

Figure 1. Project area overview on USGS orthophoto.

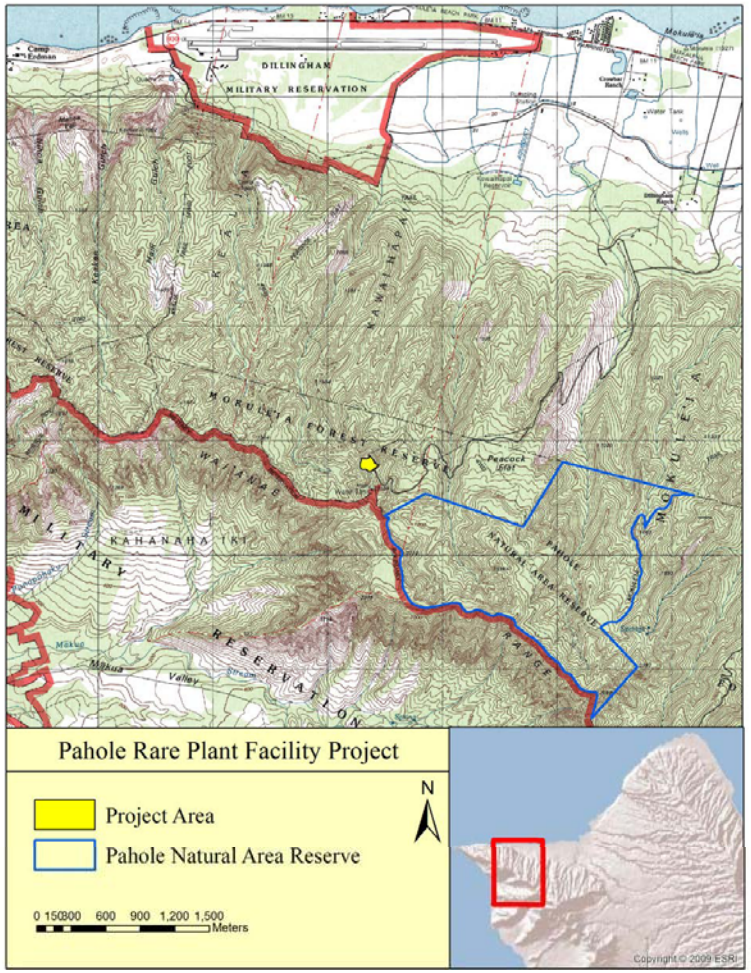

Figure 2. Project area on USGS quadrangle.

II. BACKGROUND

PROJECT AREA AND PHYSICAL ENVIRONMENT

The Pahole Rare Plant Facility is located in northwest O‘ahu, 5.84 miles (9.4 kilometers) southeast of Ka‘ena Point, in the Mokulē‘ia Forest Reserve along the top of Kuaokalā Ridge just north of the Makua Military Reservation (Fig. 2). It is within the traditional *ahupua‘a* of Kawāihapai (Fig. 3). The facility encompasses about 3.3 acres of State-owned land.

The project area consists of the entire PRPF installation, including facility buildings, greenhouses, road and parking areas, water tanks, and existing communication structures (Photos 1-3; Fig. 4). The installation is at the site of the former Integrated Fire Control (IFC) component of the Dillingham Air Force Base (AFB) Nike-Hercules guided missile battery that was active from 1961 to 1970 (designated missile Site OA-84) (Bennett 2009; Helber, Hastert and Fee 2011). Currently, agencies using the facility include the U.S. Army Environmental Program, the Nature Conservancy, the University of Hawai‘i-Mānoa Botany Department, the State of Hawaii Department of Natural Resources Division of Forestry and Wildlife, the City and County of Honolulu, and the State of Hawaii; the latter two entities use the installation for radio broadcast facilities.

Previous construction of the facility heavily impacted and altered the landscape, beginning with construction of the Nike-Hercules facility in 1961 (Bennett 2009). Most of the PRPF is graded down to create level platforms on which the facility structures were erected. Extant structures from the Nike-Hercules IFC Platoon include an administration building (currently designated the “upper building”), a T-shaped mess hall/barracks (currently designated the “lower building”), a generator building, and on radar tower base. Project improvements (listed above in section I. Introduction) include the demolition of the Nike-Hercules generator building and reconditioning of the concrete radar tower base.

Photo 1. Panoramic photograph of ICSD improvements area at the east end of PRPF. View to the west.

Photo 2. Composite photograph of ICSD improvements area at the east end of PRPF. View from the northwest to the northeast.

Photo 3. Portion of facility where water storage tanks will be relocated (wooded area in the background). View to the southwest.

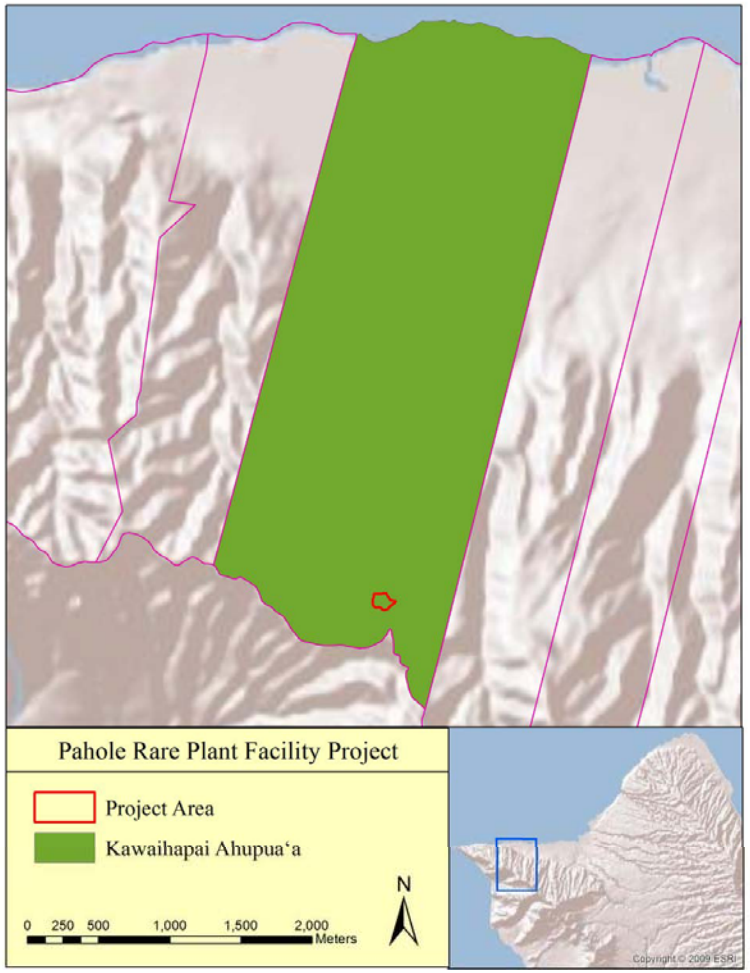

Figure 3. Project Area showing Kawaihāpai borders.

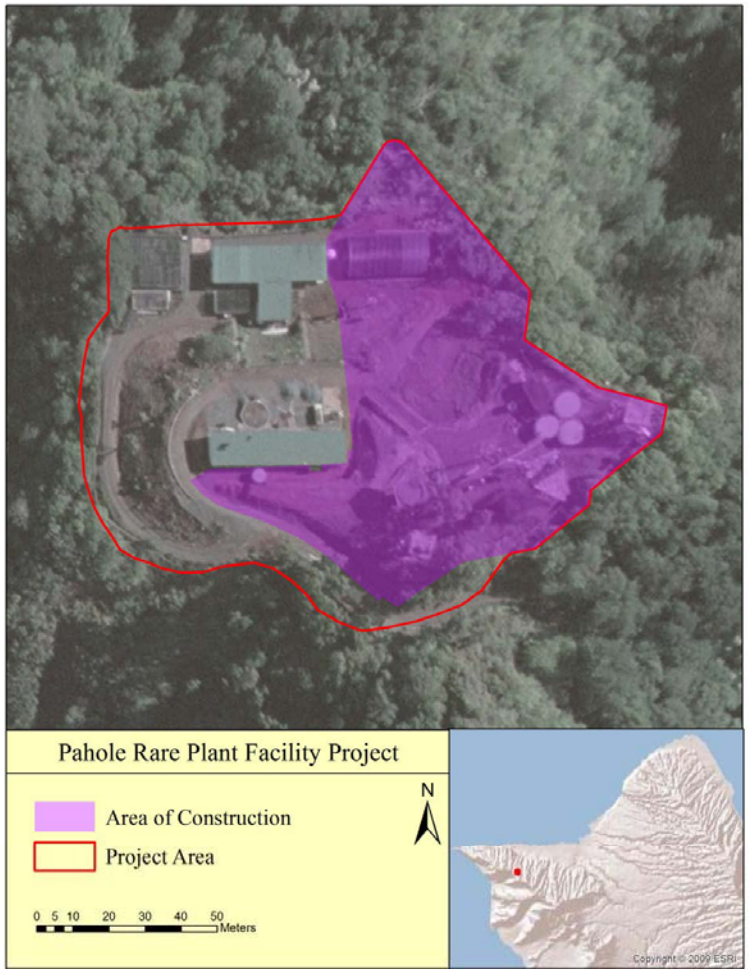

Figure 4. Location of ICSD construction in the project area on USGS orthophoto.

PHYSICAL SETTING

The project area is located near the northwest end of the Wai‘anae Mountain Range. The terrain is mountainous, situated entirely in the Mokulē‘ia uplands (Armstrong 1973), with deeply-incised Mākua Valley to the south and the low-lying Waialua Plain to the north. The primary ridgeline of the northern Wai‘anae Range (Kuaokalā and Mākua Ridges) narrows as it extends west-northwestward to Ka‘ena Point. Farther east-southeastward toward the project area, the ridgeline becomes wider and dissected, with tributary drainages feeding into a series of gulches to the north. Kawaihāpai Stream is located 2067 feet (630 meters) east of the project site.

Soils in or near the project area (Fig. 5) belong primarily to the Kemoo soil series, which is common across the Mokulē‘ia upland area (Foote et al. 1972:69-70). Kemoo silty clay sloping 35-70 percent (map symbol KpF) occurs on side slopes along drainageways. Runoff is rapid, and the erosion hazard is severe. Tropohumults-Dystrandepts association soils sloping 30-90 percent (map symbol rTP) are present directly southwest of the project area and within Pahole Gulch to the southeast. Both soils are well-drained and form in material weathered from igneous rock in steep sloping upland areas. Tropohumults occur on narrow ridge tops at higher elevations and are well-drained, strongly acid soils. Dystrandepts are dark-colored, friable soils that are well-drained and strongly acid, forming on steep side slopes and narrow ridge tops at lower elevations.

Mean annual rainfall in this area is 1,322 millimeters (52 inches), with an annual range of 44 to 186 mm (1.7 to 7.3 inches) per month (Giambelluca et al. 2011).

Vegetation in the Mokulē‘ia uplands is variable, but common taxa include Christmas berry (*Schinus terebinthifolius*), guava (*Psidium guajava*), and ironwood (*Casuarina* sp.). Native plants in the area of the installation include *‘a‘ali‘i* (*Dodonaea viscosa*), *alahe‘e* (*Canthium odoratum.*), *‘akia* (*Wikstroemia* sp.), *naio* (*Myoporum sandwicensis*), *nehe* (*Lipochaeta integrifolia*), *pā‘ū o Hi‘iaka* (*Jacquemontia sandwicensis*), *pili* (*Heteropogon contortus*), *‘ūlei* (*Osteomeles anthyllidifolia*), *wiliwili* (*Erythrina sandwicensis*), and *‘āheahea* (*Chenopodium oahuense*) (Hammatt and Borthwick 1987:13).

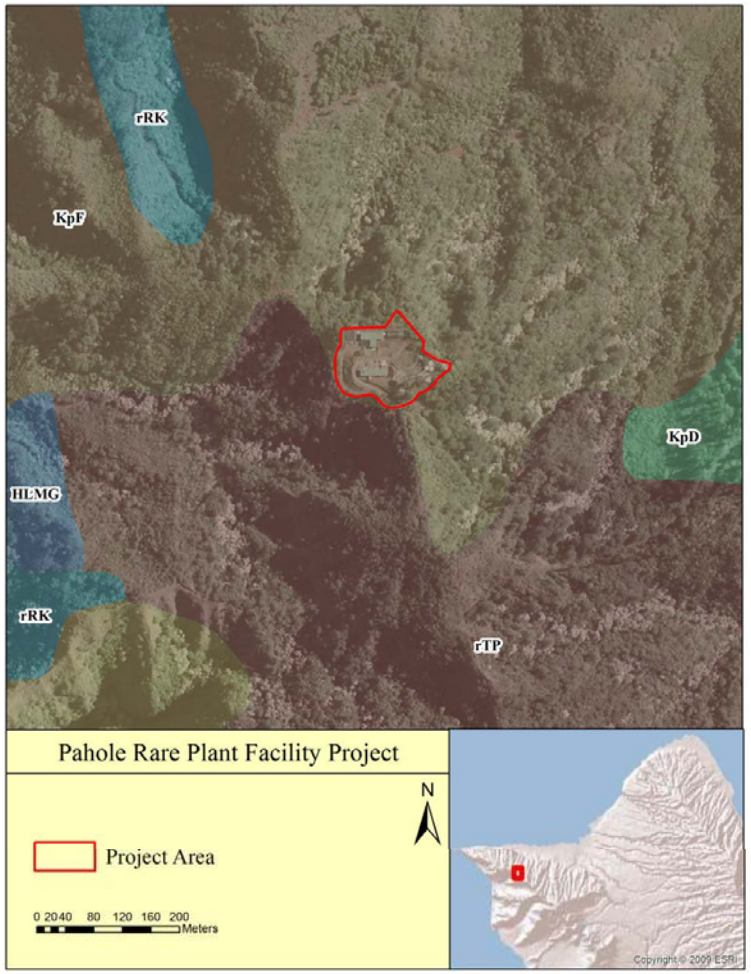

Figure 5. Project Area Soils over USGS orthophoto.

PRE-MODERN CULTURAL BACKGROUND

The boundary between the traditional Hawaiian districts of Waialua and Waiʻanae straddles Kuaokalā Ridge and extends to the tip of Kaʻena Point (see Fig. 3). Kawāihapai Ahupuaʻa in Waialua extends north to the coast and south to Kahanahaiki Ahupuaʻa in the district of Waiʻanae. It is bounded by Kealia Ahupuaʻa to the west and Kikahi Ahupuaʻa to the east. The PRPF lies on the north side of the Mākua Ridge at the south end of Kawāihapai.

PLACE NAME

The name of the *ahupuaʻa* in which the PRPF is located, Kawaihāpai, means "the carried water" (Alameida 1996). Historical sources explain that Kawaihāpai took its name from the stream that provided water for several irrigated taro fields in the area (Handy and Handy 1972:467). Oral traditions describe the origin of the name stemming from a drought event, during which two old priests offered up prayers that were answered in the form of a cloud that passed over the cliffs, producing a splashing sound and a new source of water flowing from the mountainside (Alameida 1996; Sterling and Summers 1978). This spring, known as "water without source on the cliff", was a well-known feature into the post-contact era (McGerty and Spear 2001:10).

HISTORICAL SUMMARY

The history of Kawaihāpai Ahupuaʻa and the surrounding area is summarized in reports including McGerty and Spear (2001), Moblo (1991), and Wilson and Spear (2008). Certain details are discussed here in order to establish a cultural and historical framework for the project area.

Records of traditional land use for the area are sparse before the Māhele of 1848, which initiated private land ownership in the Hawaiian Kingdom. Kahekili Keʻeaumoku was known to be *aliʻi ʻai moku* (district-level chief) of the Waialua district after the conquest of Oʻahu by Kamehameha I (Alameida 1996:84). The district remained in the hands of the *aliʻi* up to the Māhele, after which unclaimed parcels became government lands available for public sale (McGerty and Spear 2001). Following the advice of their land agent, Reverend John S. Emerson, many Kawaihāpai residents purchased lands rather than claiming them. Through purchase they could acquire pasturage and forest lands that were not usually included in *kuleana* claims (Land Commission Awards [LCA]) (Allen 2010). At least 31 individuals had lands in Kawaihāpai (Wilson and Spear 2008:13). Nineteen Land Grant parcels are identified in Emerson's 1896 map (Figs. 6 and 7, Table 1). Land use reported for these parcels included goat pens, a school house, irrigation ditches, streams, springs, fishponds, salt beds, and gardens, all suggesting an active community at the time of the land division in 1848 (McGerty and Spear 2001:11).

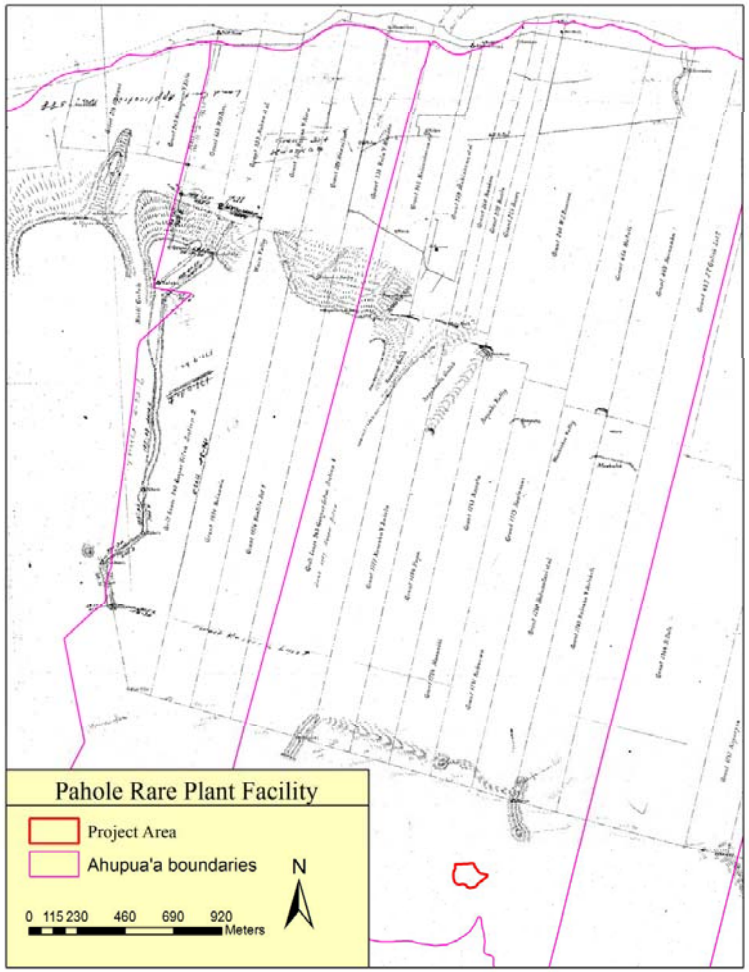

Figure 6. Project area on a portion of Emerson 1896 map.

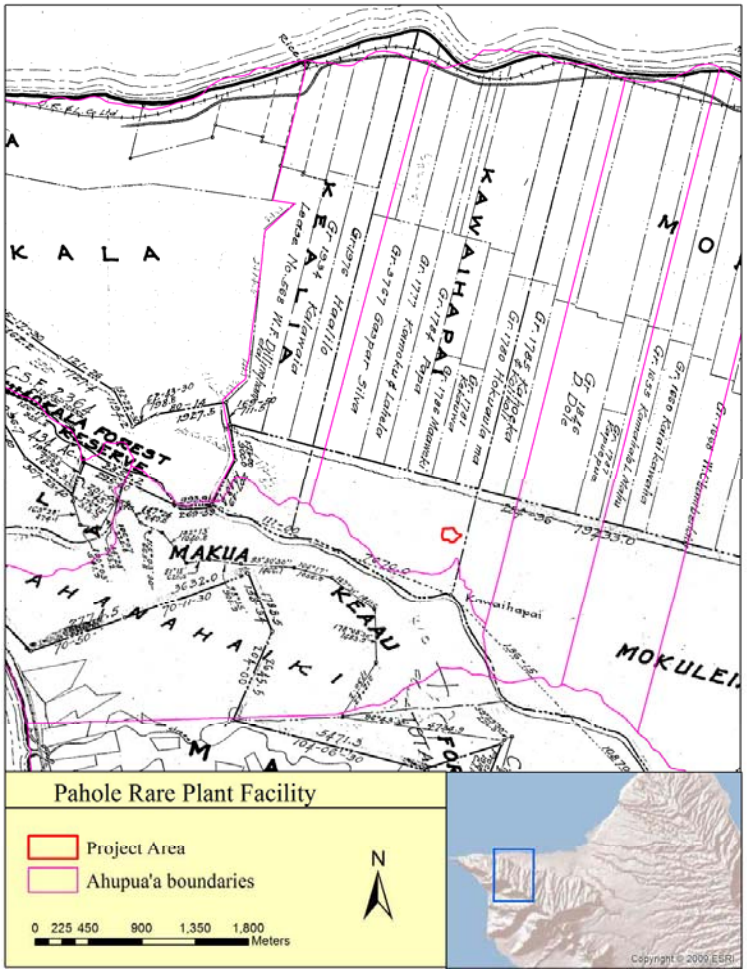

Figure 7. Project area on a portion of Evans and Iao 1925 map.

Table 1. Documented Land Grants in Kawaihāpai (Emerson 1896).

Grant No.	Year Purchased	Acreage	Awardee
3767	1895	220	Silva
1777	1855	100	Kamoku and Lahela
1784	1855	100	Papa
1783	1855	50	Kanalu
1779	1855	50	Kauloaiwi
1786	1855	50	Maaweiki
1781	1855	48	Kekauwa
1780	1855	68	Hokuaulani et al.
1785	1855	90	Kahoeka and Kolikoli
1846	1855	248	Dole
343	1850	68	Kalauohaena et al.
279	1850	66	Mahiahume et al.
260	1850	24.3	Kaakau
259	1850	24.5	Haule
258	1850	24.3	Kane
240	1850	166	Emerson
456	1850	90	Halali
459	1850	90	Koanaku
457	1850	197	Gulick

Handy and Handy (1972:467) described a sizeable complex of agricultural terraces in the lowlands of Kawaihāpai, extending west into Keālia Ahupuaʻa, recorded later as Site 461. Some of these terraces were still in use in 1935, though most had been lying fallow for a prolonged period.

Sugarcane became a considerably profitable crop in Hawaii by the second half of the 19th century, and the drilling of wells allowed the establishment of the sugar cultivation in northern Oʻahu. Much of Kawaihāpai was incorporated into Dillingham Ranch at this time, where low-lying areas between the mountains and coast were used for sugar or cattle grazing (Wilson and Spear 2008:14). The newly-established sugar economy necessitated the extension of rail lines into the area, and a new settlement grew up around the railroad station at Kawaihāpai (Moblo 1991:4).

Modern military use began in 1927 at the north end of Kawaihāpai (McGerty and Spear 2001). It was mainly used for housing and agriculture before World War II (WWII), after which it was developed into a large active airfield. Following the war, the airfield was renamed Dillingham Air Force Base and was used primarily for defensive training purposes and as a missile launch site. It was transferred from the Department of the Air Force to the Department of the Army in 1975 and is currently used for small private planes and tourism (McGerty and Spear 2001).

ARCHAEOLOGICAL EVIDENCE

The majority of archaeological fieldwork in Kawaihāpai has been undertaken in the coastal flats or the lower foothills of the *ahupuaʻa*. Due to the remote and inaccessible nature of the project area, very little fieldwork has been conducted in the vicinity. Archaeological reconnaissance survey for the fence line of Pahole Natural Area Reserve, located 1312 feet (400 meters) southeast of PRPF (see Fig. 2) did not identify any cultural resources or historical properties (Zulick 2003). No archaeological sites or historic properties are known to exist within the project area.

Due to the lack of significant archaeological work in the project area, the following discussion covers work undertaken across Kawaihāpai and the known archaeological sites therein. These sites are limited to areas of the *ahupuaʻa* located at distances of 1.25 miles (2 kilometers) or greater from the project area boundaries.

ARCHAEOLOGICAL SITES LOCATED IN KAWAIHĀPAI AHUPUAʻA

Sixteen archaeological sites, which are primarily pre-Contact or early post-Contact habitation and agricultural features, are recorded within the boundaries of Kawaihāpai (Table 2, Fig. 8).

Table 2. Archaeological Sites Previously Recorded in Kawaihāpai Ahupuaʻa.

Site No.	Reference	Name/Description	Function	Period
190	Thrum 1907, McAllister 1933	Kawailoa	*Heiau*	Traditional
191	McAllister 1933	Puʻu o Kekili	*Koʻa*	Traditional
192	McAllister 1933	Hidden Waters	Springs	Traditional
193	McAllister 1933	Kuakea	*Koʻa*	Traditional
416	Handy and Handy 1972, Rosendahl 1977	Terraces	Agricultural	Traditional
3747	Pietrusewsky 1988	Human remains	Burial	Traditional
4440	Drolet and Schiltz 1992 b	Remnant stone wall	Unknown	Unknown
4441	Drolet and Schiltz 1992b	Stone wall	Cattle wall	Historic
4442	Drolet and Schiltz 1992 b	Terrace	Unknown	Unknown
4777	Drolet and Schiltz 1992a	Stone wall (component of Settlement Cluster 1)	Habitation	Traditional/ Historic
5766	Perzinski and Hammatt 1999	Human remains	Burial	Traditional
6638	Oʻ Hare et al. 2003	Subsurface cultural layer	Unknown	Traditional
6884	Tulchin and Hammatt 2008	Stone walls	Cattle wall	Historic
6885	Tulchin and Hammatt 2008	Terraces/Walls	Agricultural	Traditional
6886	Tulchin and Hammatt 2008	Terraces/Walls	Agricultural	Traditional
6887	Tulchin and Hammatt 2008	Modified overhang shelter	Habitation	Traditional
6888	Tulchin and Hammatt 2008	Terraces/Walls	Agricultural	Traditional
Mitchell Site 2	Mitchell 1987	Wall	Military	Historic

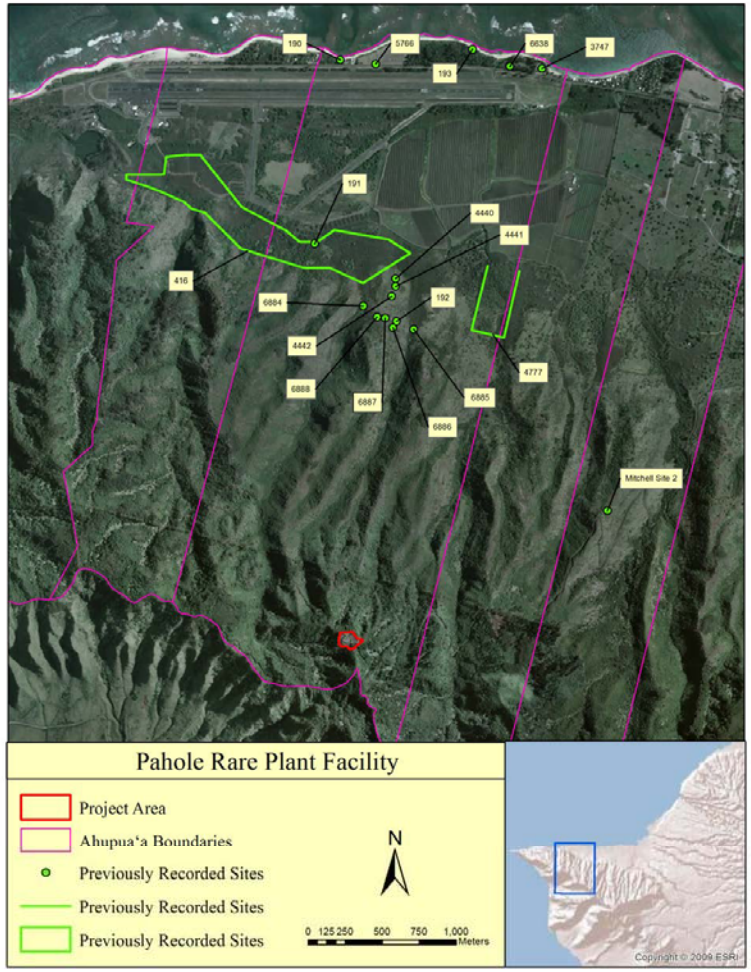

Figure 8. Previously recorded archaeological sites within Kawaihāpai. The closest known site to the project area (Mitchell Site 2) is also shown.

McAllister (1933) identified four sites in the *ahupua'a*. Two sites are located along the coast, and two in the foothills below the project area. Sites 190 and 193 were fishing shrines, or *ko'a*. These shrines were no longer in existence at the time of McAllister's writing. Site 191 is Kawailoa Heiau, situated at the base of the foothills above Dillingham Military Reservation and described by McAllister (1933, cited in Sterling and Summers 1978:99-100) as:

> Only a portion of two terraces remains. The upper terrace is 66 feet long and 4 feet high, and is excellently paved with small stones a few inches in size. The southwest limits can not be discerned. On the east end is a wall 1.5 feet high which can be followed for about 10 feet. The lower terrace was 25 feet wide with a facing 2 feet high, which can only be traced a short distance. The houses (kahua hale) in which the kahunas lived were known as "Paweo", according to Hookala. This is undoubtedly the site referred to by Thrum as Paweu, "A small heiau 58 by 65 feet at the base of the hill; badly damaged by freshets."

Site 192 consists of freshwater springs located in the foothills and described as (McAllister 1933, cited in Sterling and Summers 1978:100):

> ...four hidden waters upon which Hiiaka called when she was refused water by the old inhabitants. Their names, as given by Hookala, are Ulunui, Koheiki, Ulehulu, and Waiakaaiea. Farther toward Kaena Point is another water known as Kawaihumuole, which is a conjunction of Kanaloa and waihuna a Kaalai. Another hidden water, which Hookala says is mentioned in the Hiiaka chant is Kuilaau o Kealia, but he does not know its location.

Site 416 is a large complex of agricultural terraces directly upland from Site 191 described by Handy (1940, cited in Sterling and Summers 1978:99) as:

> …a sizeable area of terraces in the lowlands (now surrounded by sugar cane), watered by Kawaihapai Stream. These terraces have evidently been lying fallow for some time, though several being plowed for rice or taro in the summer of 1935. At the foot of the cliffs, watered by a stream name of which was not learned, are several small terraces in which taro is grown by David Keaau. He says that taro cannot be grown in the lowlands, as salt water seeps in and sometimes flows in, mingling with the fresh water in the terraces and spoiling the taro.

Seven additional traditional Hawaiian sites have been recorded in the foothills of Kawaihāpai. These sites (Sites 4440, 4442, 4777, 6885, 6886, 6887, and 6888) consist of surface features associated with traditional habitation and agriculture. The features consist primarily of stone walls and enclosures that may have been impacted or altered by post-Contact ranching activities (Tulchin and Hammatt 2008). Additionally, a single subsurface cultural deposit (Site 6638) and two burials (Sites 3747 and 5766) have been documented along the coast (O'Hare et al. 2003; Perzinski and Hammatt 2000; Pietrusewsky 1988).

The sixteen archaeological sites recorded in Kawaihāpai are all located more than 1.25 miles (2 kilometers) from the PRPF project area. The closest site to the project area is located in Auku'u Ahupua'a 1.16 miles (1.87 kilometers) from the PRPF and was recorded by Mitchell (1987) as a large wall along the west ridge of a gulch approximately 1100 feet (335 m) in elevation. The feature was thought to be of WWII military construction. No other sites have been recorded at higher elevations in the vicinity of the project area.

III. RESEARCH METHODS

This section presents the research objectives guiding the project and the field methods that were employed.

RESEARCH QUESTIONS

Two basic research questions guided the field investigations.

1. Do any of the existing structures have historic significant and are eligible for listing on the Hawai‘i Register of Historic Places?

2. Is there evidence for traditional deposits? The likelihood of traditional deposits (or surface structures) being present is low due to the previous site development and the steep terrain. However, limited subsurface testing coupled with an evaluation and documentation of the present ground surface and any subsurface exposures will provide empirical data to assess this prediction. Shovel test pits will be placed at topographic locations that offer the most promise (e.g., level areas, areas that do not exhibit evidence for erosion), while other field observations will document potential erosion that could have displaced or destroyed older deposits.

FIELDWORK METHODS

A systematic pedestrian survey was conducted across the 3.3 acre project area, with parallel transect lines spaced between 2-4 m apart across the undeveloped portions of the parcel. Survey transect lines were roughly oriented northeast-southwest, parallel to the slope contours of the project area.

Feature text descriptions documented feature type, construction details, functional interpretations, and age estimates. Feature data points were recorded with a Trimble ProXH Global Positioning System (GPS) unit using the North American Datum of 1983 in Universal Transverse Mercator Zone 4 North. GPS data were differentially corrected for submeter accuracy. Digital photographs were obtained for features and the general project area setting.

Three shovel test pits (STP) were excavated. The STPs were placed in areas that appeared to have intact soil columns with the primary aims of documenting the stratigraphic sequence and assessing the presence of buried cultural deposits. Excavated sediment was screened through 1/8-inch mesh. Scaled stratigraphic profile drawings were completed along with soil descriptions. The soil characteristics recorded include: color, including moisture condition (wet, moist, dry) when color read; texture; structural grade, size, and form (or absence of structure); dry or moist consistence; wet consistence (stickiness, plasticity); root frequency and size; presence of charcoal or other cultural materials; and lower boundary distinctness and topography (Munsell Color 2000; U.S. Department of Agriculture Soil Survey Staff 1951, 1962). All excavation units were backfilled after the placement of flagging tape at the base of the excavation.

IV. SURVEY RESULTS

The results of the pedestrian survey and subsurface testing are presented in this section.

PEDESTRIAN SURVEY RESULTS

Eight features were identified during the inventory survey (Features 1-8) (Fig. 9). These features include intact buildings, as well as, various foundations. Certain features are definitively identified as components of the Nike-Hercules guided missile battery (Features 1, 3-5), while others are inferred to be structural remnants (Features 6-8) or functionally unidentified structures (Feature 2) of the military facility. In addition to these features, numerous smaller concrete slab fragments and construction debris is distributed across the facility.

Feature 1 is a generally rectangular building located towards the southeast corner of the facility; the structure is in disuse (Photos 4 and 5). Feature 1 is the former Nike-Hercules generator building (Bennett 2009). The generator building is 10.4 m long, 3.8 m wide, and 3.5 m high. It has a concrete slab foundation with the superstructure constructed with CMU (concrete masonry units) and a lumber roof. Doorways are located at the north and south ends. A tangle of wires is exposed at the northeast corner of the building and electrical conduit runs along the tops of the west and north walls. No equipment remains inside the building but an electrical meter is still present. Graffiti covers much of the interior wall surfaces.

Feature 2 is a generally rectangular CMU building 11 m long by 8 m wide (Photos 6 and 7). The building is towards the southern boundary of the facility and is still in use. Construction is the same as the identified Nike-Hercules structures (Features 1, 3, and 4), and it is inferred that Feature 2 is another structure of the battery, although the original function is uncertain.

Feature 3, currently designated as the "upper building," is the rectangular building at the center of the facility (Photo 8). Bennett (2009) identifies this as the IFC Platoon administrative building constructed in 1960 or 1961. The building is 39 m long by 9 m wide and remains in use. As with the other buildings, this structure is built with CMU.

Feature 4 is a T-shaped "lower building" that Bennett (2009) indicates was the missile battery mess hall/barracks (Photos 9 and 10). This building is presently in use and is located between two more recently constructed plant nurseries. This building is also constructed with CMUs, and has a maximum length of 33 m and a maximum width of 30 m.

Feature 5 is a Nike-Hercules concrete radar tower base, also at the southeast corner of the facility (Photo 11). The radar base, apparently for an acquisition radar, is a concrete column supporting a platform. The column is 2 m in diameter and approximately 8 m high. The supported platform is 5 m by 5 m. No radar remains. The ground surrounding the column is paved with asphalt. Bennett (2009:11) indicates that the IFC at Pahole, as with the other Nike-Hercules IFC locations on O'ahu, would have had alternate acquisition radar (AAR), target tracking radar (TTR), target ranging radar (TRR), missile tracking radar (MRR), and possibly a low powered acquisition radar (LOPAR).

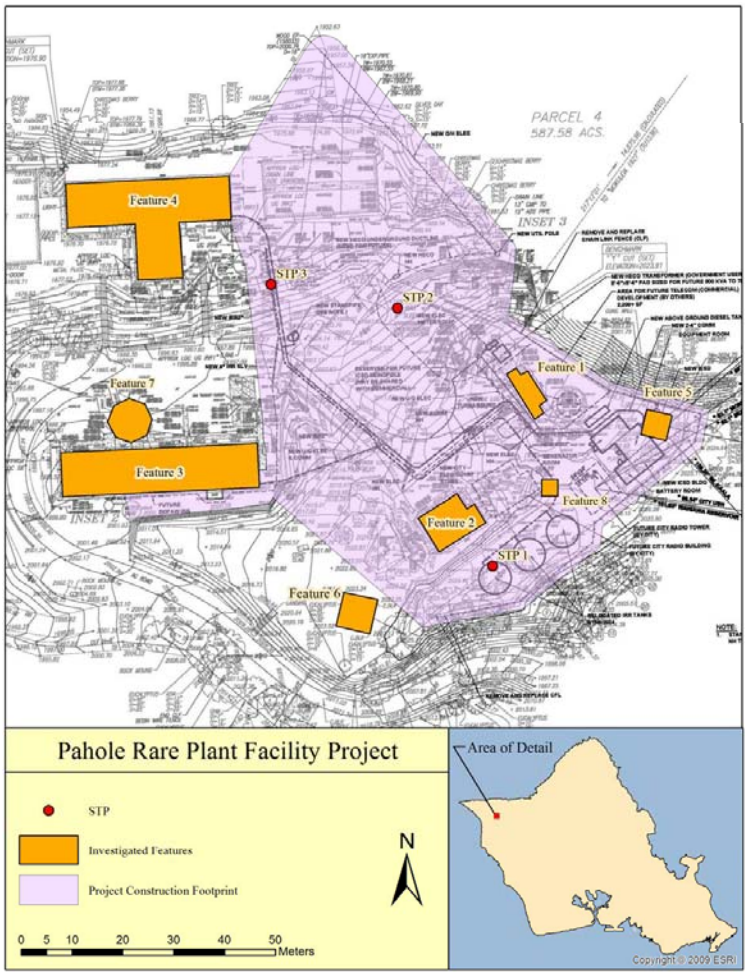

Figure 9. Locations of the extant Nike-Hercules guided missile battery structures and the shovel test pits (STP) excavated during the survey.

Photo 4. Feature 1, Nike-Hercules generator building; view south.

Photo 5. Feature 1, Nike-Hercules generator building; view northeast.

Photo 6. Feature 2, probable Nike-Hercules structure; view south.

Photo 7. Feature 2, probable Nike-Hercules structure; view southeast.

Photo 8. Feature 3, Nike-Hercules administrative building; view west.

Photo 9. Feature 4, Nike-Hercules mess hall/barracks; view east.

Photo 10. Feature 4, Nike-Hercules mess hall/barracks; view north.

Photo 11. Feature 5, Nike-Hercules radar foundation; view northeast.

Feature 6 is a square concrete footing foundation that is 7 m by 7 m. The original superstructure, and its function, is unknown. This may be the foundation for one of the Nike-Hercules radars.

Feature 7 is an octagonal foundation or platform created with concrete slabs laid on edge. The foundation has a maximum length and width of 8.5 m. The interior of the feature is soil with a 1.2 m square concrete slab on the surface near the west side. Feature 7 is located immediately to the north of the Nike-Hercules administrative building (Feature 3), and may be a radar foundation.

Feature 8 consists of multiple concrete pier foundations that appear to be radar/tower supports (Photo 12).

Photo 12. Feature 8, concrete tower pier footings; view north.

SUBSURFACE TESTING RESULTS

Three STPs were excavated during the survey. The STPs were distributed across the project area and revealed the same stratigraphic sequence (see Fig. 9). STP 1 was placed towards the south edge of the project area where the water tanks will be installed. The STP was 50 cm by 50 cm, excavated to 30 cm bs (centimeters below surface). A single stratum of dark reddish brown clay (2.5YR 3/4) was documented overlying saprolitic bedrock (Photo 13). No cultural materials were documented. STP 2 was placed on the slope between the generator building (Feature 1) and an unpaved road to the north. The STP was 50 cm by 50 cm, excavated to 45 cm bs; the stratigraphic sequence is the same as STP 1, ending at saprolitic bedrock (Photo 14) STP 3 was located on the slope between the upper parking lot and the lower portion of the facility, situated along the proposed corridor for the new utility lines. The STP was 45 cm by 45 cm, extending to 55 cm bs. As with the other STPs, the culturally sterile dark reddish brown clay soil was documented overlying saprolitic bedrock (Photo 15).

Photo 13. STP 1 at the completion of excavation.

Photo 14. STP 2 at the completion of excavation.

Photo 15. STP 3 at the completion of excavation.

V. DISCUSSION AND RECOMMENDATIONS

The archaeological inventory survey of the 3.3 acre Pahole Rare Plant Facility project area resulted in the documentation of eight structures from the 1961-1970 Integrated Fire Control (IFC) component of the Dillingham Air Force Base Nike-Hercules guided missile battery. Subsurface testing across the project area documented a culturally sterile dark reddish brown clay overlying saprolitic bedrock. No cultural deposits were encountered and substantial grading and land alteration was observed across the project area.

The data generated by the field investigations informs on the project research questions.

Do any of the existing structures have historic significant and are eligible for listing on the Hawai‘i Register of Historic Places? The eight structures from the 1961-1970 Integrated Fire Control (IFC) component of the Dillingham Air Force Base Nike-Hercules guided missile battery are recommended as being eligible for listing on the State Register of Historic Places under Criteria a and d. The Dillingham AFB IFC was an important facility within the Cold War-era U.S. civil air defense.

Is there evidence for traditional deposits? There is no evidence for traditional or early historical cultural deposits within the project area. The high-elevation landscape is not suitable for most traditional Hawaiian habitation or agricultural activities, and the terrain has been heavily modified through grading and other land alterations to create level areas for building construction. Subsurface testing confirmed a culturally sterile clay soil overlying decomposing bedrock, indicate the low probability that cultural deposits will be encountered during construction activities.

SIGNIFICANCE EVALUATION

The extant structures of the Dillingham Air Force Base Integrated Fire Control course (OA-84C) for the Nike-Hercules guided missile battery are recommended to be significant under Hawaii HAR §13-284-6 Criteria a and d. The structures provide information about U.S. military activities during the Cold War, specifically from January 1961 to March 1970. As stated in the Historic American Engineering Record (HAER) for the contemporaneous Kahuku Nike-Hercules facility (missile Site OA-17) (HAER No. HI-69), these sites reflect “an important development in the history of American civil air defense…[and] as the Hawaii and Alaska Nike missile sites were the only Nike antiaircraft installations in the United States that actually fired missiles from their tactical sites” (McAllaster 2011:Addendum summary).

The IFC Platoon was paired with a Launcher Platoon at Dillingham AFB immediately to the north; the IFC course provided incoming missile tracking, with the Nike-Hercules missile launch from the launch area at Dillingham AFB (Bennett 2009). The O‘ahu missile batteries were manned by the 298th Air Defense Group of the Hawaii Army National Guard. These Nike-Hercules batteries were meant to defend against aerial attacks by the Soviet Union.

PROJECT EFFECT

The project will involve the installation of new utility lines to the Nike-Hercules administrative building (Feature 3) and mess hall/barracks (Feature 4), reconditioning of the radar base (Feature 5), and demolition of the generator building (Feature 1). With regards to the administrative building and mess

hall/barracks, the electrical panels are on the inside walls and the electrical engineer will need to either drill through the walls or route the lines through windows. Modifications to the buildings will be no different than what currently exists. The reconditioning of the radar base will involve the attachment of microwave antenna dishes, whips, and a lightning rod. Consultation is currently underway with the SHPD Architecture Branch to determine what additional work, if any, needs to be done for a determination on possible effects for these structures.

RECOMMENDATIONS

No further mitigation is recommended for the Nike-Hercules battery structures for this project. It is suggested that the modifications to the administrative building (Feature 3) and mess hall/barracks (Feature 4) will have no adverse effect to these structures. Similarly, reconditioning of the radar base (Feature 5), which had previously been modified from its original condition by the removal of the radar, is suggested to have no adverse effect. Mitigation of the demolition of the generator building (Feature 1) has been accomplished through the current photographic, mapping, and archival documentation. However, future construction or alteration work at the Pahole Rare Plant Facility may warrant an architectural survey and recording of the extant structures.

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APPENDIX C

Cultural Impact Assessment

— FINAL —

Cultural Impact Assessment for ICSD Radio Facilities at Pahole Rare Plant Facility, Mokulēʻia Forest Reserve, Kawaihāpai Ahupuaʻa, Mokulēʻia, Oʻahu, Hawaiʻi

***Tax Map Key* (1) 6-8-001:004**

Prepared for:

Dept. of Accounting and General Services
Division of Public Works
State of Hawaiʻi
Honolulu, Hawaiʻi 96819

November 2013

Under Contract to:

International Archaeological Institute, Inc.
2081 Young Street
Honolulu, Hawaiʻi 96826

And

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2153 North King St., Suite 200
Honolulu, HI 96819-4554

IARII 201223

— Final —

CULTURAL IMPACT ASSESSMENT FOR ICSD RADIO FACILITIES AT PAHOLE RARE PLANT FACILITY, KAWAIHĀPAI AHUPUAʻA, MOKULĒʻIA , OʻAHU, HAWAIʻI

TMK (1) 6-8-001:004

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Prepared for
Dept. of Accounting and General Services
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November 2013

Kawaihāpai Ahupua‘a – mountain to the sea
(Mokulē‘ia Beach Park and Kawaihāpai Field runway in the distance)

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EXECUTIVE SUMMARY

This project is in response to a request from International Archaeological Research Institute, Inc. (IARII) for the following service: Cultural Impact Assessment (CIA) for the Pahole Rare Plant Facility (PRPF), Mokulē‘ia, O‘ahu (Tax Map Key (1) 6-8-001:004). This study is part of a larger project that includes an Archaeological Assessment (AA) conducted by IARII. The AA and the CIA will be incorporated into an Environmental Assessment (EA) completed by Belt Collins Hawaii LLC for the Department of Accounting and General Services (DAGS) – Information and Communication Services Division (ICSD) in compliance with federal and state requirements to identify and evaluate possible cultural impacts in advance of construction activities for DAGS ICSD improvements of the PRPF.

The project lands are located in the *ahupua‘a* of Kawahāpai, District or *moku* of Waialua, O‘ahu Island (now also referred to as Mokulē‘ia). This CIA is in compliance with Act 50 SLH 2000 (HB 28 H.D.1) [Appendix A] as it amends the State of Hawai‘i Environmental Impact Statement law [Chapter 343, HRS] to include “effects on the cultural practices of the community and State. [It] also amends the definition of ‘significant effect’ to include adverse effects on cultural practices.” The purpose of a CIA is to gather information about traditional cultural practices, ethnic cultural practices and pre-historic and historic cultural resources that may be affected by the implementation of a development project or undertaking in accordance with the State of Hawaii Environmental Council *Guidelines for Assessing Cultural Impacts* (Adopted on November 19, 1997) [Appendix B]. The *level of effort* for this CIA included ethnographic research (oral histories) of people who are connected to these lands in various ways and an archival cultural/historical background review of the literature (including internet research).

This report is organized into five parts or chapters. Chapter 1 describes the project area in terms of location, in the context of *ahupua`a*, district and island, as well as a generalized description of the natural environment (i.e., geology, flora and fauna) and built environment (e.g. any current features). Chapter 2 explains the methods and constraints of this study. Chapter 3 summarizes a review of the historical and traditional (cultural) literature in the context of the general history of Hawai`i, the island of O‘ahu, the traditional districts or *moku* of Waialua (Mokulē‘ia ) and local histories of the *ahupua`a* of Kawaihāpai. Chapter 4 presents the ethnographic analysis based on the supporting raw data (oral history transcript) as it pertains to land, water and cultural resources and use in the project area and vicinity. It also includes background data of the ethnographic consultant. Chapter 5 summarizes the findings of this cultural impact study based on supporting data from Chapters 1 through 4 and presents a cultural impact assessment and recommendations.

It is evident that at one time the *ahupua‘a* of Kawaihāpai was part of an ancient Hawaiian life system. This is illustrated in the *mo‘olelo* and accounts (past and current oral histories). A cultural practice of these lands at one time was growing taro and sweet potato, staples of the Hawaiian people, as well as cultivating other ethnobotanical plants such as *mai`a* or banana. However the project lands are in the *wao* or high mountain section and would have been utilized only occasionally by bird-feather gatherers, or logging for projects (*heiau*) ordered by an *ali‘i nui* or high chief. The project lands were greatly modified in the 20th and 21st centuries during construction for communication structures, facility buildings, plant nurseries, water tanks, a bypass road, and parking areas. The proposed antenna improvements will be located in an already heavily impacted area; the proposed new tanks will be located in the back of the current City and County Antenna Facility; and the proposed pavilion will be located in a previously graded area. Therefore, other than a couple of young *koa* (*Acacia koa*) trees where the new tanks will be, there are no significant impacts to cultural resources and practices for this project.

ACKNOWLEDGMENTS

A very special ***Mahalo nui loa*** to Mr. Thomas Shirai for sharing his *mana'o* and for all the documents he shared about his *ohana* and their long history in Kawaihāpai and the *moku* of Waialua.

Mahalo nui loa to my site visit companions, Thomas and Jackie Shirai and Timothy Aki who let us use his truck and who graciously unlocked, opened and locked all six gates up to the Pahole Rare Plant Facility and then again on the way down.

MAHALO!

INTRODUCTION

This project is in response to a request from International Archaeological Research Institute, Inc. (IARII) for a Cultural Impact Assessment (CIA) of the Pahole ICSD Radio Facility (IRF), Mokulē'ia, O'ahu [Tax Map Key (1) 6-8-001:004]. This study is part of a larger project that includes an Archaeological Assessment (AA) conducted by IARII (Filimoehala 2013). The AA and CIA will be incorporated into an Environmental Assessment (EA) prepared by Belt Collins Hawaii LLC in compliance with federal and state requirements to identify and evaluate possible cultural impacts in advance of construction activities for the DAGS Pahole ICSD Radio Facility.

This CIA is in compliance with Act 50 SLH 2000 (HB 28 H.D.1) [Appendix A] as it amends the State of Hawai'i Environmental Impact Statement law [Chapter 343, HRS] to include "effects on the cultural practices of the community and State. [It] also amends the definition of 'significant effect' to include adverse effects on cultural practices." The purpose of a CIA is to gather information about traditional cultural practices, ethnic cultural practices and pre-historic and historic cultural resources that may be affected by the implementation of a development project or undertaking in accordance with the State of Hawai'i Environmental Council *Guidelines for Assessing Cultural Impacts* (Adopted on November 19, 1997) [Appendix B]. The *level of effort* for this CIA included ethnographic research (one oral history) of someone who is connected to these lands in various ways and an archival cultural/historical background review of the literature (including internet research).

This report is organized into five parts or chapters. Chapter 1 describes the project area in terms of location, in the context of *ahupua'a*, district and island, as well as a generalized description of the natural environment (e.g., geology, flora and fauna) and built environment (e.g., any current features). Chapter 2 explains the methods and constraints of this study. Chapter 3 summarizes a review of the historical and traditional (cultural) literature in the context of the general history of Hawai'i, the island of O'ahu, the traditional districts or *moku* of Waialua (Mokulē'ia) and local histories of the *ahupua'a* of Kawaihāpai. Chapter 4 presents the ethnographic analysis based on the supporting raw data (oral history transcripts) as it pertains to land, water and cultural resources and use in the project area and vicinity. It also includes background data of the ethnographic consultants. Chapter 5 summarizes the findings of this cultural impact study based on supporting data from Chapters 1 through 4 and presents a cultural impact assessment and recommendations.

Scope of Work

The CIA scope-of-work (SOW) [Appendix C] was based on the Environmental Council *Guidelines for Assessing Cultural Impacts* (1997) and focuses on three cultural resource areas (traditional, historical and ethnographic), conducted on two levels: archival research (literature/document review) and ethnographic data (oral history). The SOW for this project can be summarized as follows:

1. conduct historical and other culturally related documentary research;
2. identify individuals with knowledge of the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or *ahupua'a*; or with knowledge of the area potentially affected by the proposed action (e.g., past/current oral histories);
3. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
4. assess the impact of the proposed action on the cultural resources, practices and beliefs identified.

Traditional resources research entailed a review of Hawaiian *mo'olelo* (stories, legends or oral histories) of late 19th and early 20th century ethnographic works. Historic research focused on the literature compiled and included two past oral histories conducted in the 1970s. Ethnographic research focused on a current interview with a knowledgeable individual.

Basis for Generating CIA Studies

According to BCH (11-18-13):

> The proposed work will include construction of a new Information and Communication Services Division (ICSD) communications building. Additionally, ICSD will construct various site and utility improvements, as agreed to with the Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW). The site improvement includes providing a paved vehicular turnaround adjacent to the ICSD site. The utility improvements include installing underground electric and telephone lines to service ICSD and DOFAW. Additionally, the DOFAW water catchment reservoir, which stores water to irrigate the plant nurseries operated by DOFAW and the U.S. Army (Army), will be relocated. Space has been set aside for the City and County of Honolulu (City) to construct a new radio tower and building. The new ICSD Radio Facility (IRF) at Pahole will improve the radio systems coverage and reliability.
>
> Main Construction activities associated with DAGS ICSD improvements at PRPF:

1. Relocating water storage tanks to the high-ground area along the southeast periphery.
2. Previous location where water tanks used to occupy will be reserved for Future ICSD Monopole (70 feet high).
3. Constructing new ICSD building with generator room, equipment room, and battery room.
4. Adding new above ground diesel tank.
5. Removing and replacing chain link fence (starting at the point where the barbed wire fence ends, at the eastern edge of the site, through the south/southeast edge of the property).
6. New standpipe (an external freestanding pipe to provide running water in areas with no other water supply) connected to new irrigation lines that transfer water from relocated water storage tanks to the green houses at the DOFAW and Army Rare Plant facility.
7. New HECO underground duct line, electric, and communication lines with above ground access points.
8. Paved vehicular turnaround adjacent to the ICSD site.

Project Location

The Pahole ICSD Radio Facility (IRF) is located in the upper *mauka* section (south) of the traditional *ahupua'a* of Kawaihāpai, in the district of Waialua (Figure 1) and encompasses about 3.1 acres of State-owned land within the Mokulē'ia Forest Reserve. It is west of Pahole Natural Area Reserve (NAR) along the top of Kuaokalā Ridge north of the Makua Military Reservation (Figure 2), 9.4 kilometers (km) southeast of Ka'ena Point, and south of Kawaihāpai Field (formerly Dillingham Field) in northwest O'ahu. Kawaihāpai is bounded on the west by Keālia Ahupua'a and on the east by Mokulē'ia Ahupua'a.

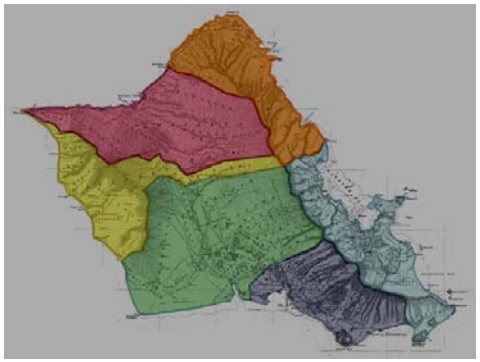

Figure 1. *Moku* or district map of O'ahu; Waialua in pin (AWA Konohiki 2013)

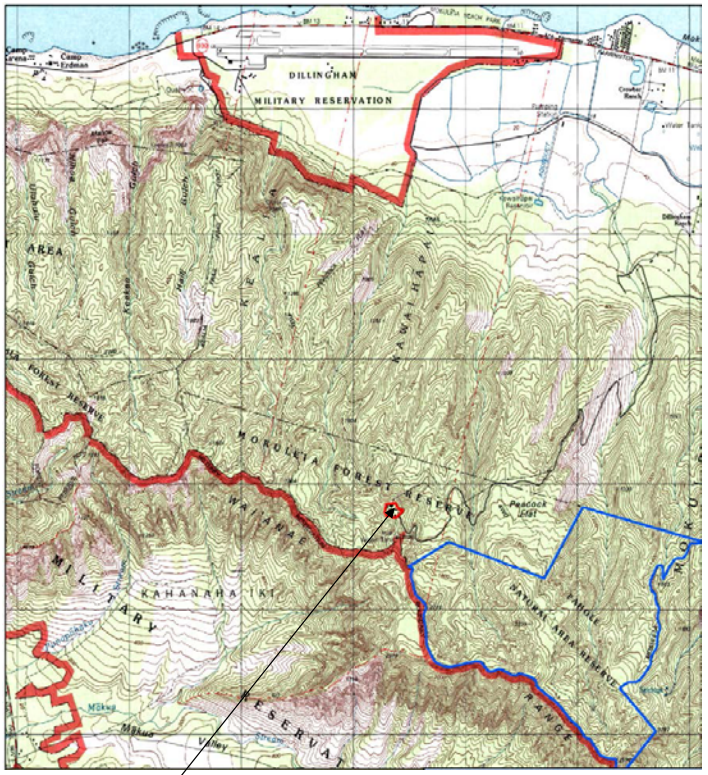

Figure 2. Map of project site within the Mokulē'ia Forest Reserve in Kawaihāpai Ahupua'a (Adapted from Filimoehala 2013: Figure 2)

The Department of Land and Natural Resources Division of Forestry and Wildlife (DLNR DOFAW) provides the following description of the Pahole Rare Plant Facility (DLNR DOFAW 2004):

> On O'ahu, outplanting efforts were increased in the Pahole Reserve and additional improvements were made to the Pahole Rare Plant Facility to enhance the outplanting program. A new Rare Plant Horticulturist was hired for the facility and initiated work on a Master Plan for the facility to organize and accommodate their cooperators (US Army, The Nature Conservancy's Honouliuli Preserve, University of Hawaii Botany Department and many local cooperators and volunteers). Design work was completed for an additional 2500 square feet of nursery space, a new access road, erosion repairs, plus a drainage plan to prevent further erosion. Unfortunately, the Pahole Horticulturist Specialist position was vacated and the Propagation Assistant resigned to take other employment, curtailing the initiation of the Pahole's Master Plan. Forty-five plant species (35

species are listed as Endangered) are in propagation and maintained in the Pahole Rare Plant nursery for outplanting, genetic storage, or production of seeds/cuttings. Another 500 plants for Army Environmental are maintained at the Pahole facility. Propagule collection of the rare plant species on O'ahu is ongoing as part of the cooperative aspect of the Pahole nursery. A large part of the Pahole Rare Plant Facility's mission of education has been accomplished by providing educational work trips for 13 different educational, community, civic service, and conservation groups, in addition to University of Hawaii and Community College graduate/undergraduate classes. These groups provided in kind labor to support Pahole Natural Area Reserve projects as well as the Pahole Rare Plant Facility (DLNR DOFAW 2004).

Photos 2-4. Rare Plant Nursery below proposed redevelopment area.

The Pahole Rare Plant Facility complex currently consists of facility buildings, greenhouses, retaining wall, road and parking areas, water tanks, and existing communication structures. Previous construction of the complex greatly impacted and altered the landscape. Most of the PRPF complex was graded to create level platforms where structures were assembled. The Pahole IRF project area where the proposed construction and relocation activities will take place is limited to the eastern and southern areas of the complex where the existing water tanks and radio tower facilities are currently located (Figure 3).

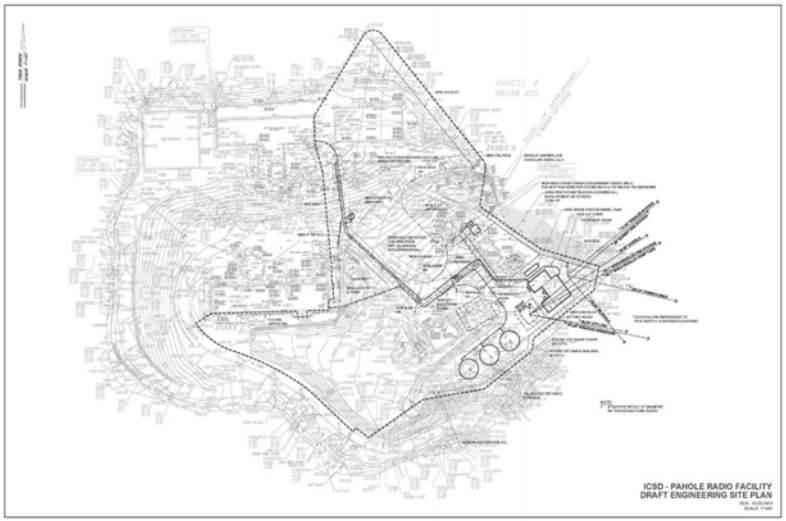

Figure 3. ICSD Pahole Draft ENG Site Plan (BCH 2013)

Physical Setting: Natural and Built Environment

The project area is located near the northwest end of the Waiʻanae Mountain Range. The terrain is mountainous with deeply-incised Mākua Valley to the south and the low-lying Waialua Plain to the north. Soils in or near the project area belong primarily to the Kemoo soil series, which is common across the Mokulēʻia upland area (Foote et al. 1972:69-70). Kemoo silty clay sloping 35-70 percent (map symbol KpF) occurs on side slopes along drainage ways. Runoff is rapid, and the erosion hazard is severe. Tropohumults-Dystrandepts association soils sloping 30-90 percent (map symbol rTP) are present directly southwest of the project area and within Pahole Gulch to the southeast. Both soils are well-drained and form in material weathered from igneous rock in steep sloping upland areas. Tropohumults occur on narrow ridge tops at higher elevations and are well-drained, strongly acid soils. Dystrandepts are dark-colored, friable soils that are well-drained and strongly acid, forming on steep side slopes and narrow ridge tops at lower elevations (Filimoehala 2013:9).

The primary ridgeline of the northern Waiʻanae Range (Kuaokalā and Makua Ridges) narrows as it extends west-northwestward to Kaʻena Point. Farther east-southeastward toward the project area, the ridgeline becomes wider and dissected, with tributary drainages feeding into a series of gulches to the north. Kawaihāpai Stream is a perennial stream located 2,067 ft (630 m) east of PRPF and is 7.5 miles long (12 km) within the Kawaihāpai Watershed (Figure 4). The watershed is 4.4 square miles with a maximum elevation of 2,411 ft (735 m) and located west of the Pahole Watershed (Figure 5) which is 2.6 square miles with a maximum elevation of 2,556 ft (779 m) (*Atlas of Hawaiian Watersheds*…2008:5545 & 553).

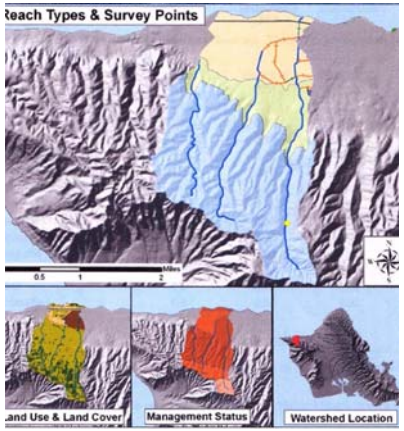

Figure 4. Kawaihāpai Watershed (AHW 2008)

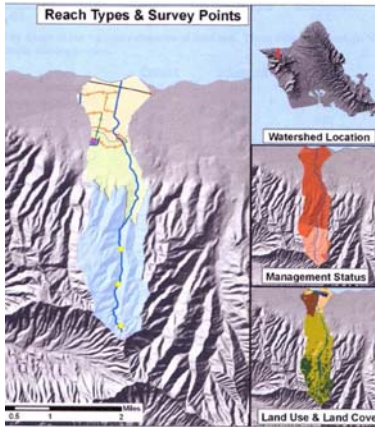

Figure 5. Pahole Watershed (AHW 2008)

Watersheds in the Waialua Region, their streams and DAR code # (AHW 2008) (P = perennial)

- Kawaihāpai (36001): Kawaihāpai Stream (P), Mokulēʻia Stream
- Pahole (36002): Pahole Stream (P)
- Makaleha (36004): Makaleha Stream (P)
- Kiʻikiʻi (36006): Haleʻauʻau, Kaukōnāhua, Kaukōnāhua-north, Kaukōnāhua-south, Kiʻikiʻi, Mohiākea, Poamoho, Poamoho-south, Wahiawā Res, Waikōloa
- Paukauila (36007): Helemano, ʻŌpaeʻula, Paukauila (P)
- Anahulu River (36008): Anahulu (P), Kawai Iki, Kawailoa, Kawainui
- Lokoea (36009): Lokoea Stream (P)
- Waimea River (36010): ʻElehāhā, Kaiwikoʻele, Kamananui, Kauwalu, Waimea Stream (P)

Vegetation in the Mokulēʻia Forest Reserve varies, but common taxa include Christmas berry (*Schinus terebinthifolius*), guava (*Psidium guajava*), and ironwood (*Casuarina* sp.). Native plants in the area of the installation include *ʻaʻaliʻi* (*Dodonaea viscosa*), *alaheʻe* (*Canthium odoratum*), *ʻakia* (*Wikstroemia* sp.), *naio* (*Myoporum sandwicensis*), *nehe* (*Lipochaeta integrifolia*), *pāʻū o Hiʻiaka* (*Jacquemontia sandwicensis*), *pili* (*Heteropogon contortus*), *ʻūlei* (*Osteomeles anthyllidifolia*), *wiliwili* (*Erythrina sandwicensis*), and *ʻāheahea* (*Chenopodium oahuense*) (Hammatt and Borthwick 1987:13). The vegetation in PRPF area today (May 10, 2013) is mixed - predominantly alien species overtaking any native plants that were planted there or naturally grown. The photographs below illustrate the vegetation conditions and types within the proposed construction and relocation sites.

Photo 5. New turn around area

Photo 6. Future City Radio Building

Photo 7 & 8. Mixed vegetation on slope below current water tanks

Photo 9. Unknown groundcover with blue flowers

Photo 10. Unknown plant with white flowers

Photo 11. *Alahe'e* (*Canthium odoratum*) diseased

Photo 12. *Koa* (L) in area of relocated tanks

Photos 13 & 14. East-facing chain link fence to be replaced

Photo 15. South-facing chain link fence to be replaced

Photo 16. Area in back of City building where irrigation tanks will be relocated

Photo 17. Approximate area of proposed construction activity

Photo 18. Site of new HECO transformer and pad for future KVA transformer

Photo 19. Irrigation tanks to be relocated in rear of City building

Photos 20. View of East from PRPF

Photos 21. View of SW from PRPF

Mean annual rainfall in this area is 1,322 millimeters (52 inches), with an annual range of 44 to 186 mm (1.7 to 7.3 inches) per month (Giambelluca et al. 2011). PRPF has its own weather station and a sample recording is listed below (IDcide 2013):

KAWAIHAPAI 841 Weather station (Normal Precipitation)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Inch	5.89	3.71	3.28	2.12	1.71	0.91	1.23	0.74	1.17	2.76	3.84	3.52	30.88

Photo 22. Kawaihāpai Weather Station at PRPF

Photo 23. New standpipe to be installed near weather gauge location

METHODS

This Cultural Impact Assessment was conducted April 2013 to May 2013. The study consisted of three phases: (1) cultural and historical archival literature review; (2) ethnographic survey (oral history interview), analysis of ethnographic data (past oral histories) and (3) report writing. The level of effort for this study included a broad archival research literature review and an ethnographic review and analysis (two past oral histories and one current oral history).

The personnel consisted of the principal investigator (ethnographer) who has a master's degree in Anthropology, with a graduate curriculum background in the archaeology track as well as anthropology theory, cultural resource management, ethnographic research methods, and public archaeology; an undergraduate curriculum background that included Hawaiian History, Hawaiian Language, Hawaiian Archaeology, Pacific Islands Religion, Pacific Islands Archaeology, Cultural Anthropology, as well as a core archaeology track, Geology, and Tropical Plant Botany; and ethnographic field experience that includes over 400 interviews to date.

This CIA is based on *Grounded Theory,* a qualitative research approach (Haig 1995; Pandit 1996) in which "raw data" [transcripts and literature] are analyzed for concepts, categories and propositions. Categories were pre-selected as part of the overall research design. Categories were generated by forming general groupings such as "Land Resources and Use," "Water Resources and Use," "Marine Resource and Use" and "Cultural Resources and Use." Conceptual labels or codes are generated by topic indicators (i.e., gathering, bird hunting).

Primary source material included genealogies, oral histories and other studies and reports. Secondary source material included translations of 19th century ethnographic works, historical texts, indexes, various reports and Hawaiian language resources (i.e., proverbs, place names and dictionary) and several copies of documents provided by Mr. Thomas Shirai about his *ohana* and their association with the *ahupua'a* of Kawaihāpai.

The selection of the ethnographic consultant was based on the following criteria:

- Had/has Ties to Project Location(s)
- Known Hawaiian Cultural Resource Person
- Known Hawaiian Traditional Practitioner
- Referred By Another Cultural Practitioner

The formal interview process included a brief verbal overview of the study. Then the ethnographic consultant was provided with a consent or 'agreement to participate' form to review and sign (Appendix D). An ethnographic research instrument (see Appendix E) was designed to facilitate the interview; a semi-structured and open-ended method of questioning based on the person's response ('talk-story' style). Each interview was conducted at the convenience (date, place and time) of each consultant. The interview was conducted using a cassette tape recorder. The interviewee was allowed to choose where he wanted to have his interview conducted. Notes were also taken, but more attention was given to listening intently to the consultant. A *makana* or gift was given to the consultant in keeping with traditional reciprocal protocol.

Ethnographic research constraints include the following:

- Due to the isolation of the project site with limited access for decades only one formal interview was conducted;
- A second interview was considered but an email correspondence revealed that the person had moved to Molokai;
- Lastly, another cultural consultant suggested that he was not the best resource and suggested someone else and provided contact information.

The taped interview was transcribed by a hired transcriber and edited by the ethnographic investigator. The consultant was emailed an explanation of the transcript review process, along with the interview transcript, and a 'release of information' form. This process allows for corrections (i.e., spelling of names, places), as well as a chance to delete any part of the information if so desired or to make any stipulations if desired. The consultant was also informed of the two-week time limit for their review after which it will be assumed that the raw data can be selectively used.

The ethnographic analysis process followed a more traditional method, as a qualitative analysis software program was not necessary. The interview was manually coded for research thematic indicators or categories (i.e., personal information; land resources and uses; site information-traditional and/or historical; and anecdotal stories). For the purpose of this CIA, it was also not necessary to go beyond the first level of content and thematic analysis. However, sub-themes or sub-categories were developed from the content or threads of each interview (e.g., land resources; cultural resources).

The Summary of Findings section is based on both archival and ethnographic data: Summary of Significant People and Events (e.g., Legendary Entities, *Ali'i Nui*), Summary of Historic People and Events, and Significant Practices Pre-Contact and Post-Contact. This section also includes 'Environmental Council Guidelines Criteria in Relation to Project Lands' and the Cultural Impact Assessment and recommendations or mitigation if any are made.

The report includes the description of the project area; the explanation of methods; a review of the historical and traditional (cultural) literature; the ethnographic analysis; summary of findings and cultural impact assessment.

A site visit of the project area was made by this researcher along with the ethnographic consultant and his wife. A key was provided by DLNR Forestry Division. The researcher's brother was invited; he provided a 4X4 truck and unlocked/locked all six gates on the 2.6 mile drive up the mountain. With the exception of the lower road, the site visit included the entire PRPF complex. Several photographs were taken of the area, especially the proposed construction areas (see photos above).

CULTURAL AND HISTORICAL BACKGROUND REVIEW

The Cultural and Historical Background Review entailed a review of previous reports that included primary and secondary source literature. Examples of primary source material include maps, Land Court records, newspaper articles, genealogies, oral histories and other studies. Secondary source material includes translations of 19th century ethnographic works, historical texts, indexes, archaeological reports, internet research and Hawaiian language resources (i.e., proverbs, place names and Hawaiian language dictionary). A review of selected archival material is presented in this section.

The ethnographic works of the late 19th and early 20th century contribute a wealth of information that comprise the traditional literature--the *mo'olelo, oli,* and *mele*--as well as glimpses into snippets of time, and a part of the Hawaiian culture relatively forgotten. The genealogies handed down by oral tradition and later recorded for posterity, not only give a glimpse into the depth of the Hawaiian culture of old, they provide a permanent record of the links of notable Hawaiian family lines. The *mo'olelo* or legends allow *ka po'e kahiko*, the people of old, the *kupuna* or ancestor, to come alive, as their personalities, loves, and struggles are revealed. The *oli* (chants) and the *mele* (songs) not only give clues about the past, special people and *wahi pana* or legendary places, they substantiate the magnitude of the language skills of *na kupuna kahiko*.

Po'e ku'auhau or genealogy *kahuna* (masters) were very important people in the days of old. They not only kept the genealogical histories of chiefs "but of *kahuna*, seers, land experts, diviners, and the ancestry of commoners and slaves …an expert genealogist was a favorite with a chief." During the time of 'Umi-a-Līloa, genealogies became *kapu* (restricted) to commoners, which is why there "were few who understood the art; but some genealogists survived to the time of Kamehameha and even down to the arrival of the missionaries" (Kamakau 1992:242).

There are several chants from Hawai'i and other Polynesian islands referred to as migration chants that expand on the travels of ancient Polynesians and not only explain why they traveled from place to place, and where the traveled, they also give their genealogy illustrating how families are connected from one Polynesian island-nation to another. Examples are the chants and stories by Kamakau and Kepelino about Hawaii-loa a famous ancient navigator and discoverer of the islands named after him (PVS 2013).

Ruling chiefs of the various islands came from combinations of genealogies or branches. Malo (1971) wrote about the connection between the *maka'āinana* and the chiefs. "Commoners and *ali'i* were all descended from the same ancestor, Wākea and Papa" (Malo 1971:52). Surviving genealogies illustrate that the ruling families of each island were interrelated quite extensively. The chiefs of O'ahu, Kaua'i, Hawai'i, Maui and Moloka'i had one common ancestry. Families branched out, but conjoined several times in succeeding generations (Kamakau in McKinzie 1983: xxv). Not only were the chiefs or *ali'i* related to each other, they were also related to the commoners. In *Ruling Chiefs of Hawaii,* Kamakau states that "there is no country person who did not have a chiefly ancestor" Kamakau (1992:4). Genealogies were very important to the chiefs, because ranking was very important.

One could defend and/or prove their rank by knowing or having one's genealogist recite one's genealogy. "To the Hawaiians, genealogies were the indispensable proof of personal status. Chiefs traced their genealogies through the main lines of 'Ulu, Nana'ulu, and Pili, which all converged at Wākea and Papa (Barrère 1969:24). Two well-known genealogy chants are the *Kumuhonua* and the *Kumulipo.*

The *Kumuhonua* first published by Fornander in 1878 in *The Polynesian Race* Vol. I was based on information from Kamakau and Kepelino. Kumuhonua, the man, was of the Nana'ulu line, and the older brother of Olopana and Mo'ikeha (McKinzie 1986:14-15 vII). Barrère (1969) explains that some of the *Kumuhonua* legends were recorded by Kamakau and Kepelino between the years 1865 and 1869,

however, the 'genealogy' of the *Kumuhonua*, published by Fornander, was given to him "to provide credibility to the legends…this 'genealogy' (was) constructed from previously existing genealogies--the *Ololo* (*Kumuhonua*) and the *Paliku* (*Hulihonua*), which are found in the *Kumulipo* chant (see Beckwith 1951:230-234) and interpolations of their own invention" (Barrère 1969:1).

Feher (1969) asks several notable Hawaiian scholars to write passages in his *Kumulipo: Hawaiian Hymn of Creation-Visual Perspectives*. In the Introduction, Momi Naughton states "The *Kumulipo* belongs to a category of sacred chants known as *pule ho'ola'a ali'i,* 'prayer to sanctify the chief,' which was recited to honor a new-born chief (Feher 1969:1). In her passage, Edith McKinzie states:

> "The *Kumulipo* is a historical genealogical chant that was composed by the court historians of King Keaweikekahiali'iokamoku of the island of Hawai'i about 1700 AD in honor of his first born son Ka-lani-nui-'I-a-mamao. This important chant honors his birth and shows the genealogical descent of both the *ali'i* (chiefs) and the *maka'ainana* (commoners) from the gods, in particular Wakea…" (Feher 1969:1).

In a passage by Roger T. Ames, he corroborates this idea and states that "what is of particular humanistic interest is the way in which the *Kumulipo* as a repository of cultural authority served Hawaiian society in transmitting its cultural legacy and organizing its community. In doing so it combines both a linear sense of temporal development and the richness of one particular moment in time" (Feher 1969:3).

Edith McKinzie completed the first volume of *Hawaiian Genealogies* in 1983, based on genealogy articles translated from 19th century Hawaiian newspapers such as *Ka Nonanona* and *Ka Nupepa Kuokoa* in the late 19th century and early 20th century. These articles were in response to a call to preserve the Hawaiian heritage. Some of the information came from Malo's (1838) *Mo'olelo Hawaii* (Hawaiian History), and in Fornander's (1880), *The Polynesian Race* (Book I) (McKinzie 1983:1).

Youngblood (1992) found that he could draw on both Fornander and Beckwith's translations of 'The Kumulipo' to sketch a socio-political history of Hawai`i (Youngblood 1992:34). In his re-creation he found that stemming from Wākea and Papa are two major Hawaiian genealogies: the *Nana'ulu* and the '*Ulu*. The *Nana'ulu* was the wellspring for the *ali'i* of O'ahu and Kaua'i, while the *'Ulu* line supplied the chiefs of Maui and the Big Island.

Using thirty years to account for one generation, McKinzie determined that Wākea was born ca. AD 190; Umi-a-Līloa ca. 1450; Keawekehahialiiokamoku ca. 1650, Kalanihuiikupuapaikalanui Keoua ca. 1710; and Kamehameha I ca. 1740 (McKinzie 1983:12). Volume One of *Hawaiian Genealogies* was published in 1983 and Volume Two of *Hawaiian Genealogies* was published in 1984 (reprinted in 1986 and 1997) with information extracted from genealogical lists published in thirteen newspapers from 1858 to 1920. It compliments genealogies found in other works, such as Fornander's (1880) *An Account of the Polynesian Race* and David Malo's (1903) *Hawaiian Antiquities* (McKinzie 1986: v).

The following excerpt is from Kamakau's article in *Ka Nupepa Kuokoa* October 7, 1865, and was translated by McKinzie (1986). It illustrates some of the mid-19th century sentiment regarding genealogies:

> *I na maka'ainana, he mea wai wai ole, no ka mea ua papa ko lakou mau makua o hoohalikelike, a hoohanau keiki o ke kuaaina a pii aku i na li`i. Nolaila ia ao ole ia ai na keili a na makaainana, ma kahi makuakane a makuahine, a kupuna aku no…. Ia kakou i ka poe o keia wa, aole waiwai o keia mea he mooalii aole a kakou mau kuleana nui iloko. Aka, ma ko kakou noonoo iho he waiwai nui. Ua komo kakaou iloko, ua waiwai na li`i na kupuna; a ua waiwai pu kakou i koo kakou ike ana. No ka mea, ua kapu i ka makaainana aole e ike i keai mea. Aka, no ka pii ana i ka naauao a*

me ke akamai o na keiki a na makaainana; nolali, ua noa na wahi kapu, ua pii waleia. O ke koeana mai o na kupuna oia kahi waiwai.

To the commoners, a genealogy was of no value because their parents forbad (sic) it lest comparisons should occur and country children be born and rise up as chiefs. Therefore, the children of the commoners were not taught beyond father, mother, and perhaps grandparents…. To us, the people of this time, there is no value of this thing of a chiefly lineage; we have no great interest in it. But in our thoughts it is of great value. We have entered into discussion of it; the chiefs valued the chiefs and ancestors; and we also value our knowledge of it. Because it was forbidden to the commoners, they were not to know this. However, due to the rise of wisdom and skill of the children of the commoners, therefore, all of the ranking privileges were no longer restricted; it was only lifted. What remains of the ancestors is something of value (McKinzie 1986:18-19).

"In the genealogical line of *Nana'ulu*, it is believed that he is an ancestor of Tahiti and Borabora because in this genealogy down to Mo'ikeha [it is said he is from Tahiti] and married Hooipo (Hinauulua) in Kauai who bore their three children: Hookamalii, Haulanuiaiakea, and Kila. And Hookamalii became the chiefly ancestor for O'ahu; Haulanuiaiakea for Kauai; and Kila for Hawaii" (Kamakau in McKinzie 1983:xxv). The following table starts with the genealogical line called *Kumu-Honua* which descends to the *Nana'ulu* line - the ancestral chiefs of O'ahu and Kaua'i - from Nanaulu down to Lā'ielohelohe (McKinzie 1983:13). Kamakau (1991) says that Nanaulu to 'Olopana are the ancestors of Kahiki [Tahiti] and Nu'uhiwa [Marquesas] (Kamakau 1991:79). (Note: macrons may not be used because McKinzie did not use them.) The majority of the sources come from McKinzie (1983 and 1986); Kamakau (1991); Peleioholani (2011) and Kekoolani (2010).

Table 1a. Annotated Genealogy of O'ahu Chiefs

(McKinzie 1983:13; 1986:14, 15; Kamakau 1991:76-77; Peleioholani; Wikipedia).

Kane (male)	**Wahine (Female)**	**Keiki (offspring)**
Kumu-Honua	Haloiho	Ahukai (k)
"	"	Kane-a-Kumuhonua
"	"	Kanaloa-a-Kumuhonua
Ahukai	Holehana	Kapili
Kapili	Alonainai	Kawakupua
Kawakupua	Heleaeiluna	Kawakahiko
Kawakahiko	Kahohaia	Kahikolupa
Kahikolupa	Lukaua	Kahikoleikau
Kahikoleikau	Kupomakaikaelene	Kahikoleiulu
Kahikoleiulu	Kanemakaikaelene	Kahikoleihonua
Kahikoleihonua	Haakookeau	Haakoakoalaulani
Haakoakoalaulani	Kaneiakoakanioe	Kupo
Kupo	Lanikupo	Nahaeikekua
Nahaekekua	Hanailuna	Keakenui
Keakenui	Laheamanu	Kahianahinakii-Akea
Kahianahinakii-Akea	Luanahinakiipapa	Koluanahinakii
Koluanahinakii	Hanahina	Limanahinakii
Limanahinakii	Onohinakii	Hikiuanahina
Hikiuanahina	Waluanahina	Iwahinakiiakea
Iwahinakiiakea	Lohanakiipapa	Welaahilaninui
Welaahilaninui	Owe	**Kahiko Laumea (I) (Kahiko)**
Kahiko Laumea (I) (Kahiko)	Kupulanakehau	**Wākea** (Nu'uanu, O'ahu)
Kukalaniehu	Kahaukauakoko	**Papa** (w) Nu'uanu, O'ahu
"	"	Kauakahi
"	"	Kainohiula
Wākea [lived in Waolani, Nu'uanu]	**Papa** (Papahanaumoku) (Haumea)	Kaalewalewa
"	"	Hoohokukalani (w)
"	"	Laukapalili
"	"	Haloa I (k) [stillborn]
Wākea	**Hoohokukalani** (daughter)	**Haloa II (k)**
Haloa II	Hinaaihoouluae (Hinamanoluae)	**Waia** (k)
"	"	Huhune (w)
Waia (sibs)	Huhune	Hananaloa (Hinanalo) (k)
"	"	Hauiki (Haunu'u) (w)
Hananaloa/Hinanalo (sibs)	Hauiki/Haunu'u	Haulani (w)
"	"	Nanakehili (k)
Nanakehili	Haulani	Waia-loa (Wailea, Manaku) (k)
"	"	Hikawaakaunu (Hikawaopuaianea)
Waialoa (sibs)	Hikawaakaunu	Kio (k)
"	"	Kamuoleilani (Kamole) (w)
Kio (sibs)	Kamuoleilani	Ole (k)
"	"	Haihailauahea (w)
Ole (sibs)	Haihailauahea	**Kahiko Luamea (II)** (k)
"	"	Pupue (w)
[Wikipedia has it slightly different from McKinzie who has Pupue m Kamahele – they have Manuka (k), then Manuka m Hikohaale and they have Kahiko (k) who m Kaea and they have Luanuu…the rest is same]	[Wikipedia has another Kahiko son of Manuka & Hikohaale who m Kaea and has Lukahakona (k)] who m Ko'ulamaikalani and they have Kaealuanui (Lu'anu'u) (k)]	Wikipedia's information comes from various genealogies…most prolific is from S. K. Peleioholani.
Kahiko Luamea (II) (sibs)	Pupue	Kawaamaukele (w)
Kaealuanui (Lu'anu'u)	Kawaamaukele	Hinakoula (w)
"	"	Kukū (Kū) (k)
Kū (sibs)	**Hinakoula**	**Nanaulu (Nana'ulu)** (k) [O'ahu lines]
"	"	**Ulu ('Ulu)** (k) [c. 415AD]
"	"	**Kapumaleolani(Kapomaleolani)** w
Ulu ('Ulu)	Kapunuu	Kapulani (Kapulani-a-Ulu) (w)
"	"	Nana (k)
Ulu ('Ulu)	Kaulani I	**Nanaele (Nanaie)** (k) [c. 440AD]
Nanaulu (sibs)	Kapumaleolani (Kapomaleolani)	**Kahauomokuleia** (w) [c. 444AD]
Nanaulu	Ulukou	Nana-mea (k) [13 gen◊Maweke]
Nanamea	Puia	Pehekeula (k)
Pehekeula	Uluae	Pehekenana (k)
Pehekenana	Nanahapa	Nanamua (k)
Nanamua	Nanahope	Nanakeauhaku (k)
Nanakeauhaku	Elehu	Keaoa (k)
Keaoa	Waohala	Hekumu (k)
Hekumu	Kumukoa	Umalei (k)
Umalei	Umaumanana	Kalai (k)
Kalai	Laikapa	Malelewaa (k)
Malelewaa	Pililohai	Hopoe (k)
Hopoe	Hauananaia	Makalawena (k)
Makalaawena	Koihouhoua	Lelehooma (k)
Lelehooma	Hapuu	Kekupahaikala (k)
Kekupahaikala	Maihikea	**Maweke** ◊ O'ahu /Kaua'i/Ni'ihau
Maweke (Ruling Chief-O'ahu)	Naiolaukea	**Mulielealii** (Kona, O'ahu residence)

"	"	Keaunui (Ewa, Waianae, Wai'alua)
"	"	Kalehenui (Koolau)
Mulielealii (O'ahu Ruling Chief)	Wehelani	**Kumuhonua II** (k) [O'ahu chiefs]
"	"	Olopana (k) (Waipi'o Valley)
"	"	Moikeha (k) (Kaua'i)
"	"	Hainakolo (w) (Kuaihelani)
	KUMUHONUA II RULING CHIEFS Term **Ali'i Aimoku** first used:	
Kumuhonua II [1st Ali'i Aimoku]] [1st cousin to Laakona of Ewa, Nuakea-queen consort of Moloka'i; Mō'i, kaula/Moloka'i; and high chiefess of Ko'olau, Hinakaimauliawa]	unkn	**Elepuukahonua** (k)
"	"	Molohaia (k)
"	"	Kahakuokane (k)
"	"	Kukawaieakane (k)
Elepuukahonua (k) **2nd Ali'i Aimoku** [Cousin Haulanuiaiakea, Kauai king]	?	**?**
Hikilena	Olepuukahonua	**Kahokupohakano**
Kahokupohakano (3rd Ali'i Aimoku)	Kumana	**Nawele**
Nawele (4th Ali'i Aimoku of O'ahu)	Kalanimoeikawaikai	**Lakona** (Ewa, Waianae, Wai'alua)
Lakona (5th Alii Aimoku of O'ahu) [Ruled Ewa/Waianae/Wai'alua moku; his cousins Maelo ruled Kona, O`ahu and Kaulaulaokalani ruled Ko`olau]	**Alaikauakoko** (also wf of **Kanipau)** [Kanipau-4th Ali'i Aimoku of Hawai'i Is; **Pili** line-usurped…he went to Moloka'i-his gds **Kalapana** later Mō'i of HI Is]	**Kapae-a-Lakona (k)**
Kapae-a-Lakona (6th Ali'i Aimoku)	Wehina	**Haka** (k) (resided Lihue/Ewa)
Haka-a-Kapae (7th Ali'i Aimoku O'ahu); [O'ahu chiefs revolted and killed Haka at his fortress near Waewae, near Līhue; they then elected **Mā'ilikūkahi** to rule O'ahu.]	Kapunawahine	Kapiko-a-Haka (k)
	END of Kumuhonua Ruling Chiefs as **Mā'ilikūkahi** descended from **Moikeha,** brother of **Kumuhonua.**	**However…** Haka's granddaughters connected the O'ahu –Kaua'i ohana. See below
Kapioko-a-Haka (son of Haka)	Ulakiokalani	Kaulala(w)◊ Kanekapuakakuhihewa
"	"	Kauoi (w)
"	"	Kamiliahonui (w) ◊Kaumualii
Kalaniuli (Koolau chief)	Kaulala (gdau of Haka)	[started **Kualii** line of O'ahu chiefs]
Ilihiwalani [son of Kalanikuma-13th Ali'i Aimoku of Kaua'i and Kapoleikauila, descendant of Maweke/Kumuhonua line]	Kamiliahonui (gdau of Haka) [They are ancestors of Kaumuali'i, last king of Kaua'i]	Kukawaieakane (k) ('Ewa/Lihue)
	MOIKEHA LINE	
Moikeha (1st Ali'i Aimoku-Kaua'i) [Brother of Kumuhonua]	Hanauula	Hookamalii (k) Kona/'Ewa◊Kahai ◊Mailikukahi◊Kalona
"	"	Haulanuiakea (k) [He and brothers sailed to Kahiki to fetch La'a (McKinzie 1991:15)]
"	"	Kila (k)
Hookamalii	Keahiula	Kahai (k)
Kahai (grandson of Moikeha) [He sailed to Kahiki, Wawae, Upolu and Sawaii and brought back 'ulu that was planted at Pu'uloa (McKinzie 1991:15)]	Kehenu/Keheau	Kuolono (k)

Kuolono	Kaneakaleleoi	Maelo (w)
Lauli-a-Laa	Maelo	Laulihewa (k)
Laulihewa	Akepamaikalani	Kahuoi (k)
Kahuoi	Pelea	Puaakahuoi (k)
Puaakahuoi	Nononui	Kukahiaililani (k)
Kukahiaililani	Kokalola	**Mā'ilikūkahi (k)** [8th O'ahu Ali'i Nui] resided in Lihue, O'ahu
	NEW O'AHU REIGN **MOIKEHA LINE** (from Kaua'i)	
Mā'ilikūkahi (8th Ali'i Aimoku-O'ahu) Lihue, O'ahu . [Born at Kūkaniloko birthstones and coronated at Kapukapuakea Heiau; from Maweke & Paumakua lines; raised at Wahiawa, Kanewai and Wai'alua, but later made Waikiki his permanent residence; ended human sacrifices; Hilo and Maui chiefs raided O'ahu ('Ewa) during his time & were defeated in Kipapa Gulch]	Kanepukaea	Kalona-nui (k) [Lihue, O'ahu] [Born at Kūkaniloko]
"	"	**Kalona-iki (k)** [b/Kūkaniloko and considered to be a Lo-Ali'i chief, who were guardians of Kūkaniloko and lived at Lihue, now Schofield Barracks]
Kalona-nui	Kahalakaihuholua/Kaihuholua	**Kalamakua** [◊ I 'ohana of Hilo; and Pi'ilani 'ohana of Maui]
Kalona-iki (9th Ali'i Aimoku-O'ahu)	Kikenui-a-Ewa [⇓Lakona⇓Maweke]	Kamaleamaka (w)
"	"	**Piliwale (k) O'ahu Mō'i-Waikiki**
"	"	Lali/Lo-Lale-o-Halona [Lo-Ali'i] (k)
	O'AHU -MAUI LINES CONNECT	
Lolae-o-Halona (Ali'i-Lihue, O'ahu)	Keleanuinohoanaapiapi (Maui chiefess) Aunt of Pi'ilani, Mō'i of Maui	Kaholialale-o-Halona/Lihue
"	"	Luliwahine-a-lale-o-Halona/Lihue
"	"	Luli-kane (Halona/Lihue)
	[Kelea is the sister of Kawaokaohele, Maui Mō'i and father of Pi'ilani who succeeded him]	[All three children like their father were born at Kūkaniloko birthstone and were Lo-Ali'i]
Kalamakua (Waikiki/Hālawa) [Son of Kalona-nui, nephew of Kalona-iki, cousin of Lolae. developed the extensive irrigation system that supported several hundred acres of taro fields and fishing at Waikiki. This irrigation system changed the formerly wet-taro cultivating area of Waikiki, Kapahulu, Mo'ili'ili & Manoa. The increase of fishing was due to the development of fishponds, which along with the taro pondfields, were irrigated by water drawn from the Manoa and Palolo Valley streams and large springs in the area. He was also known to enjoy surfing, especially at Kahaloa near the mouth of the 'Apuakeahau Stream; high chief of Hālawa]	Keleanuinohoanaapiapi (niaupio) [former wife of Lolae-o-Halona, who was son of Kalona-iki. She was also noted for her surfing prowess.]	Laielohelohe (w) [wf of Pi'ilani/Maui] [Bethrothed to cousin Pi'ilani at birth; they became the progenitors of the famous Maui line of ruling chiefs. Half-sib of Kaholialale & Luliwahinealale keiki of Lo-Ali'i of Lihue, O'ahu] MORE O'AHU -MAUI CONNECTIONS
Kawaokaohele (Maui Mō'i)	Kepalaoa (O'ahu Chiefess)	Pi'ilani
Pi'ilani (Maui Mō'i)	Laielohelohe (O'ahu Chiefess)	Lono-a-Piilani [Maui Mō'i]

"	"	Kiha-a-Piilani [O‘ahu -Maui Ali‘i]
"	"	Piikea [m/Umi-a-Liloa-Hawaii Mō‘i]
"	"	Kala‘aiheana [given the title of Kihawahine, mo‘o goddess of Maui]
Piliwale (10th Ali‘i Aimoku-O‘ahu)	Paakanilea	**Kūkaniloko** (w) b/Kūkaniloko
"	"	Kohepalaoa/Kohipalaoa (w)
Kaholialale-o-Halona [s/Lo-Lale & Keleanuinohoanaapiapi of Maui]	Kohipalaoa [1st cousins]	Kanehoalani (k) ◊ grdf of **Kākūihewa**
Luaia [Maui chief-gs/Kaka‘alaneo; son of Kahekiliahumano; cousin of Pi‘ilani]	**Kūkaniloko** (11th Ali‘i Aimoku-O‘ahu)	**Kalaimanuia (w) b/Kukaniloko** [childhood in Wahiawa mtns and youth/adult in Kalauao-res at Kukiiahu & Paaiau; She built many fish shrines and fish ponds of Kapaakea, Opu & Paaiau; She died at 91yrs; ruled 65 yrs]
"	"	Kauwahimakaweo (k)
Lupekapukeahomalii	**Kalaimanuia** (12th Ali‘i Aimoku)	**Ku-a-Manuia** (k) (b/live Waikiki)
"	"	**Kaihikapu-a-manuia** (k) (Waimanalo) [given Kalauao/Aiea/Hālawa/Moanalua]
"	"	Hao (k) (lived Waikele/‘Ewa) [given ‘Ewa Beach/Wai‘anae]
"	"	Kekela (w) (lived Kalauao) [given Wai‘alua/Koolauloa; Napulanauhu-Mahiki (son of Hao) married Kekela (nephew/aunt) - they ruled Wai‘anae/Wai‘alua/Ko‘olauloa]
Ku-a-Manuia (13th Ali‘i Aimoku-O‘ahu) [given Kona/Ko‘olaupoko; greed/assault got him killed]	?	**?**
Kaihikapu-a-Manuia (14th Ali‘i Aimoku) Grew up in Waimanalo/Ko‘olaupoko; built Loko Kaihikapu & Lelepaua in Ke‘ehi; was jealous of bro Hao’s wealth and killed him]	Kaunuiakanehoalani (Ko‘olau) [Grt-grd dau of Lō-Lale & Kelea; daughter of Lō-ali‘i Kanehoalani]	**Kākūhihewa** (k) -b Kūkaniloko [He grew up in Waipi‘o, Waiawa & Manana; royal res ‘Ewa, Waikiki & Alele, Kailua]
Kākūihewa* (15th Alii Aimoku) [He was born at Kūkaniloko; taken to Hoolonopahu by gf Kanehoalani; & 48 chiefs, e.g., Makohau, Ihukolo, Kaaumakua, Pakapakauana & sacred drums Opuku & Hawea; he grew up at Waipi‘o, Waiawa & Manana]	Kahaiaonuiakahuailana (Waianae) aka Kaea-a-Kalona [She was dau of Napulanahumahiki, son of Hao and Aunt Kekela; with this union Ko‘olauloa united with Wai‘anae and Wai‘alua]	**Kanekapu-a-Kakuhihewa** [when his father died O‘ahu was divided between the 3 eldest brothers]
"	"	Kaihikapu-a-Kakuihewa (k) [2nd son]
"	"	Makakailiilani (w)
"	Kaakaualani (dau of Laninui-a-Kaihupee, a descendant of the Kalehenui-a-Maweke branch and his wife Kauhiiliula-a-Piilani, a daughter of Pi‘ilani, the King of Maui.)	Kauakahinui-a-Kakuihewa (k)
"	Koaekea (unkn)	Kalehuapaikua (k)
"	Kahamaluihi (dau of Kaiole, a descendant of the Kumuhonua-a-Mulielealii branch of the Maweke line and Kawelo-Ehu, of the Kaua‘i branch descending from Ahukini-a-Laa, 4th Ali‘i Aimoku of Kaua‘i. Said to have become the wife of her stepson, Kakuhihewa son, Kanekapu-a-Kakuhihewa)	Kumuhonua-a-Mulieleali
Kaihikapu-a-Kakuihewa Ruled Waikiki & Ewa; during this time	Ipuwaiaholani [O‘ahu /Hawaii] [Dau of Hoalani, brother of	Kauakahikuaanaauakane/kama (w)

Kauhi-a-Kama Maui Mō‘i invaded Waikiki and was killed; he was offered at heiau Apuakehau	Kakuhihewa’s wife and Kaua Kamakaohua, dau of Kohala chief]	
Iwikauikaua (O‘ahu /Hawaii Chief) (son of Makakaualii (k) & Kapukamola & grdson of Kukailani who was nephew of Keawenui Mō‘i of Hawai‘i Island and father of Kaikilani (w) 17th Ali‘i Aimoku of Hawai‘i Island	Kauakahikuaanaauakane/kama (O‘ahu Chiefess - descendant of **Kākūihewa** of O‘ahu)	Kaneikauaiwilani (k) Kaneikaiwilani
" (cousins) [ancestor of Kalākaua & Lili‘uokalani]	Keakamahana (19th Hawai‘i Mō‘i)	Keakealaniwahine (20th Hawai‘i Mō‘i)
Kaneikauaiwilani (1/2 sibs)	Keakealaniwahine (Hawai‘i Island Mō‘i)	Kalanikauleleaiwi (w) [She married several ruling chiefs and became progenitor of several ruling families on Hawaii and Maui islands, e.g., wife of Hawai‘i Island Mō‘i and ½ sib **Keawe**ikekahialiiokamoku; grt-grdmf of Kamehameha I; she married Kaulahea II Mō‘i of Maui and had Kekaulike-Maui Mō‘i
	SEE MIXED LINES BELOW	
Kanaloakaiwilewa	Keakealaniwahine (29th Hawai‘i Mō‘i)	Keaweikekahialiiokamoku (21st Hawai‘i Mō‘i; ggf of Kamehameha I)
Kaneikauaiwilani (O‘ahu Ali‘i) (½ sibs)	"	Kalanikauleleiaiwi (w) (ggm of K-I)
Kaulaheanuiokamoku [Maui Mō‘i]	Papaikaniau	Kekaulike (k) ◊ Maui Mō‘i
Kaulaheanuiokamoku [Maui Mō‘i]	Kalanikauleleiaiwi	Kekuipoiwanui I (w) m ½ sib Kekaulike ◊ Maui Dynasty
Keawe II [21st Hawaii Mō‘i] (½ sibs) [progenitor of the House of Keawe]	"	Ke‘eaumoku Nui (k) (Kona ch) ◊ grdf of Kamehameha I
"	"	Kekelaokalani (w) ◊Kekuipoiwa II mother of Kamehameha I
Kauauanui-a-Mahi (Kohala chief)	"	Alapia-nui (k) [22nd Hawaii Moi]
"	"	Haae-a-Mahi (k) (Kohala Chief)
Lonoikahaupu	"	Keawepoepoe (k) [father of royal twins Kameeiamoku/.Kamanawa]
Ke‘eaumoku Nui	Kamakaimoku	Keōua (k) ◊ Kamehameha I
"	Kailakanoa	Kanekoa (k) ◊ Kawananakoa
Haae-a-Mahi (k) (Kohala Chief) ½ sibs	Kekelaokalani	Kekuipoiwa II mother of Kamehameha I
	[After death of **Kakuhihewa** the Kingdom was divided into 3 districts and ruled by 3 eldest brothers; since Kanekapu, O‘ahu Ali‘i Aimoku ruled from Kailua, the ‘Ewa & Wai‘alua chiefs ruled West O‘ahu]	
Kanekapu-a-Kuhihewa (16th Ali‘i Aimoku) ruled from Kailua; he is ancestor of Papaikaniau, mother of Kekaulike, Maui Mō‘i]	Kalua-o-Hoohila (descendant of Haka’s gd)	**Kahoowahaokalani** (k)
“	Kahamaluihi (step-mother)	NI
Kahoowahaokalani (17th Ali‘i Aimoku) [Koolaupoko Chief, ruled from Kailua; his mother descended from Haka of O‘ahu & Ilihiwalani of Kaua‘i; Maweke line]	Kawelolauhuki (Kauai chiefess)	**Kauakahi-a-Kahoowaha** (k)

Kauakahi-a-Kahoowaha (18th Ali‘i Aimoku) he ruled from Kailua; introduced the kapu-moe to O‘ahu from his ‘ohana on Kaua‘i-from O‘ahu it went to Maui-Kekaulike]	Mahulua	**Kualiilanipipililanioakaiakunuiakealu anuuokuiialiikahalau (k)** [born at Kalapawai, Kailua; raised in Kailua & Kualoa; sacred drums Opuku & Hawea used at birth ceremony]
Kūali‘i (19th Mō‘i O‘ahu) (Kaua‘i) [Famous for his Law of Niaupio Kolowalu; Kuali‘i defeated ‘ohana Wai‘alua army at Kalena on plains of Heleauau (Haleauau) and later defeated ‘ohana army of ‘Ewa at Malamanui and Paupauwela uniting O‘ahu again]	Kalanikahimakeialii (w) (Maui) [dau of sibs Kaulahea II & Kalaniomaiheuila, who connect to Kauai and O‘ahu lines; father of Kekuiapoiwanui I and Kekaulike who were parents of Kamehamehanui, Kahekili & Kalola and gp of Kalanikupule, Kiwalao, and Liliha Kekuiapoiwanui]	**Kapiohookalani** (k) (O‘ahu Mō‘i)
"	"aka Kalanikahemakoalii	**Peleioholani I (k)** (b 1735) [He was given Kaua‘i to rule while older brother ruled O‘ahu , but later ruled O‘ahu as well following death of nephew Kapio]
"	"	Kukuiaimakalani (w)
"	"	Kaionuilanilalahai (w)(Maui)(b 1733) [mother of Kahahana, last O‘ahu Mō‘i]
Kapiohookalani (20thAli‘i)(son/mom) [after Kekaulike’s death, Kapio invaded Moloka‘i; he was defeated and slain by Alapa‘inui, uncle of Maui Mō‘i Kamehamehanui and Kahekili at Kawelo]	Kalanikahimakaialii (w) (Maui)	**Kanahaokalani** (k) (O‘ahu Moi) [six when father died so Uncle Peleioholani took over and went to Maui to assist nephew Kauhiaimokuakama, Kekaulike’s oldest son who waged war on younger brother Kamehamehanui]
Kanahaokalani (21st Alii-O‘ahu) aka **Kahahaokalani** [regent ruled - he was six years old; died at 7; he was descendant of Kaihikapu-a-Manuia]	NA	NA
Peleioholani I (21st Ali‘i) (sibs) [Kualii made him ali‘i nui of Kaua‘i; co-ruled O‘ahu as regent for nephew]	Halakii (Kauai Chiefess)	**Kūmahana** (k)
"	"	Keelaniihonuaiakama (w) [She was murdered on Moloka‘i and avenged by her father who spared Kaiakea, his son-in-law of other dau]
"	"	Kaapuwai (w)
" (dau)	Kukuiaimakalani	Kalanipoo-a-Peleioholani (w)
" (sibs)	Lonokahikini	Keeaumoku-a-Peleioholani (k)
"	"	Kuwalu (w) m I (Ali‘i of Hilo) wf of I
"	"	Kapueohoanoano (w)
Kumahana (22nd Mō‘i) (neph/aunt) [Just a youth as Mō‘i; deposed 1773]	Lonokahikini [one version] Unknown [another version]	Kaneoneo-a-Peleioholani (k)
Kaiakea (Molokai Ali‘i-Nui)	Kalanipoo-a-Peleioholani (w)	Kaakaupalalaka (w)
"	"	Kuluehu (k)
"	"	Kolokoli (k)
Kaneoneo (O‘ahu Ali‘i)	Kamakahelei [Kauai chiefess; dau of Kaapuwai-sister of Kumuhana]	Lelemahoalani (w)
" [died in an insurgency]	Kalanikauiokikilo (daughter of Maui Ali‘i Aimoku Kamehameha-Nui & sib Kalolo…very, very high rank)	[She had four children]
Elani (‘Ewa Chief; Maweke-Lakona)	Kaionuilalahai (daughter of Kuali‘i & related to Kahekili II)	**Kahahana** (k) O‘ahu /Molokai; b Kukaniloko [nephew of Peleioholani; cousin of Kumahana; great-grandson of Kaulahea II; grandson of Kekaulike; nephew of Kehekili and raised in Kahekili’s court]

Kahahana (23rd Ali‘i Aimoku-O‘ahu) [15 when voted in by O‘ahu Council after Kumuhana; later tricked/slain by Uncle Kahekili; he “was killed at Maunakapu, as one descends to Moanalua” - last of Kuali‘i line]	Kekuapo‘iula (Maui) [Very beautiful] daughter of Kekaulike-Maui Mō‘i; niece of Kehekili II; she and Kahahana were betrayed to Kahekili II by her brother Kekuamanoha, son of Kekaulike; nephew of Kahekili II]	?
	END OF O‘AHU -MAUI RULE	
	BEGINNING OF RULE BY MAUI ALI‘I	
Kahekili II (24th Mō‘i) 25th Mō‘i of Maui (1/2 sibs)	Kauwahine (dau of Kekaulike)	**Kalanikupule** (k) Maui/O‘ahu
Kaeokulani (26th Maui Mō‘i) Kaua‘i Mō‘i (son of Kekaulike; 1/2 sib of Kahekili)	Kamakahelei (Queen of Kaua‘i; granddaughter of Peleioholani)	Kaumuali‘i (k) last Kaua‘i Mō‘i
Kalanikupule (25th O‘ahu Mō‘i) (27th Maui Mō‘i)	[Defeated/slain by Kamehameha I - possibly ½ sibs]	

*At the time Kākūihewa was the ruling chief of O‘ahu, Kihapi‘i and his son Kamalalawalu were chiefs of Maui; Keli‘iokaloa [later killed by Kona’s people], Keawenuiaumi, Kanaloakuaana [Kona, Kohala and Hamakua], and Umiokalani were ruling chiefs of Hawai‘i Island (Kamakau in McKinzie 1986:13, 14). However, the families from each main island were all related as the genealogy of Kawaookekahuli illustrates, as written by her husband Samuel R. Keli‘ihahaimoku. “The birth of the ancestors occurred through those of Molokai, Hawaii, and of Maui. The great-great-grandparents join together with those of O‘ahu nui; and the great-great-grandparents were related to Kūhihewa” (McKinzie 1986:75). Keli‘ihahaimoku continues:

> We have partially withdrawn through a straight line in the history of the genealogical line, unbranched; and because the history of Kawaookekahuli (w) is extensive, what the researcher has partially presented are the individual alignments and O‘ahu nui’s great-great-grandparents on the side of Kawaookekahuli’s father. This is what we now present; that there are those from Waianae, those from Oki Kupee, those from Wahiawā, of Kūkaniloko, and those of Mokuleia. The desire of the ancient period has passed away (Samuel R. Keliihahaimoku husband of Kawaookekahuli In McKinzie 1986:75)

Table 1b. Annotated Genealogy of O‘ahu Chiefs – House of Pili

	END OF RULE by MAUI ALI‘I	
	RULE BY HAWAII-MAUI LINE	
	HOUSE OF PILI (KAMEHAMEHA)	
Keoua-kalani-kupua-i-kalani-nui (bro of Kalani‘opu‘u Hawai‘i Is Mō‘i)	Kekuiapoiwa II [dau of Kekelaokalani & Haae (k); niece of Alapa‘inui Hawai‘i Is Mō‘i; niece of Kekaulike’s ½ sib wife]	**Kamehameha I**
Kahekili (Maui Mō‘i) [said to be biological father of K-I]	Kekuiapoiwa II (Hawai‘i Is chiefess)	**Kamehameha I**
Kalei‘o-u‘u/Kalani‘opu‘u (Hawai‘i Is Mō‘i; mom from O‘ahu; Brother of Keoua; uncle of Kamehameha I)	Kalola (Maui Chiefess) [dau of Kekaulike and Kekuiapoiwa I; sib of Kamehamehanui and Kahekili II]	Kiwala‘o (Hawai‘i ruling chief) [cousin of Kamehameha I; grandson of Kekaulike; father of Keopuolani]
Keoua-kalani-kupua-i-kalani-nui (bro of Kalani‘opu‘u; father of Kamehameha I)	Kalola (Maui Chiefess) [younger sister of Kamehamehanui; older sister of Kahekili and Namahana; aunt of Ka‘ahumanu and Ke‘opuolani]	Liliha Kekuiapoiwa III [gdau of Kekaulike; mother of Ke‘opuolani]
Kiwala‘o (half sibs) [cousin of Kamehameha I]	Liliha Kekuiapoiwa III (Maui chiefess) [½ sib of Kamehameha I- they shared the same father]	Kalani-kau-i-Ka‘alaneo/**Ke‘opu-o-lani**
Ke‘eaumoku Pāpa‘iahiahi (Hawaii	Namahana Kaleleonalani (Maui	John Adams Kuakini (k) (Hawai‘i chief)

chief)	Chiefess) [widow of Kamehamehanui-Maui Mō‘i who was her half brother-they were keiki of Kekaulike]	Governor of Hawai‘i Island
"	"	Ka‘ahumanu (fav wf of Kamehameha I)
"	"	George Cox Kahekili Ke‘eaumoku II Governor of Maui (bro of Ka‘ahumanu)
"	"	Kalakua (w) (Maui chiefess)
		Lydia Namahana Pai‘iia
Paiea Kamehameha (nephew/aunt) [warrior youth]	Kānekapolei	Pauli Ka‘ōleiokū
Pauli Ka‘ōleiokū [son of Kamehameha I]	Keouawahine	Kalani Pauahi (‘fire out’…gunpowder explosion she narrowly escaped)
"	Kahailiopua Luahine	Laura Konia
Kala`imamalu (bro of Kamehameha I)	Kalākua Kaheiheimālie (Maui chiefess; sister of Ka`ahumanu and Namahana)	Miriam Auhea Kekāuluohi
Paiea Kamehameha	Kalola-a-Kumuko`a	NI
Kamehameha I (Hawaii Is chief-King of all islands except Kauai)	Ka`ahumanu (Maui/Hawaii chiefess) [favorite wife]	NI
"	**Keōpūolani** (Maui chiefess-niaopio)	**Liholiho** (Kamehameha II)
"	" (grdau of Kekaulike-Maui Moi)	**Kauikeaouli** (Kamehameha III)
"	"	Nahi‘ena‘ena
"	Peleuli-i-Kekela [dau of Kamanawa; gm of Kekauōnohi]	Kahoanoku Kina‘u (k) father of Kekauōnohi wf of Liholiho)
"	Kalākua Kaheiheimālie (dau of Namahana Kaleleokalani; Maui chiefess; gd of Kekaulike; descendant of Pi‘ilani)	Kamāmalu (later wf of Kamehameha II) (two sons died as infants)
"	"	Elizabeth Kina‘u (hanai to Peleuli; wf of Kamehameha II)
"	Lydia Namahana Pi‘ia (dau of Namahana Kaleleokalani; Goc of O`ahu)	NI
"	Kahakuha‘akoi Wahinepio (Maui cfs; her father was son of Kekaulike; her mother Kamakahukilani was daughter of Kauhiaimokuakama-eldest son of Kekaulike; sister of Kalanimoku, Boki and Manono II and cousin of Keōpūolani; buried at Moku`ula)	NI
" (uncle/niece)	Miriam Auhea Kekāuluohi (dau of Kalākua & Kala‘imamalu; Kuhina Nui; wf of K-II and Charles Kana‘ina; mom of Lunalilo)	NI
"	Kekipipa‘a (dau of Kame‘eiamoku cousin of Kiwala`o; she was mother of High Chiefess Kapiolani)	
"	Manono II (sister of Kalanimoku, Boki & Kahakuha‘akoi; gd of Kekaulike; wf of Keaoua Kekua-o-kalani-both died in Battle of Kuamo`o in favor of the kapu system)	NI
Liholiho (Kamehameha II) (1/2 sibs)	Kamāmalu (fav wife; dau of Kalakua/Kamehameha I)	NI
" (uncle/niece)	Kalani Pauahi [dau of Pauli; gd of K-I; mom of Princess Ruth Ke`elikōlani]	NI
" (1/2 sibs)	Elizabeth Kina‘u (dau of Kalākua and Kamehameha I; Kuhina Nui after Ka‘ahumanu; mother of two kings with another kāne)	NI
" (step-sister/cousin)	Miriam Auhea Kekāuluohi [dau of Kalākua; ½ sib of Kamāmalu and Kina‘u; Gov of Kauai]	NI

" (cousins)	Anna/Miriam Kekau‘ōnohi (dau of Kahakuha‘akoi & Kahō‘anokū Kīna‘u-the eldest son of Kamehameha I and wife Peleuli; Boki niece; ggd of Kekaulike; ggd of Kauhiaimokuakama)	NI
Charles Kana‘ina (b/Napo‘opo‘o; descendant of Pi‘ilani – Maui Mō‘i; House of Nobles-Privy Council)	Miriam Auhea Kekāuluohi (dau of Kalākua & brother of Kamehameha I)	**William Charles Lunalilo**(k)
Kauikeaouli (sibs)	Nāhi‘ena‘ena	Infant died
Kauikeaouli	Kalama (mom sister of C. Kana‘ina)	Two infants died/hanai several
"	Jane Lahilahi Young Ka‘eo [dau John Young; grand niece of Kamehameha I; companion of Nahi‘ena‘ena]	Albert Kuka‘ilimoku Kunuiakea; twin Keoua died as infant; hanai by Queen Kalama
Mataio Kekūanāo‘a (punahele of Liholiho; Gov of O‘ahu; Kuhina Nui after Kamāmalu - dau of Kalākua & Kamehameha I)	Kalehua	Pa‘alua (k)
"	Kalani Pauahi (gd of Kamehameha I; wf of Liholiho)	Princess Ruth Ke`elikōlani
"	Elizabeth Kīna‘u (dau of Kamehameha; wf of Liholiho; Kuhina Nui/K-III)	David Kamehameha
"	"	Moses Kukūāiwa
"	"	Lot Kapuāiwa (Kamehameha V)
"	"	Alexander Liholiho (Kamehameha IV)
"	"	Victoria Kamāmalu (Kuhina Nui)
Abner Pāki (Molokai/Maui ali‘i; gs of Kamehamehanui Ailuau-Maui Moi)	Laura Konia (gd Kamehameha I)	Bernice Pauahi Bishop (named for aunt Queen Kalani Pauahi)
Alexander Liholiho (Kamehameha IV)	Emma Na‘ea (dau of Fanny Young; gd of John Young; ggn of Kamehameha I; she and husband established Queen’s Hospital)	Albert Edward Kauikeaouli (died at 4 years old)
Lot Kapuāiwa (Kamehameha V)	NA	NA (No heir)
William Charles Lunalilo [thru his father descendant of Pi‘ilani & Kumunuiakapokii union]	NA	NA (No heir)
	END OF PILI/KAMEHAMEHA LINE	
	HOUSE OF KALĀKAUA	
Caesar Kaluaiku Kapa‘akea (Hana)	Analea Keohokālole (Hana/Hawaii lines)	Moses Kapa‘akea
"	"	James Kaliokalani
"	"	David La‘amea **Kalākaua**
"	"	Lydia Kamakeha (Lili‘uokalani)
"	"	Kaiminaauao
"	"	Anna Ka‘iulani
"	"	Kinini
"	"	Miriam Kekāuluohi Likelike
"	"	William Pitt Leleiohoku II
David Kalākaua	Esther Kapiolani (dau of Kuhio Kalanianaole and Kinoiki Kekaulike - niaupio dau of King Kaumualii of Kauai)	NI (Kapiolani later hanai sister Victoria Kekaulike’s sons David Kawānanakoa and Jonah Kuhio Kalanianaole – heirs; she estb Kapiolani Maternity Home now Kapiolani Medical Center)
Liliu‘okalani	John Owen Dominis	NI
Archibald Scott Cleghorn	Miriam Kekāuluohi Likelike	Victoria Ka‘iulani Cleghorn (heir)
	GOVERNMENT OVERTHROWN 1893	

Key: k/kane=male; w/wahine=female; wf/wife; dau/daughter; gd/granddaughter; gs/grandson; gf/grandfather; gm/grandmother; ggf/great-grandfather; ggd/great-granddaughter; sibs/siblings; gp/grandparents; OT/Over Thrown

The following Table 2 lists the various Houses of the *ali‘i nui* of O‘ahu:

Table 2. Houses of Ali‘i Nui of O‘ahu

HOUSE	ALI`I NUI OF O`AHU
Maweke	Maweke · Mulielealii · Kumuhonua · Elepuukahonua · ? · Nawele · Lakona · Kapae · Haka (OT)
Paumakua-O‘ahu	Mailikukahi · Kalonaiki · Piliwale · Kūkaniloko
Paumakua (Maui)	Kalaimanuia
Lupe-Kalehenui-Maweke	Kumanuia · Kaihikapuamanuia · Kakuhihewa · Kanekapukakuhihewa · Kahoowahaokalani · Kauakahikahoowaha · Kualii · Kapiohookalani · Kanahaokalani · Peleioholani · Kumahana (OT)
Laakona-Keaunui-Maweke	Kahahana (Last independent monarch)
Paumakua (Maui)	Kahekili II · Kalanikupule (sacrificed)
Pili	Kamehameha I · Kamehameha II · Kamehameha III · Kamehameha IV · Kamehameha V
Kanaina-Eia	Lunalilo
Paumakua-O‘ahu	Kalakaua · Liliuokalani (OT)

Table 3. Lineage of Victoria Kamamalu [RP 7713] (McKinzie 1986:31; Spoehr 1987:8-9).

Kane (male)	Wahine (female)	Keiki (offspring)
Ke‘eaumoku Nui (Hawai‘i Chief)	Namahana (Maui Chiefess)	Kuakini (k)
"	"	Kalākua (w)
"	"	Ka‘ahumanu (w)
Kamehameha I (Hawai‘i ali‘i)	Kalākua (Maui Chiefess)	Kina‘u
"	"	Kamamalu
"	Ka‘ahumanu (Maui/Hawai‘i Chiefess)	NI
"	Keōpūolani (Maui/Hawai‘i Chiefess)	Liholiho
"	"	Kauikeaouli
"	"	Nahi‘ena‘ena
Mataio Kekuanao‘a	Kina‘u	Moses Kukuaiwa
"	"	**Victoria Kamamalu**
"	"	Lot Kamehameha (K-V)
"	"	Alexander Liholiho (K-IV)
Alexander Liholiho (K-IV)	Emma Na‘ea	Albert Edward Kauikeaouli

Legends: k/kāne-male; w/wahine-female; wf/wife; dau/daughter; gd/granddaughter; gs/grandson; gf/grandfather; gm/grandmother; ggf/great-grandfather; ggd/great-granddaughter; sibs/siblings; gp/grandparents; OT/Over Thrown; fav/favorite.

O‘ahu Chiefs and Lineages

About the 12th century, Kapawa, the son of *ali‘i nui* Nanakaoko and his wife Kahihiokalani, was the first high *ali‘i* to be born at Kūkaniloko, located on the Waialua side of Kaukōnāhua Gulch in central O‘ahu. It was one of two sacred places in Hawai‘i where *kapu* chiefesses went to give birth (McAllister 1933:134-135; Handy and Handy 1978:465; see also Fornander 1969 (1880): 20; Kamakau 1991 (1869): 136; Cordy 1996:596). *Mele* or *‘oli* informed about and honored the chiefs. The following *‘oli* from Kamakau (1991), is about Kapawa, the first child born at Kūkaniloko, the sacred birthing site of *ali‘i nui* in central O‘ahu.

‘O Kapawa, ‘ke ali‘i o Wai`alua,	Kapawa, the chief of Wai‘alua,
I hanau i Kūkaniloko;	Was born at Kūkaniloko;
‘O Wahiawā ke kahua;	Wahiawā the site;
‘O Līhu‘e ke ēwe,	At Līhu`e the placenta,
‘O Ka`ala ka piko,	At Ka‘ala the navel cord,
‘O Kapukapuāea ka a‘a,	At Kapukapuākea [heiau] the caul,

‘O Kaiaka i Māeaea;	[Heiau] of Kaiaka at Māeaea
Ha‘ule i Nukea i Wainakia.	He died at Nukea at Wainakia.
I ‘A‘aka Haleu,	Through [the surf of] ‘A‘aka at Haleu,
I ka la‘i malino o Hauola,	Through the calm stillness of Hauola,
Ke ‘li‘i‘o Kapawa ho ‘i no,	The chief Kapawa was taken,
Ho‘ino i uka ka waihona,	Taken upland [in ‘Iao] for laying away,
Ho‘ino i ka pali kapu o nā ‘li‘i…	Taken to the sacred *pali* of the chiefs…
He kia‘i Kalāhiki no Kaka‘e.	Kalāhiki is the “watchman” of [the burial Cave called Ka-pela-kapu-o-] Kaka‘e.
‘O Heleipawa ke keiki a Kapawa,	Heleipawa was the son of Kapawa,
He keiki ali‘i no Wai‘alua O‘ahu….	A chiefly child of Wai‘alua, O‘ahu…

(Kamakau 1991:136-137).

Cordy (1998) explains the “rise of complex societies and settlement inland” that occurs in the 1300s with special reference to central O‘ahu:

> By the 1300s, the oral histories tell of the formation of district (*moku*) sized countries (Cordy 1996:597-598). The accounts are brief, but they suggest these were much larger countries. Around A. D. 1320-1340, the sons of the chief Maweke were in charge over three noted countries on O‘ahu. These were ‘Ewa, Kona and Ko‘olaupoko. Importantly for the history of Wai‘anae, the ‘Ewa country included not only ‘Ewa, but also Wai‘anae and Wai‘alua (Fornander 1960 (1880): 48-49, 68, 88 56). The senior line of Maweke, the Maweke-Kumuhonua line, controlled ‘Ewa in these times. Some accounts suggested that Kumuhonua (Maweke's grandson) was the nominal ruler of all O‘ahu about 1340-1360. This ‘Ewa country included Kūkaniloko (the sacred birthing area), and Līhu‘e became the country's important ruling center. Līhu‘e was located on the central plateau, roughly in the Schofield Barracks area. It is vital to realize that the ‘Ewa country may not have been divided into districts at that time. This might account for the fact that Kūkaniloko is in Wai`alua today and that Līhu‘e was mostly in today's Wai‘anae-uka and perhaps once lapped over into parts of Wai‘alua and ‘Ewa. The borders may have come later.
>
> Another important point related to the rise of these larger countries is that more administrative levels of chiefs probably formed -- with a ruler and with local chiefs over the many communities of these district-based countries. More chiefs were present. In the Līhu‘e area the early famed ruling line belonged to the Lō Ali‘i chiefs. Anthropologists also believe that the political structure was still kin-based. The ruler would be the senior man in the dominant kin group of the country, and the local chiefs would be his kinsmen or the senior men in the dominant kin groups of their communities. The land-holding system is also still likely to have remained kin-based, with local groups controlling land. Countries may have had populations of 1,000-3,000 based on similar types of countries in Polynesia at European contact and other estimates.
>
> The oral histories also show that the chiefs began to be behaviorally isolated from commoners to a greater degree in the 1300s (Cordy 1996:597-598 56). The Aha Ali‘i council was established and restricted access to chiefly status. Certain types of temple worship supposedly became more restricted, with rulers and chiefs becoming the main participants. One would expect different levels of temples to develop in these years -- with local community temples and larger temples at the ruling centers (national temples).... However, temple sizes were certainly still much smaller that the sizes seen at European contact. No temples dated to this period have yet been documented for O‘ahu…. Construction of large national temples may have begun in the 1300s (Cordy 1998: 9-10).

In Cordy’s next period (AD 1400s-1500s) he summarizes the “Rise of the O‘ahu Kingdom” in the following:

> The oral histories indicate that O‘ahu was unified into one kingdom during the 1400s -- the O‘ahu Kingdom. La‘akona, who was the ruler of ‘Ewa, Wai‘anae, and Wai‘alua about 1420-1440, was apparently recognized as the overall ruler of O‘ahu by the other district based countries. In his

> line "descended the dignity of *Mō'ī* of O'ahu" (Fornander 1969:89(1880); Cordy 1996:598 56). La'akona was the senior Maweke-Kumuhonua line. This line held power until the reign of Haka, 1520-1540. Haka portrayed as an evil ruler in the accounts -- "a stingy, rapacious, and ill-natured chief, who paid no regard to either his chiefs or his commoners" (Fornander 1969:88(1880); Kamakau 1991:53-54) -- was deposed by the O'ahu chiefs. He retreated to the fortress of Waewae on the Kawiwi ridge between Wahiawā and Wai'anae valleys, where he was captured and slain. Mā'ilikūkahi of the junior Maweke-Mo'ikeha line was made ruler in 1520-1540, and this line held power until the late 1700s.
>
> Up to the time of Haka, rulers of O'ahu seem to have retained Līhu'e as their royal center, and Kūkaniloko remained an important birthing site throughout O'ahu's history. When Haka was removed, the ruling center was moved to Waikīkī in Kona district as this was the district long controlled by the Maweke-Mo'ikeha line (Fornander 1969: 89; Kamakau 1991: 54, 56). But, Mā'ilikūkahi still seems to have traveled to the Līhu'e area and perhaps periodically resided there, for he was there when raiders from Hawai'i Island arrived (Kamakau 1991: 55-56). Mā'ilikūkahi had been raised partly at Wahiawā (Kamakau 1991: 53 56). These raiders proceeded up from Pearl Harbor and were met by Mā'ilikūkahi and defeated in battles running from the gulches to Waikakalaua to Kīpapa, just below Wai'anae uka.
>
> With island unification, at least three administrative levels of chiefs should have been formed -- the ruler, high chiefs over one or more districts (or over multiple communities), and local chiefs over one or two communities. Social stratification, thus, became more complex. Each stratum of chiefs would have been set off from the commoners and amongst themselves (Cordy 1998:10-11).

The Proto-Historic Period, A.D. 1650-1795, appears to be marked with both intensification and stress. Many wars and intermittent periods of peace took place during this period between intra-island chiefdoms and inter-island kingdoms; cousins challenged cousins, nephews rebelled against uncles, fathers battled sons--all living on various islands and some losing track that they were related [see Kamakau 1992a; 66-174]. In Cordy's reconstruction of O'ahu Kingdoms, this was also a time of continued population growth:

> These are the years when the O'ahu Kingdom grew to the pinnacle of its power (Cordy 1996:600-603). Population grew, fields expanded, and more houses were built. These were the times of famed O'ahu rulers: Kalai'manuia (1600-1620), Kākūhihewa (1640-1660), Kūali'i (1720-1740), and Pelei'ōhōlani (1740-1779)…. The three generations of rulers following Kākūhihewa slowly lost power to the high chiefs of the kingdom's districts (Fornander 1969(1880): 275-278). The ruler resided mostly in Ko'olaupoko, and the high chiefs of Kona, of 'Ewa-Wai'anae, and of Wai'alua and Ko'olauloa apparently were virtually independent within their own lands.
>
> About 1720 Kūali'i became ruler. He re-established the ruler's power over the kingdom in a series of battles, first with the Kona chiefs and then with the 'Ewa, Wai'anae and Ko'olauloa chiefs. His first battle with the 'Ewa, Wai'anae and Ko'olauloa chiefs was at Kalena in today's Schofield Barracks area of Wai'anae uka (Fornander 1969: 270-272; Fornander Collection 1917, 4(2): 412-416). Then while off raiding Hawai'i Island, the 'Ewa, Wai'anae and Ko'olauloa chiefs rose again. Kūali'i returned, and another battle was fought at Kalapo Stream [Kālepa? (sic)] in the Wai'anae uka area near the ridgeline of the Wai'anae mountains (Fornander Collection 1917, 4(2): 414). This ended the last resistance on O'ahu. The remainder of the long reign of Kūali'i was marked by periods of stability…. Kūali'i also gained power over parts of Kauai, evidently through inheritance. He put his junior son, Pelei'ōhōlani over those Kauai lands -- occasionally visiting them himself (Kamakau 1991: 70-75; Fornander 1969: 277-282).
>
> Upon Kūali'i's death about 1740, his eldest son -- Kapiho'okalani -- came to power. He carried on the conquest of Molokai, but was slain there by the army of the Kingdom of Hawai'i under Alapa'inui. Alapa'inui [first cousin of Pelei'ōhōlani] led his army on to O'ahu.... The O'ahu chiefs meanwhile sent to Kaua'i for Pelei'ōhōlani to come and serve as regent for his brother's

> young son. Pelei'ōhōlani arrived and assumed control of the O'ahu army. A truce was reached with the high chief of Wai'anae, Na'ili (brother of Alapa'inui's wife), negotiating the truce, and the Kingdom of Hawai'i's army returned home. Pelei'ōhōlani soon became the sole ruler of O`ahu, and in later years he conquered Molokai, and brought the O'ahu Kingdom to the height of it power (Kamakau 1961:7-0-75; Fornander 1969(1880): 134-140) (Cordy 1998: 13-16).

Cordy (1998) explains what happened after Pele-i'ō-hōlani died on O'ahu.

> Pelei'ōhōlani's son, Kumuhana, was not a capable ruler, and he was soon removed by the O'ahu chiefs (Fornander Collection 1919, 6(2): 282-291; Kamakau 1961: 128-141). (Kumuhana returned to his family's lands on Kauai.) Kahahana was chosen to be ruler. The son of a sister of Pelei'ōhōlani (Kaionuilalahai) and of a powerful 'Ewa high chief ('Elani), Kahahana had been raised on Maui in the court of the Maui ruler, Kahekili [his uncle].... [Kahekili] tricked Kahahana into slaying his high priest, Ka'opulupulu… [who] had control of the Waimea-Pūpūkea area and the huge *heiau* of Pu'u Mahuka. He also had control over Kunaiwa Heiau at Pu'u Kahea in Wai'anae....
>
> Kahahana, while in Wai`anae and refurbishing Kamohoali'i Heiau, called Ka'opulupulu to him. He was captured, slain at Pu'uloa, taken to Waikīkī, and offered up on the *heiau* there. With this advisor out of the way, the Maui army [led by his uncle Kahekili] invaded in 1783. The O'ahu army was defeated at Kahe-iki in Nu'uanu, and Kahahana fled into the Ko'olaus with his wife and an aide.
>
> Kahahana was caught in 1785 and slain. This led to a revolt by the O'ahu chiefs with his father, 'Elani, one of the leaders. The [O'ahu] rebels were harshly subdued in battles in 'Ewa. The remainder pulled back into the Wai'anae mountains, but some were lured out and crushed again by Kahekili's forces. In subduing this revolt, Kahekili was said to have slain many of the remaining nobles of the O'ahu Kingdom…. For 10 more years, the Maui Kingdom ruled O'ahu. It is likely that a Maui high chief was given Wai'anae district and lesser Maui chiefs were placed over the *ahupua'a* of Wai'anae.... Kamakau in 1865 said only one chief of Maui ever entered Kūkaniloko's birthing area (Kamakau 1991: 38) (Cordy 1998:15-16).
>
> After Kahekili died in 1794 and shortly before Kamehameha's invasion, Ka'eokūani -- Kahekili's half-brother and the ruler of Kauai was returning to Kauai from the wars with Hawaii. Reputedly to avoid a conspiracy against him, he chose to attack [his nephew] Kalanikūpule, Kahekili's son and the new Maui/O'ahu ruler. Ka'eo [father of Kauai ali'i Kaumuali'i] was "joined by the warriors of Wai`alua and Wai`anae" and they fought and won a series of battles across 'Ewa. But, at a major battle at Kalau'ao (today's Pearlridge), the Kauai army and its allies were defeated, and Ka'eo was slain. Kalanikūpule proclaimed a *kanawai,* and "the slaughtering stopped, and the lives of some of the chiefs and warriors were saved, and they were released to return to their lands on Kauai" (Cordy 1998:15-16).
>
> Maui's rule came to an end in 1795 with the final conquest of Kalanikūpule and the Maui Kingdom at Nu'uanu at the hands of Kamehameha's Hawaii Kingdom army (Kamakau 1961: 168-169; Fornander 1969: 262-266). Kalani-kū-pule hid in the underbrush for a little over a year and then was captured mauka of Waipi'o in 'Ewa and killed. His body was brought to Kamehameha and offered in sacrifice to his god, Kū-ka'ili-moku. (Kamakau 1961:173) (Cordy 1998:17).

In 1803 Kamehameha settled in on O'ahu where he placed his chiefs over all the lands (Cordy 1998:17). He put the chiefs and their men from Hawaii to work farming the lands of O'ahu (Silverman 1987:41-47).

Moʻolelo

Legends, stories or *moʻolelo* are a great cultural resource as well as entertaining. Leib and Day (1979) state in their annotated bibliography of Hawaiian legends, that legends "are a kind of rough history." They noted Luomala's idea of the value of legend and myth in the serious study of a culture and her following quote. "To a specialist in mythology, a myth incident or episode is as objective a unit as an axe, and the differences and similarities of these units can be observed equally clearly and scientifically." Leib and Day also expressed concern about authenticity, and sometimes found it difficult to determine if a legend was a primary or secondary source. The following definitions of terminology, including the Hawaiian classification of prose tales--*moʻolelo* or *kaʻao,* come from their work (Leib and Day 1979: xii, 1):

Tradition	used to refer to that which is handed down orally in the way of folklore
Folklore	a rather inclusive term, covering the beliefs, proverbs, customs, and literature (both prose and poetry) of a people
Myth	a story of the doings of godlike beings
Legend	deals with human beings and used interchangeably with 'myth'… because the collectors and translators of the tales often failed to make the strict distinction
Kaʻao	"pure fiction"
Moʻolelo	deals with historical matters and somewhat didactic in purpose… included tales of the gods, as well as tales of historical personages… many have recurring patterns, plots, and types of characters.

Lō Aliʻi

> The chiefs of Līhuʻe, Wahiawā, and Halemano [also Helemano] on Oʻahu were called *lō aliʻi.* Because the chiefs at these places lived there continually and guarded their *kapu,* they were called *lō aliʻi* [from whom a "guaranteed" chief might be obtained, *loaʻa*]. They were like gods, unseen, resembling men (Kamakau 1991:40).

Moʻolelo of Lō Kaholi-a-Lale. The following excerpts are from Kamakau (1991:50-51):

> Lō Lale was the father and Kelea-nui-noho-ʻana-ʻapiʻapi [sister of Kawaokaohele, Piʻilani's father] was the mother of Lō Kaholi-a-Lale. He was born in the uplands of Līhuʻe and raised there until manhood. This youth was an exceedingly handsome man with features like his mother's. Lō Kaholi-a-Lale was taught club wielding, *ke kaʻalaʻau,* and spear throwing, *ka lono-maka-ihe,* and he became highly skilled in striking, thrusting, and parrying. In striking, no creeping or flying thing did he miss.
>
> The main occupation of the Līhuʻe chiefs in olden times was to learn the art of spear throwing, and from there came the most skilled teachers. Spear throwing was also the main occupation of Piliwale, the *mōʻī* of ʻEwa. He belonged to the chiefly family, *ʻohana aliʻi,* of Kumuhonua [Nanaʻula genealogy according to editors notes] of Kūkaniloko, and he had two daughters, Kūkaniloko, the older, and Kohe-palaoa, the younger. The older was betrothed to the son of the *mōʻī* of Maui; Luaia was the name of this youth.
>
> Piliwale said that if a man were found who was skillful in hurling spears and whose skill was as great as that of his own teacher the reward would be his daughter Kohe-palaoa. The name of the chief's teacher of spear throwing was ʻAwa. We could grasp ten spears in his right hand and ten in his left. He was a "triple threat" in throwing; he could throw ten spears from the shoulder, two backwards, and two directly to the navel….
>
> There were two days of sham battles on the plain of Pueohulunui, but no one challenged ʻAwa. However, Lō Kaholi-a-Lale studied the stances and thrusts of this teacher who was so skilled in *kākā lāʻau,* the striking, thrusting, and parrying with the spear-club *lāʻau pālau*. He himself

> already knew the thrusts and the stances of his own teacher, whose name was Ake-pao-a-nā-ihe. On the third day, the sham battles were resumed to seaward at Hālaulani. From there word came to the chief Piliwale that a young chief from upland Līhuʻe had challenged ʻAwa-hāuna-laʻau-nui in *kākā lāʻau*. Here the youth exerted himself to the limit and was beyond compare in wielding the spear-club. The strokes by which he won were the *pane oluna* and the *huʻalepo*…. This incident gave names to places that remain to this day: Kūpahu, "to hurl," and Hanapouli, "make dark." These places are in Waipiʻo in ʻEwa.
>
> Kohe-palaoa became the wife of Lō Kaholi-a-Lale. That was the beginning of the combining of the *lō* and the *wohi,* the ranks of Kaholi-a-Lale. As for Kohe-palaoa, her rank was that of a Kumuhonua chief of Kūkaniloko; she was a *nīʻaupiʻo.* They had a son named Kānehōalani who became the of Koʻolau.

Moʻolelo of Māʻili-kūkahi. The following excerpts are from Kamakau (1991).

> Puaʻa-a-Kahuoi was the father and Nononui the mother of Māʻili-kūkahi. He was born at Kūkaniloko and was named the *aliʻi kapu* for the land because of his dedication by the chiefs and priests and people; he had been vowed as such before the gods and had been anointed by the *kāhuna.* Chiefs born at Kūkaniloko were the *akua* of the land and were *aliʻi kapu* as well.
>
> Māʻili-kūkahi was raised at Wahiawā and at Kānewai and at Waiʻalua. When he was a little over twenty years of age, he was chosen by the chiefs to be the administrator of the government, the *mōʻī hoʻoponopono o ke aupuni*. Māʻili-kūkahi did not refuse them. Haka, a descendant of Kumuhonua, was the *aliʻi mōʻī* at the time.
>
> Haka was a bad chief and a stingy one. He did not take care of the chiefs and people. Because of this, the chiefs rebelled against him and fought with him. Haka took refuge in the *puʻu kaua* Waewae, the fortified hill at Kawiwi there in Līhuʻe…. The rebelling chiefs and warriors came up, crowding thickly in the stronghold. Haka was the only person killed….
>
> [Māʻili-kūkahi] was taken to the *heiau* of Kapukapu-ākea at Paʻalaʻa-kai in Waiʻalua and consecrated by the *kahuna* to rule as *mōʻī.* At the end of this ceremony, he was taken inside the *heiau* for the ceremony of the cutting of the navel cord, just as at the birth of a chief. After that another important ceremony, that of circumcision, *ʻoki poepoe* was reenacted. This was to cleanse and purify him; ʻUlonokū was the prayer. When this ceremony was over, he was installed as ruler of the island, *ke aliʻi o ka moku.* This chiefly ritual pertained to high chiefs from remote time – *mai ka pō mai.* It was not performed for rebellious chiefs, however, nor for warrior chiefs who took the kingdom by force, but for "chiefs of Pōkano" [chiefs of unblemished bloodlines from remote times (MKP)]. That is the manner in which Māʻili-kūkahi became ruler of the kingdom, and he ruled as *mōʻī* over the land [26 August 1865].
>
> Soon after he became *mōʻi* the chiefs took Māʻili-kūkahi to Waikīkī to live; he was perhaps the first of the ruling chiefs to live there. Until then the chiefs had lived in Waiʻalua and ʻEwa. When the kingdom passed to Māʻili-kūkahi, the land divisions were in a state of confusion; the *ahupuaʻa,* the *kū* – [*ʻili kūpono*], the *ʻili ʻāina*, the *moʻo* ʻāina, the *pauku ʻāina,* and the *kīhāpai* were not clearly defined. Therefore Māʻili-kūkahi ordered the chiefs, *aliʻi,* the lesser chiefs, *kaukau aliʻi,* the warrior chiefs, *puʻaliʻi,* and the overseers, *luna* to divide all of Oʻahu into *moku* and *ahupuaʻa, ʻili kūpono, ʻili ʻāina,* and *moʻo ʻāina.* There were six districts, *moku,* and six district chiefs, *aliʻi nui ʻai moku*. Chiefs were assigned to the *ahupuaʻa* – if it was a large *ahupuaʻa,* a high chief, an *aliʻinui*, was assigned to it. Lesser chiefs, *kaukau aliʻi,* were placed over the *kūpono* lands, and warrior chiefs over *ʻili ʻāina.* Lands were given to the *makaʻāinana* all over Oʻahu.
>
> Māʻili-kūkahi commanded the chiefs, *kahuna,* lesser chiefs, warrior chiefs, and people: "Cultivate the land, raise pigs and dogs and fowl, and take the produce for food. And you, chiefs of the land, do not steal from others or death will be the penalty. The chiefs are not to take from the

maka'āinana. To plunder is to rebel; death will be the penalty. This is my command to the chiefs, the lesser chiefs, the warrior chiefs, the warriors, and the people; all the first-born sons, the *keiki makahiapo,* are to be mine to raise; they will be my sons, *ka'u keiki,* and mine to take care of."

The chiefs and people agreed with pleasure. Because of his exceedingly great concern for the prosperity of the kingdom, the chiefs and people never rebelled during his reign….

In the time of Mā'ili-kūkahi, the land was full of people. From the brow, *lae,* of Kulihemo to the brow of Maunauna in 'Ewa, from the brow of Maunauna to the brow of Pu'ukua [Pu'u Ku'ua] the land was full of chiefs and people. From Kānewai to Halemano in Wai'alua, from Halemano to Paupali, from Paupali to Hālawa in 'Ewa the land was filled with chiefs and people. The chiefs kept themselves apart, *'oko'a,* and the commoners kept to the *makai* side of the land. From Halahape to O'ahu-nui in Wai'alua was the *kūlanakauhale* of Mā'ili-kūkahi. There he raised the first-born sons of the *maka'āinana* and of the chiefs. The chiefs and commoners loved him for his great *aloha* for their children…. Mā'ili-kūkahi's name became famous from the skies to the earth and from Hawai'i to Kauai.

The chiefs of Hawai'i and Maui heard of Mā'ili-kūkahi and of the high state of his kingdom. Hilo, the son of Hilo-kapuhi, Hilo-a-Lu'ukapu, and Punalu'u, chiefs of Hawai'i, and Luako'a, a chief of Maui, decided to go and make war on Mā'ili-kūkahi. They sailed and landed in Waikīkī, then went to Kapua'ikāula in 'Ewa with their canoes full of men. *Mauka* of Wai-kakala-ua gulch the battle was to begin. While they were going inland, they were cut off in the rear by the foster children of Mā'ili-kūkahi. Of the chiefs of Hawai'i and Maui, Punalu'u was killed on the plain now called Punalu'u. Corpses that "paved" a gulch gave the name Kīpapa to that place. Some of the invaders reached as far as the sea at 'Ewa and Waimano – the gulches were filled with their corpses. The heads of Hilo *ma* were cut off and taken to Honouliuli to a place now called Po'o-hilo….

There was peace again on O'ahu, with fear of the kingdom of Mā'ili-kūkahi. It is said of this chief that he was a religious chief. The people all over O'ahu lived religiously and in peace. It is said of Mā'ili-kūkahi that he did not sacrifice men in the *heiau* and *luakini.* That was the way of Kūkaniloko chiefs. There were no sacrificial *heiau, po'okanaka*, there.

Cruel Chief Waia.

Waia, grandson of Wakea was said to be a cruel chief. He cared nothing of their gods or of doing good. He had men and women killed for the fun of killing them. When he saw a maiden with shapely legs, he ordered them cut off and if a man or a woman had beautiful tattooing he was put to death. Because of this he was driven away by the people. In the legend of Hi'iaka, it was said that Waia lived and practiced his evil deeds at Waialua. The people suffered so much there that the place was named for him Waia-lua (Doubly disgraced) (Pukui 1928)

The following list of *mo'olelo* sources in the *Hawaiian Legends Index* Vol II & III by the Hawaii State Public Library System (HSPLS) (1989) that mention Kawaihāpai, Mokulē'ia or Waialua. Since there are several stories they will not be summarized or included in this report.

Kawahāpai:

'Legend of Maikoha'
In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 2 pp270-273

'This land is the sea's'
In Thrum, *Hawaiian Folk Tales*
pp 203-214
'Legend of Maikoha'

Mokulē'ia:

Pele and Hiiaka
Emerson, Nathaniel Bright

'Story of the formation of these islands and origins of this race'
In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 2 pp2-31
'O'ahu nui'

In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 2 pp270-273

'Kaneaukai, a legend of Waialua'
In Thrum, *Hawaiian Folk Tales* pp 250—254

Waialua:

'The well of last resources'
In Day, *The Princess of Manoa*
pp 12-19

'Story of the formation of these islands and origins of this race'
In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 2 pp2-31

'Legend of Helemano
In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 2 pp270-273

'The maile'
In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 2 pp 614-619

'The story of Pele and Hiiaka
In Green, *Hawaiian Stories and Wise Sayings*
pp 18-27

'The sacred spear-point'
In Kalakaua, *Legends and Myths of Hawaii*
pp 209-225

'Umi, the peasant prince of Hawaii'
In Kalakaua, *Legends and Myths of Hawaii*
pp 249-315

'Kaiana, the last of the Hawaiian knights'
In Kalakaua, *Legends and Myths of Hawaii*
pp 383-408

'The well of last resources'
In Knudsen, *Hawaiian Tales*
pp 136-139

'The cannibal chiefs from the South Seas'
In Thorpe, *In the Path of the Trade Winds*
pp 83-90

'Stories of the Menehunes'
In Thrum, *Hawaiian Folk Tales*

In Thrum, *Hawaiian Folk Tales*
pp139-146

Pele and Hiiaka
Emerson, Nathaniel Bright

'History of Kualii'
In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 1 pp 364-434

'Legend of Maikoha'
In Fornander, *Fornander Collection of Hawaiian Antiquities and Folklore*
Vol 2 pp 2?8-263

'Legend of Halemano'
In *Selections from Fornander's Collection of Hawaiian Antiquities and Folk-Lore*
pp 250-293

'The iron knife'
In Kalakaua, *Legends and Myths of Hawaii*
pp 177-205

'Kelea, the surf-rider of Maui'
In Kalakaua, *Legends and Myths of Hawaii*
pp 229-246

'The cannibals of Helemanu'
In Kalakaua, *Legends and Myths of Hawaii*
pp 371-380

'The Story Laiekawai'
In Kalakaua, *Legends and Myths of Hawaii*
pp 455-480

'Hinaaikamalama'
In *The Hawaiian Romance of Laieikawai*
p 354

'Kalelealuaka'
In Thrum, *Hawaiian Folk Tales*
pp 74-106

'O'ahu nui'
In Thrum, *Hawaiian Folk Tales*

pp 114-116

'This land is the sea's'
In Thrum, *Hawaiian Folk Tales*
pp 203-214

'Fish stories and superstitions'
In Thrum, *Hawaiian Folk Tales*
pp 269-274

'Kekupua's canoe'
In Thrum, *More Hawaiian Folk Tales*
pp 31-35

'Chief man-eater'
In Westervelt, *Legends of Old Honolulu*
pp 189-203

pp 139-146

'Kaneaukai, a legend of Waialua'
In Thrum, *Hawaiian Folk Tales*
pp 250-254

'Kukaniloko: famed birthplace of ali'is'
In Thrum, *More Hawaiian Folk Tales*
pp 87-93

'Keaomelemele, the maid of the golden cloud'
In Westervelt, *Legends of Ghosts and Ghost-Gods*
pp 116-151

'Ōlelo No'eau

'Ōlelo no'eau or proverbial/traditional sayings usually had several layers of meanings. They reflected the wisdom, observations, poetry and humor of old Hawai'i. Some of them referenced people, events and/or places. The following *'ōlelo no'eau* that make references to Helemano/Halemano, Wahiawā, Pa'ala'a, Kūkaniloko were compiled by Mary Kawena Pukui between 1910 and 1960 with both translations and an explanation of their meaning (Williamson et al. in Pukui 1983:vii), which are often more *kaona* (hidden or double meaning) than obvious.

Kawaihāpai:

'Ōlelo no'eau *Ka wai kumu 'ole.*
Translation: The water without source.
Meaning: Kawaihāpai, O'ahu. A drought once came there in ancient times and drove out everyone except two aged priests. (p 178 #1655)

'Ōlelo no'eau *Mākole iho hewa i Mākua.*
Translation: Red-eyed one goes to Mākua by mistake.
Meaning: Applied to one who has gone off his course. Once, a red-eyed person left Mokulē'ia, O'ahu, intending to go to Mākaha, but went by way of Kawaihāpai and arrived at Mākua instead. (p 230 #2112).

Mokulē'ia:

'Ōlelo no'eau *Ka moena pāwehe o Mokulē'ia*
Translation: The patterned mat of Mokulē'ia (O'ahu)
Meaning: It is varied and pretty as a patterned mat. (p 161 #1486)
Same as above (p 230 #2112).

Waialua:

'Ōlelo no'eau *A nui mai ke kai o Waialua, moe pupu'u o Kalena i Hale'au'au.*
Translation: When the sea is rough at Waialua, Kalena curls up to sleep at Haleauau
Meaning: Applies to a person who prefers to sleep instead of doing chores. A play on *lena* (lazy), in Kalena, who was a fisherman and *hale* (house) in Haleauau (p 16 #121)

'Ōlelo no'eau *I Waialua ka po'ina a ke kai, o ka leo ka 'Ewa e ho'olono nei.*
Translation: The dashing of the waves is at Waialua but the sound is being heard at 'Ewa.
Meaning: Sounds of fighting in one locality are quickly heard in another. (p 137 #1263)

'Ōlelo no'eau *Like no Ka'ena me Waialua.*
Translation: Ka'ena and Waialua are one.
Meaning: Ka'ena Point is in Waialua. Similar to the saying, "Six of one and half a dozen of the other." (p 215 #2000)

'Ōlelo no'eau *Waialua, 'āina ku pālua i ka la'i.*
Translation: Waialua, land that stands doubly becalmed.
Meaning: Said in admiration for Waialua, O'ahu , where the weather was usually pleasant and the life of the people tranquil. (p 318 #2902)

Place Names

Hawaiians of old generally named everything; from winds and mountains, to rocks, canoes, taro patches, fishing stations, and "the tiniest spots where miraculous or interesting events are believed to have taken place" (Williamson et al. in Pukui, 1983:x). They all represented a story; some known only locally, while others became legendary. Unfortunately, the stories and meanings of many place names today have been forgotten.

Table 4. Documented Land Grants in Kawaihāpai (Emerson 1896) (From Filimoehala 2013:144).

Grant No.	Year Purchased	Acreage	Awardee
3767	1895	220	Silva
1777	1855	100	Kamoku and Lahela
1784	1855	100	Papa
1783	1855	50	Kanalu
1779	1855	50	Kauloaiwi
1786	1855	50	Maaweiki
1781	1855	48	Kekauwa
1780	1855	68	Hokuaulani et al.
1785	1855	90	Kahoeka and Kolikoli
1846	1855	248	Dole
343	1850	68	Kalauohaena et al.
279	1850	66	Mahiahume et al.
260	1850	24.3	Kaakau
259	1850	24.5	Haule
258	1850	24.3	Kane
240	1850	166	Emerson
456	1850	90	Halali
459	1850	90	Koanaku
457	1850	197	Gulick

Historic References

By and large "Historic References" pertain to notable historic events and overviews of important places and land tenure within the project area and district. One of the most significant practices in the history of the Hawaiian people was their concept of the stewardship of the land. However, over time, these practices were replaced by more western methods of land tenure and use, as the lands of Kawaihāpai went from the domain of the *ali'i nui* to the monarchy, to various individuals and entities. The history of land use in this area went from traditional *ahupua'a* land management and use (*kalo lo'i* and terraces, sweet potato) to sugar-related activities in the early 1800s to military, tourism, and recreation today. [NOTE: Parts of this section will include ethnographic data (oral history quotes) from people interviewed in a previous ethnographic survey (i.e., Gutmanis 1977).]

It was during the time of Kahaukapu of Hawai'i and Kaka'alaneo of Maui (also said to be the time the Spanish first came with Ku-kanaloa [Kamakau 1991:324]) that the division of lands is said to have taken place under a *kahuna* named Kalaihaohi'a. He portioned out the lands into districts, sub-districts, and smaller divisions, each ruled over by an agent appointed by the landlord of the next larger division, and the whole under control of the ruling chief over the whole island or whatever part of it was his to govern (Handy & Handy 1978:491; Beckwith 1970:383). Each island was divided into *moku* or districts that were controlled by an *ali'i 'ai moku.* Within each of the *moku* on each island, the land was further divided into *ahupua'a* and controlled by land managers or *konohiki*. The boundaries of the *ahupua'a* were delineated by natural features such as shoreline, ridges, streams and peaks, usually from the mountain to the sea, and ranged in size from less than ten acres to 180,000 acres (Moffat and Fitzpatrick 1995:24-29, see also Chinen 1958:3).

Each *ahupua'a* was often divided and sub-divided several times over (i.e., *'ili, kuleana, mo'o, pauka, kōele, kiha pai*), answerable to *ali'i* where the lesser division was located. However the *'ili kūpono* or the *ili kū* was "completely independent of the *ahupua'a* in which it was situated…tributes were paid directly to the king himself" (Chinen 1958:4). Rights to lands were mutable or revocable; a ruling chief or any "distributor" of lands could change these rights if displeased, or as favors--usually after a victorious battle, and after the death of the *ali'i nui* or ruling chief (Chinen 1958:5).

After the death of Kamehameha I his consort Ka'ahumanu took a leading role in the government of the new kingdom, helping his son and heir Liholiho or Kamehameha II as *kuhina nui* (chief advisor and administrator).

> As *kuhina nui,* Ka'ahumanu took control of the lands. But she permitted the chiefs to keep the lands they had received from Kamehameha I because no traditional *kālai'āina* was acted on and she also needed loyal supporters. She made certain that the *ali'i 'ai moku* (district ruling chiefs) on each island were of the same Maui and Hawai'i genealogical lineage as she was in order to maintain absolute control over the lands (Kame'eleihiwa, *Native Land and Foreign Desires* 1992:74). This enabled her brother, Kahekili Ke'eaumoku, also known by the English name George Cox, to become the *ali'i 'ai moku* of Waialua from about 1837 (Alameida 1996:83-84).
>
> As the *ali'i 'ai moku,* Ke'eaumoku was charged with the management and overseeing of the annual collection of tributes or taxes. His selection of qualified candidates for the office of land agents, or *konohiki,* required final approval from the *ali'i nui.*

The *konohiki* of each *ahupua'a* answered to the *ali'i 'ai moku,* who answered to the *ali'i nui.* The names of the *konohiki* were not always named in Native Testimonies, but a few were mentioned such as the one below.

> As for the *konohiki* of Kawaihāpai, the contemporary sources at the time of the Mahele did not name a specific person. The available records suggest, however, that such a person existed. The testimony for land claims to the Land Commission before the Mahele makes no clear indication of a *konohiki* for this *ahupua'a,* although Gideon La'anui, brother-in-law of Ka'ahumanu, was the *konohiki* of the entire *moku* of Waialua during Ka'ahumanu's time. From the literature, the *konohiki* was an integral part of the *ahupua'a,* acting as supervisor and land agent for the *all 'i.* In the land-claim testimonies for Kawaihāpai, one name was mentioned by three different individuals. Niho had several land claims at Kawaihāpai. In his third claim he said, "the land] was bounded on the north by the land of Mahiahume; east by the land of Kaewaewa; south by the *po'alima* [literally, the fifth day] of Napahi" (Native Testimony, Niho to Land Commission, vol. 2, 4 9 1 AH). A claim by Kalalawalu said that his land "is bounded on the north by the land of Niho; east by the land of Haule; east by Hulu; and west by the land of Kaewaewa; south by the *poalima* of Napahi; west by the *poalima* of Napahi" (32 Native Testimony, Kalalawalu to L a n d Commission, vol. 2, 5 0 9 AH). The claim of Haule states that his first claim "is bounded on the north by Kaanaana; east by Paele; *po'alima* of Napahi; south by the land of Hoikamalii; west by the land of Moewaa" (Native Testimony, Haule to Land Commission, vol. 2, 524. AH) (Alameida 1996:85-86).
>
> After the death of Kahekili Ke'eaumoku in 1824, his sister, Lydia Kekuapi'ia Namahana, also known as Pi'ia, inherited the entire *moku* of Waialua (Kame'eleihiwa, *Native Land and Foreign Desires* 1992:120). La'anui, nephew of Kamehameha I and husband of Pi'ia, in testimony before the Land Commission, said that, "Ke'eaumoku [86] died in 1824, and then Ka'ahumanu gave Waialua to Pi'ia from cape to cape, from the upland to the sea and from that side to that side yet, it had no *ku"* (*'Hi kupono,* independent land division within the *ahupua'a*). (Native Testimony, Laanui to Land Commission, vol. 5, 494. A H). [The term *'Hi kupono* refers to a land division within the *ahupua'a.*] After Pi'ia died in 1829, Ka'ahumanu said to La'anui, "Your *wahine* has died and you are my *kaikaina,* you shall live in our house and my lands, which are yours from your *wahine,* shall be yours as in her bequest" (Laanui to Land Commission, vol. 5, 494. AH) (Alameida 1996: 86).
>
> Then, in her *kauoha,* or oral testament, Ka'ahumanu left all her lands to her niece, Kina'u, daughter of her sister Kaheiheimalie (Kame'eleihiwa, *Native Land and Foreign Desires* 1992:123). In his testimony, La'anui also said that Kina'u had told him, "You return to Waialua and live, you shall be for me [*sic*]—you return as *luna* [landlord or supervisor] of the land you occupy—your lands from your *wahine* [female; wife] shall be yours" (Laanui to Land Commission, vol. 5, 494. AH) (Alameida 1996: 86).

Waialua Moku Lands. Information regarding Victoria Kamamalu comes from various sources.

> In either case, however, La'anui never owned, in a Western sense, any portion of the *moku* nor was any land listed as his in the 1848 *Buke Mahele* (*Buke Mahele* 1848:130. A H). After the death of Kina'u in 1839, her youngest daughter, Victoria Kamamalu, held the *kalana* (land smaller than a *moku)* of Waialua. The term *kalana,* as defined in the Pukui-Elbert *Hawaiian Dictionary,* is a division of land smaller than a *moku,* or district. See Kame'eleihiwa, *Native Land and Foreign Desires* 1992:27 (Alameida 1996:86).

Victoria Kamamalu was the granddaughter of Kamehameha I, daughter of Kinau and Mataio Kekuanaoa and sibling of David Kamehameha, Moses Kekuaiwa, Lot Kapuiwa [Kamehameha V] and Alexander Liholiho [Kamehameha IV]. Her father Mataio Kekuanaoa and John I'i, executor of her estate (Mahele Book 1, 3, 5, 6, 8, 10) relinquished the following lands: 23 *ahupua'a* in Hawai'i; 3 *ahupua'a* on Kaua'i; 8 *ahupua'a* on Maui; 1 *ahupua'a* in Moloka'i; the island of Ni'ihau; 11 *ahupua'a* on O'ahu; 2 *'ili* on Kaua'i; and 48 *'ili* in Honolulu. However, they received on her behalf 18 *ahupua'a* and 4 *'ili* on Hawai'i; 2 *ahupua'a* on Kaua'i; 1 *ahupua'a* on Lāna'i; 7 *ahupua'a* and 1 *'ili* on Maui; 1 *ahupua'a* on Moloka'i; and 11 *ahupua'a* and 11 *'ili* on O'ahu.

> After the death of Kina'u, daughter of Kamehameha I, all of her lands in Waialua were inherited by her infant daughter Victoria Kamamalu. Although only nine years old at the time of the *Māhele,* Kamamalu was the third largest land holder in the kingdom. However, she gave up all of her lands between the *ahupua'a* of Kamananui and Ka'ena inclusive to the government to satisfy the one third commutation requirement set by the Land Commission (*Buke Mahele* (1848) 130, AH). Kauikeaouli, the *mo'i,* designated these lands at the western end of Waialua district as government lands, distinct from those he reserved for himself. The *'āina* of Kawaihāpai, Kamananui, Mokulē'ia, Keālia, and Ka'ena became land that the *maka'āinana* and foreigners were able to purchase in fee simple (Alameida 2003:40).
>
> Two years after the Mahele, my great, great-grandfather Holt [Robert W. Holt, brother-in-law of Captain John Dominis Holt] and his partners...bought several large estates, including the ahupua'a of Makaha, from the High Chief Abner Pākī, father of Princess Bernice Pauahi Bishop. From the estate of Victoria Kamamalu (she was...only eleven years old), they purchased the lands known as O'ahu Nui, Wahiawā, Helemano, and Waialua (Holt 1993:280).
>
> [Great] Uncle William [K. R. Holt] lived in the style of a great old chief with his sampan, locomobile, and a huge estate at Waialua, with an orchard, taro patches, and a flower garden.... He had made a judicious and profitable arrangement with Castle & Cooke for the sale of his share of the Holt lands at Wahiawā, Helemano, Waialua, and Hale'iwa. The family once owned all of the land from the south edge of Wahiawā town to Hale'iwa Beach, an enormous *'ili* acquired from the Princess Victoria Kamamalu estate. Uncle William's arrangement with the sugar people paid him a handsome monthly income for life..... In the Waialua and north shore area, he was looked upon as the local *ali'i* (Holt 1993: 287).

Victoria Kamamalu died on May 29, 1866 leaving her father Mataio (Matthew) Kekuanaoa her sole heir (Barrère 1994:222-228). However, before she died some of her lands were already being transferred to others by authority of her Guardians as recorded in the Grantee Index 1845-1869 A-K and Grantee Index 1845-1869 L-Z (BOC 2001a).

According to reports to the American Board of Commissioners for Foreign Missions (ABCFM) from American missionary John S. Emerson of Waialua, Emerson arrived in Hawai'i with his wife in 1832 and except for brief absences, they lived and worked as missionaries in Waialua from 1832 to 1867. Waialua *konohiki* Mataeo Kekuanaoa (father of Victoria Kamamalu and her brothers) was troublesome and [Emerson] questioned Kekuanaoa's "rights" in the following (Alameida 2003:38-39):

> 1. Eia ka ninau mua. [Here is the first question] Can one konohiki make kapu two different kinds of timber on the same land, the one on one side of the land & the other on the other side of it? Kekuanao'a has ho'okapued [sic: to forbid] the wiliwili on one side of Mananui & on the opposite side of the same ahupuaa he has put a kapu on the koa - because the wiliwili is the best wood there & the koa the best here.
>
> 2. The district of Waialua belongs to Kekuanao'a. Can he put a kapu on more than one kind of timber in the district at the same time? There are now made kapu in different parts of this district not less than six kinds of timber. Eia na inoa mau laau. [Here are the tree (plant) names] Mananui ka *wiliwili* a me ke *koa.* Ma Paala [sic: Pa'ala'a] a me Kawailoa ka *olona,* besides the *hala, coconut* & ko. These last however I think are justly claimed, but it appears to me that the cocoanuts [sic: coconuts] belong to the aupuni?
>
> 3. Concerning the fish. Is it right to ho'okapu two kinds of fish on one small land? Is it right for Kekuanoa [sic: Kekuanao'a] the konohiki of Waialua to change the kind of fish which is kapu as the spot on which they are found is more or less favourable for this or that kind of fish. Here are the fish kapu - *Kaena, Kawaihāpai* & *Mokuleia* ka *hee. Mananui* in different places, the *hee,* the *moi,* the *amaama,* the *o'opu,* & the *uhu.* Paalaa-the *hee, amaama* & *o'opu. Kawailoa, Moi, he'e, amaama, o'opu,* the *awa,* in different places. Is it right that all these kapus should exist? On one

> very small cape Puaena [Pua'ena] the *hee* is kapu on one side of the cape & the moi on the other side with only one konohiki.
>
> *Pau ia* [all done, completed]. I hope you will be able to make use of these things, which I write from the lists of the Lunaauhao, Kahukula & two deacons of the church to the advantage of the people & the cause of humanity (Emerson, letter to Richards, June 8, 1847. text, HMCS).
>
> Hence, up to the time of the Mahele in 1848, the *moku* of Waialua was still in the hands of the *ali'i,* heirs of Kamehameha. From the time of Kamehameha's death in 1819 until 1848, the lands on all the islands "were in a constant state of flux, being given as presents by one *Ali'i Nui* to another, as tribute from a lesser *Ali'i* to a higher one, or granted by an *Ali'i Nui* as a favor to a lesser *Ali'i"* (Kame'eleihiwa, *Native Land and Foreign Desires* 1992:133). Waialua was no different (Alameida 1996:86).

When Mataio Kekuanaoa died November 24, 1868, all of the remaining Kamamalu lands were inherited by her half-sister Princess Ruth Ke`elikōlani [first husband was William Pitt Leleiohoku; second husband was George Hueu Davis, son of Isaac Davis advisor to Kamehameha I] (Holt 1993:180).

In an interview of Louis Aila, Jr. by June Gutmanis (1977) he explained how names were passed down in his *ohana* including the name "Kamakahiki" when Lono Kamakahiki, a Hawai'i Island *ali'i nui* visited Waialua.

> But this Lono Kamakahiki, one of his son roamed in here Waialua District--I don't know, maybe three, five, six hundred years ago - roamed Waialua District, and one of Lono Kamakahiki's sons came and married one of the Aila family, our family, so it produced children. So that's the story of Kewela Aila…. I saw in (Abraham) Fornander's book and then (S.M.) Kamakau's book. Whether it's true or not, I don't know. But it says the story is there because one of Lono Kamakahiki's son is, I know his name Keikihumahana. In his young days he roamed back and forth - roamed the Waialua District. He married one of the Aila's in Waialua District. We come from Waialua but we're the only Aila in the whole territory. There's nobody else. No Aila besides us. Only my family (Aila 1977).

During the period 1839 to 1855, several legislative acts transformed the centuries-old Hawaiian traditions of *ali'i nui* land stewardship to the western practice of private land ownership. In the first stage, King Kamehameha III (Kauikeaouli) divided up his lands among the highest-ranking *ali'i* (chiefs), *konohiki* (land managers), and favored *haole* (foreigners) (Chinen 1958:7-14; Moffat and Fitzpatrick 1995:11, 17). This historic land transformation process was an evolution of concepts brought about by fear, growing concerns of takeovers, and western influence regarding land possession. Kamehameha III, in his mid-thirties, was persuaded by his *kuhina nui* and other advisors to take a course that would assure individual personal rights to land.

One-third of all lands in the kingdom would be retained by the king; another one-third would go to *ali`i* or chiefs as designated by the king. In 1846 he appointed a Board of Commissioners, commonly known as the Land Commissioners, to confirm or reject all claims to land arising previously to the 10th day of December, AD 1845. Notices were frequently posted in *The Polynesian* (Moffat and Kirkpatrick, 1995). However, the legislature did not acknowledge this act until June 7, 1848 (Chinen 1958:16; Moffat and Fitzpatrick 1995:48-49), known today as *The Great Mahele*. The *mahele* did not actually convey title to the *ali'i* and *konohiki*, but it essentially gave them the right to claim the lands assigned to them. These lands became known as the *konohiki* lands. The *konohiki* chiefs were required to present formal claims to the Land Commission and pay a commutation fee, which could be accomplished by surrendering a portion of their land to the government. The government could later sell these lands to the public in the form of Grants. Upon payment of the commutation fee, the Minister of Interior issued a Royal Patent to the chief or *konohiki*. The last one-third was originally designated to the *maka'ainana*, but not acted on -

instead it was set aside to the government, "subject always to the rights of the tenants" (Moffat and Kirkpatrick 1995:41-43; see also Chinen 1958:15-21).

'Ili kūpono were the only '*ili* (parcel) recognized in this process, all the '*ili* and lesser divisions were absorbed into the *ahupua'a* claim (Chinen 1958:20). In 1892 the legislature authorized the Minister of Interior to issue Royal Patents to all *konohiki* or to their heirs or assignees where the *konohiki* had failed to receive awards for their lands from the Land Commission. The Act further stipulated "that these Royal Patents were to be issued on surveys approved by the Surveyor General of the kingdom" (Chinen 1958:24; Moffat and Fitzpatrick 1995:41-43). Kamehameha III formalized the division of lands among himself (one-third) and 245 of the highest-ranking *ali'i* and *konohiki* (one-third) between January 27 to March 7, 1848. He acknowledged the rights of these individuals to various land divisions in what came to be known as the *Buke Mahele* ('sharing book') or *The Great Mahele.*

The *ahupua'a* of Kawaihāpai is bordered on the west by Keālia, but on the east there are two different versions; the Bishop Museum map In *Sites of O'ahu* (Figure 6) where it borders undivided Mokulē'ia Ahupua'a, and the KSBE map in Google (2013) of *ahupua'a* in Waialua Moku (Figure 7) where it borders Kikahi, which may have been an '*ili* in Mokulē'ia Ahupua'a. The PRPF lies at the south end of Kawaihāpai Ahupua'a.

Fig 6. Kawaihāpai Ahupua'a [see enlarged view in Appendices-last page]

Fig 7. Ahupua'a of Waialua

The following excerpts about Kawaihāpai Ahupua'a come from an interview of Louis Aila by June Gutmanis (1977); from *Sites of O'ahu* by Sterling & Summers (1978); and from a newspaper article interviewing Thomas Shirai by Eloise Aguiar (2001).

> In Kawaihāpai we only had about 40 to 45 Hawaiians. It's just a little village. It's not a big place. About 40 to 45 people [about eight houses]. Nice community. Hawaiian. Most all Hawaiian. Mormon Church. But we have some of that locality, they belong different churches. But we all come together. We, all Hawaiians those days, all stick together. They love one another. Regardless. They don't question you whether you a Catholic, or you are a Protestant. We all meet together, and then, well, anything to be done, some families need help, the whole community give hand. Without paying. They just go and offer their services. That's how the Hawaiians did it. If somebody building a house, well, he don't have to ask us to help him. No~ we know he building a house. The whole community go there and help him. But first you ask "You need any help? We're here to help you." "Oh, yeah." Then we all pitch in. Repair the house, build a house, you know, maybe they want to clean the taro patch. You know, in the mountain there was a lot of taro patches. And then plow the taro patch or plant the taro. They all get together, see? To help one another. The Hawaiians those days, they really stick with one another. And they love one another.

> They work. They help and no money. We don't have money those days. But the love and the respect is more than you know what I mean. We don't worry those days. We don't get money. But the food, there's a lot of food. Lot of poi, lot of taro, lot of fish. We go hunt up the mountain. Hunt goats, hunt pigs, hogs, in the back of the mountain. Mokuleia got lot of pigs, lot of hogs. Wild pigs. And goats. Lots of goats, those days. And we love goats. We have a garden at home and then we have a patch up toward the mountain there where the water come down all the time. That's where our taro was and we plant sweet potatoes. Sometimes around rainy season we plant corn (Aila 1977).
>
> Those days he (father) followed the old Hawaiian calendar. You know, when to plant potatoes, when to plant bananas. He don't plant fruits any old time. There's certain times he knows. He look by the stars, the moon every night. And he's an intelligent man. He can come out at night, he say, "What night is this?" We have name, eh? He can come out and look out and say, "Oh, this is so-and-so." And he says, Hawaiian calendar thirty days every month, not 29, 31, no. Thirty days every month. That's Hawaiian calendar. He goes by that, so, well, he predict something, come true. And when he go fishing, he knows what night to go fishing. He don't go fishing any old time. He knows what day to go fishing. They all go by Hawaiian name, like *Ku, Ku-kahi, Ku-lua, Ku-kolu*, and maybe *Olepau*, *Ole-ku-kahi, Ole-ku-lua.* What they call in English? What they call that? The phase of the moon. He's pretty smart. I got all of that in a book. I kept it, but I didn't get the experience of my dad….. Well, we have some [sweet potato] *mohihi.* Some *kaneala,* and then I kind of forget, but many, many varieties of sweet potato. Since we never practice that all these years, you kind of forget. Unless you write them down and you keep a record…. a Hawaiian sweet potato. They call it *mohihi*. They used for medicine. I don't know for what kind of sick. But this only what I heard people say. Most time they plant just for eat…. We have chickens. We don't keep [livestock] so far as I know. We didn't any pig. If we want pig we just go up and hunt right in back of the mountain. We go hunt, get pig. Wild ones, you got to know how to prepare. Like my dad and my brothers and sisters know how to prepare. So you won't, they say, smell. There's no smell their way. I don't know how do they prepare…. we had one store in the village where we were staying, but they don't have no meat down there. Maybe they had canned stuff and cracker or maybe cream, rice, but there's no market down our place, no market at all. So, when friends come over they got to eat what we give them. But those days they don't select what they want. Like when we go to their home whatever they get they tell us participate in the food with them. We don't ask questions, we just eat what they get on the table. With the old Hawaiians you cannot tell what we going to eat, no, no. Very rude, you know (Aila 1977).
>
> In Kawahāpai they have water from the mountain. Till today, I believe so. And lot of taro patch right where we were on the lowland. And Hawaiians, different families who go up and plant taro and whatever it is, or plant sweet potato, or corn, whatever it is, see (Aila 1977).
>
> I knew had ilima those days. When we live in Kawaihāpai we have ilimas, too. We have ilima. We plant and we take care of the ilimas (Aila 1977).
>
> [We lost the land] because of, since the War. The second World War. So they condemned that place. I don't know how many years the government condemned the place and then they took it over. The Dillinghams. But originally the name of that site, right there, is Kawaihāpai. It's not Dillingham. But it's not on the map now when you look. So, I came from there (Aila 1977).
>
> There is a sizable area of terraces in the lowlands (now surrounded by sugar cane), watered by Kawaihāpai Stream. These terraces have evidently been lying fallow for some time, though several were being plowed for rice or taro in the summer of 1935. At the foot of the cliffs, watered by a stream the name of which was not learned, are several small terraces in which taro is grown by David Keao. He says that taro cannot be grown in the lowlands, as salt water seeps in and sometimes flows in, mingling with the fresh water in the terraces and spoiling the taro. Above his inland terraces, along the base of the cliff and above the talus slope, grow three varieties of wild taro – called Aweu – one white, one red like Kumu, and one striped black. I saw the first two varieties under the cliffs where the water pipe intake begins, and I saw the third, said to have come

from there, in the grounds of the Andrew Cox School (Handy 1940:85 In Sterling & Summer 1978:99).

Life on this land in the olden days was a life of plenty until trouble came, for plants died because of the lack of water. Everybody thought of going and leaving the land. There were two old men* who belonged to the priestly class of old, and they remained, setting up the kapu with prayers and after praying they saw a hog shaped cloud coming directly from Kahuku point and they guessed that it was going to rain, that their prayers were heard. This place where this strange water created by God is on the hill facing the length and breadth of the district of land call Kawaihāpai that lies between Waianae and Waialua, O'ahu. Because God created this water of the cliff, the name of the land from old was called Ka-wai-hapai (Lifted water) because the water was lifted up and placed above and because no one knew the source of this water it is called Ka-wai-kumu-ole-i-ka-pali (Water-without-source-on-the-cliff) to this day (Liokakele 1911 In Sterling & Summer 1978:99). [*these two men were ancestors of Thomas Shirai (Aguiar 2001).]

Puu o Hekili (Site # 190), an *ahua* which was once located on the beach below the Kawaihāpai station. According to Hookala, an ahua is "bent instead of angular in construction" and was evidently a type of fishing shrine (*ko'a*). Unfortunately nothing remains of the site (McAllister 1933 In Sterling & Summer 1978:99).

Kawailoa Heiau (Site 191). Only a portion of two terraces remains. The upper terrace is 66 feet long and 4 feet high, and is excellently paved with small stones a few inches in size. The southwest limits cannot be discerned. On the east end is a wall 1.5 feet high which can be followed for about 10 feet. The lower terrace was 25 feet wide with a facing 2 feet high, which can only be traced a short distance. The houses (*kahua hale*) in which the *kahunas* (sic) lived were known as "Paweo", according to Hookala. This is undoubtedly the site referred to by Thrum as Paweu, "a small heiau 58 by 65 feet at the base of the hill; badly damaged by freshets." (McAllister 1933 In Sterling & Summer 1978:99-100).

Hidden Waters (Site 192), mountain side of Kawailoa Heiau, Kawaihāpai. These are four hidden waters upon which Hiiaka called when she was refused water by the old inhabitants. Their names, as given by Hookala, are *Ulunui, Koheiki, Ulehulu,* and *Waiakaaieas.* Farther toward Kaena Point is water known as *Kawaikumuole*, which is a conjunction of Kanaloa and Waihuna a Kaalai. Another hidden water, which Hookala says is mentioned in the Hiiaka chant is *Kuilaau o Kealia,* but he does not know its location (McAllister 1933 In Sterling & Summer 1978:100).

Fishing Shrine (Site #193). Kuakea fishing shrine (*ko'a*), Kawaihāpai was formerly located on the beach in a direct line with Kawailoa Heiau. Nothing marks the site (destroyed) (McAllister 1933 In Sterling & Summer 1978:100).

Ka-wai-kumu-ole. We met Pohaku-loa, arrived at Ai-ea, moved on to the grassy plains of Kawaihāpai; saw the water of Ka-wao-kumu-ole surrounded by gingers and palai ferns (*Nupepa Kuokoa* Aug 11, 1899 In Sterling & Summer 1978:100).

The following are excerpts from 'Mo'olelo O Kawaihāpai' by Roy Alameida (2003) and a few were also in 'Kawaihapai: A Place in Time' by Roy Alameida (1996).

Kawaihapai was known for its large *lo'i* (irrigated terraces) and sweet potato fields as well as excellent fishing grounds. The *lo'i* extended into Kealia, the *ahupua'a* to the west, where small terraces at the foot of the *pali* (cliff) grew varieties of taro.4 These small terraces, or *mo'o 'āina,* also referred to as *mo'o,* were usually planted with wet-land taro and often extended along streams and ditches. According to Kamakau, "The lands were fertile, and the principal crop on Kauai, O'ahu, and Molokai was wet-land taro cultivated in ponds, artificially constructed patches, along the banks of water courses, or anywhere where the ground was soft and moist" [Handy & Handy 1972:50 In Alameida 1996]

At Kawaihapai, the land claimant Lauwahine testified, "My house claim is bounded on the north by a 'sand dune' pond [*loko kai pu'uone*]...." (Native Testimony, Lauwahine to Land Commission, vol. 2: 493, AH). According to Kamakau, these ponds "belonged to commoners, land holders and land agents, the *maka'ainana, haku,* and *konohiki.*" He noted: The *pu'uone* ponds near the sea, *(loko kai pu'uone)* were much desired by farmers, and these ponds they stocked *(ho'oholo)* with fish. *Pu'uone* ponds were close to shore ponds, *loko kuapa,* or to the seashore, and next to the mouths *(nuku)* of streams.... The farmer stocked it with awa and fish fry, *pua i'a* - two or three gourds full - until the pond was full of fish.... The offering of sweet potatoes [made when the pond was first stocked] was a service to the *'aumakua (he hana 'aumakua)* . . . (Kamakau, *The Works of the People of Old* 49).

There were also those who claimed fishing areas for themselves. Hikiau, in his testimony, mentions his "octopus fishing ground," (Native Testimony, Hikiau to Land Commission, vol. 2: 509, AH) and Lapa describes his "*kai*" (fishery), and his choice of fish to protect was the *moi* which could only be fished for him and the *konohiki.* (Native Testimony, Lapa to Land Commission, vol. 3: 700, AH).

Regardless of their size, the *loko i'a,* or *kai* provided the necessary fish supply for the residents of Kawaihapai. In keeping with traditions, "the gods were the first to be considered by chiefs and people. The first fruits were sacred to the gods. The first born children, animals, the first fruits of the land, the first fish caught, the first product of any labor was sacred to the gods" (Kamakau, *Tales and Traditions of the People of Old*). (This traditional concept of *mālama* continued until it met resistance from foreign interests and desires.) (Alameida 1996:35-36).

In 1839, Emerson reported: "There are now 4 or 5 boats running much of the time between Waialua and Honolulu owned by the natives of Waialua. Carrying burdens across the land is now very much out of fashion." (Emerson Station Reports: 1839, HMCS). Hokuaulani of Kawaihapai [Land Grant #1780] operated a boat to take supplies and mail from Waialua to Honolulu and returned with foreign goods. William Emerson, the son of John Emerson and a student at Punahou School in Honolulu, wrote in a letter to his mother, "Hokuaulani's boat came in yesterday and we got the eggs and the bucket of oranges." (Emerson, letter to Ursula Emerson, Sept. 27, 1851, HMCS).

In a visit to Kawaihāpai, Emerson writes the following (Alameida 2003: 39):

I went to Kawaihapai, distant about 6 miles to preach to a small congregation. Found many sick on the road calling for medicine; & when (I) arrived at the place of meeting I found two unburned corpses, but a few steps from the schoolhouse & others sick apparently nigh unto death. I divided my time between ministering to the souls & to the bodies of the people & have since been happy to learn that several were relieved from their sufferings by the timely aid. What a poor time to preach to men, when they are panic struck! Sickness & death have no power to convert the soul. The past epidemic has been of a very strange character. Many were taken with violent pains in the head or stomach, which would soon spread over the whole system; & some times in one or two days the patient would die, but more frequently he would linger along six or ten days. (Emerson, letter to Rufus Anderson, 22 May 1850, HMCS).

The following excerpts describe Kawaihāpai Kuleana Land Commission Awards and Land Grants:

Records of traditional land use for the area are sparse before the Māhele of 1848, which initiated private land ownership in the Hawaiian Kingdom. Kahekili Ke'eaumoku was known to be *ali'i 'ai moku* (district-level chief) of the Waialua district after the conquest of O'ahu by Kamehameha I (Alameida 1996:84). The district remained in the hands of the *ali'i* up to the Māhele, after which unclaimed parcels became government lands available for public sale (McGerty and Spear 2001).

Following the advice of their land agent, Reverend John S. Emerson, many Kawaihāpai residents purchased lands rather than claiming them. Through purchase they could acquire pasturage and forest lands that were not usually included in *kuleana* claims (Land Commission Awards [LCA]) (Allen 2010). At least 31 individuals had lands in Kawaihāpai (Wilson and Spear 2008:13). Nineteen Land Grant parcels are identified in Emerson's 1896 map. Land use reported for these parcels included goat pens, a school house, irrigation ditches, streams, springs, fishponds, salt beds, and gardens, all suggesting an active community at the time of the land division in 1848 (McGerty and Spear 2001:11) (Filimoehala 2013:11).

The *Māhele* at Kawaihapai was unique. The land was sold. It is not known why [the Kawaihāpai land was sold], since government lands were not available as *kuleana* (responsibility, property, right) claims, several Kawaihāpai residents filed testimony with the Land Commission. Each claimant defined the boundaries of their claims. For example, Ka'akau, a resident who purchased 24 and 2/3 acres for $9.2527 said in his testimony that his land was bounded on the north by the land of Ho'okamali'i, on the east by a pali, on the south by the land of Ka'aona, on the west by a fence (Native Testimony, Kaakau to Land Commission, vol. 2: 491, AH). So did Niho who gave the names of neighbors bordering his land. Another claimant, Mahiahume, was part of a *hui* or partnership that purchased land at Kawaihāpai. He presumably was a resident of Kawaihāpai prior to the *Māhele* since his name was listed in the 1840 census. Regarding his claim, Mahiahume testified that:

> *The first is a house lot bounded on the north by the sea, on the east by a kula, on the south by mooloa, on the west by kula. The moo is bounded on the north by fence, on the southeast by a land for Kaaona and a spring on the west by a moo for Napae. The kula is bounded on the north by a spring, on the east by an a* (possibly *a'a*)*, on the south by pali and on the west by an a. A goat pen is bounded on the north by a schoolhouse, on the east and west by kula, on the south by mooloa* (Native Testimony, Niho to Land Commission, vol. 3: 677, AH).

He received 16.5 acres of the total 66 acres that the *hui* bought as recorded in Royal Grant 279.30 As the prospect of more land sales materialized, land agents were appointed by the Minister of Interior and charged with specific duties with respect to their work (Alameida 2003:40-41).

Emerson made himself available and was appointed the government land agent in Waialua. He believed that there was no other person in Waialua who would have the best interest of the people in mind. In some respect, he replaced the traditional *ali'i 'ai moku* (district ruling chief) of Waialua (Alameida 2003:41).

There were several reasons why Emerson decided to become land agent for Waialua: (1) the land was for sale and natives would take little the rest going to rich men who would become "lord of the soil and oppressors of the people;" (2) since natives were currently not owners of their lands they would become subject to labor tax for their landlords; and (3) the people requested that he do it because they knew he cared for them (Royal Grant 279, Honolulu: HBC) (Alameida 2003:41-42).

Emerson then began to sell Kawaihāpai land to the residents. A petition sent to the Land Commission by several land claimants in Waialua requested that their claims be voided so that they could purchase government lands in fee simple (Emerson to Anderson, May 22, 1850, HMCS). Yet, in some cases, the residents were buying land they had lived on and worked on prior to the *Māhele.* These were usually small tracts of wet land taro, *kula* lands for dry crops and pasture or a house lot. Others bought *kula* lands they had not previously possessed. Most of these were large tracts of 100 acres or more usually acquired by a *hui;* a type of co-tenancy or co-ownership.

The customary rules of the Hui suggest its affinity to the earlier land system: there was an allotment system by which each member could select a house lot and garden of five to ten acres

for each "share;" there were pasturage rules specifying the number of cattle which could be run on the common range per share, with penalty rates for a larger number; and regulations as to cutting wood, fishing, fencing, and the like ... But the hui filled a useful purpose in the nineteenth century as a transitional device on the road to Allodial tenure (Theodore Morgan 1948:138 In Alameida 2003:42).

Of the 18 Royal Grants issued for Kawaihapai, roughly 27 per cent were in this category. The land acreage for a *hui* ranged from 24 to go acres, while the range for individual buyers was 24 to 197 acres. In some cases, the purchased land was divided among two to four individuals….

Those who bought government lands were issued documents called grants or often referred to as Royal Patent Grants signed by Kamehameha III. These differed from the awards issued by the Land Commission. The Land Commission awards identified the nature of the title conferred as either fee simple or leasehold and gave a description of the boundaries. After the claimant paid the commutation of one-third the value of the unimproved land, Allodial title to the land was confirmed.35 With the passage of a law in 1850 that allowed foreigners to buy land in fee simple, William Emerson and John T. Gulick, missionary descendants, took advantage of that law and bought large tracts of Kawaihapai land. Although Hawaiians were listed in the 1840 census as Kawaihapai landowners, they were not necessarily permanent residents. Hawaiians and non-Hawaiians alike were attracted to the chance to own fee simple land in Kawaihāpai (Alameida 2003:43).

Emerson's 1863 Station Report indicated a sharp increase in the population of the Waialua district from 1,137 in 1854 to 1,309 in 1860. He reported, "There is more land owned by the common natives in Waialua than in any other district of O'ahu, and the people are less oppressed by foreign land owners than in any other district and so they increase by immigration faster than they decrease by excess of deaths above the births" (Emerson, Station Report, 1863. Manuscript Collection, HMCS In Alameida 2003:43).

From the testimonies recorded in the *Native Testimony and Foreign Testimony* for Kawaihapai, seven *kuleana* claims for Kawaihapai land were filed with the Land Commission. However, none of those individuals were listed as landowners, nor do any documents confirm that they purchased any government land. With the exception of Emerson and Gulick mentioned above, the government lands purchased at Kawaihapai remained in the hands of Hawaiians. It appears that the Kawaihapai residents were cognizant of the process they needed to complete in order to attain fee simple title. If a date was needed to determine the end of the land sales at Kawaihapai, it probably would be 1856. "The business of selling Government lands is now at an end; none of much value remains unsold in the district....," wrote Emerson (Emerson Station Report 1863, HMCS In Alameida 2003:43-44)'

LCA Claims – None were awarded (Waihona ʻĀina 2013)

LCA#	Claimant	Island	Moku	Ahupuaʻa
00870	Kaakau	Oʻahu	Waialua	Kawaihapai, Kealia
00871	Niho	Oʻahu	Waialua	Kawaihapai
00873	Lauwahine	Oʻahu	Waialua	Kealia, Kawaihapai
00893	Kalalawalu	Oʻahu	Waialua	Kawaihapai
00894	Hikiau	Oʻahu	Waialua	Kawaihapai
00900	Moewaa	Oʻahu	Waialua	Kawaihapai
00912	Haule	Oʻahu	Waialua	Kawaihapai
00915	Kaaona	Oʻahu	Waialua	Kawaihapai
00993	Kaakau	Oʻahu	Waialua	Kawaihapai, Kealia,
03704	Mahiahume	Oʻahu	Waialua	Kawaihapai

By the late 1800s, some of the heirs of the original Kawaihapai landowners were selling land. In 1858, the heirs of Haleli (Grant 456) sold all 90 acres to John Emerson for the sum total of $140. Likewise, Kekauwa (Grant 1781) sold his 48 acres to John Emerson for $48. Three other landowners sold land and made a profit. Papa sold his 100 acres for $80 for a profit of $30. Kahoeka (Grant 1785) sold his 90 acres for $321 that netted a profit of $276.39 The remaining landowners either willed the land to a spouse or surviving heirs. In one case, the landowner died intestate, and by court order, the land was inherited by his niece, his only surviving heir.

The *Māhele* that created a formal mechanism for lands to be held in fee simple also became the avenue by which Hawaiians and non-Hawaiians alike obtained access to private ownership of land. For at least 40 years after the *Māhele* in 1848 and 30 years after the sale of government lands ended in 1856 in Waialua, the familial history of the Royal Patent grantees reflected, in many cases, a strong desire to keep the lands within the *ʻohana*. However, by the turn of the century, almost all the Kawaihapai lands slowly slipped away from Hawaiian control. The *moʻolelo* of Kawaihāpai is bittersweet. Gone are the *kupuna.* Gone are the *hoaʻaina.* The *ʻāina* of Kawaihāpai the symbol of loyalty to locality, gone (Alameida 2003:44-45).

Hokuaulani & Kaawelu Land Grant #1780: this parcel of land is outside the boundaries of PRPF, but is the closest privately owned lands to the project site, approximately 345 m (1,132 ft.) north.

Table 5. Documented Land Grants in Kawaihāpai (Emerson 1896) (From Filimoehala 2013:144).

Grant No.	Year Purchased	Acreage	Awardee
3767	1895	220	Silva
1777	1855	100	Kamoku and Lahela
1784	1855	100	Papa
1783	1855	50	Kanalu
1779	1855	50	Kauloaiwi
1786	1855	50	Maaweiki
1781	1855	48	Kekauwa
1780	1855	68	Hokuaulani et al.
1785	1855	90	Kahoeka and Kolikoli
1846	1855	248	Dole
343	1850	68	Kalauohaena et al.
279	1850	66	Mahiahume et al.
260	1850	24.3	Kaakau

259	1850	24.5	Haule
258	1850	24.3	Kane
240	1850	166	Emerson
456	1850	90	Halali
459	1850	90	Koanaku
457	1850	197	Gulick

The following excerpts are agricultural post-Mahele historic land use:

Sugarcane became a considerably profitable crop in Hawaii by the second half of the 19th century, and the drilling of wells allowed the establishment of the sugar cultivation in northern Oʻahu. Much of Kawaihāpai was incorporated into Dillingham Ranch at this time, where low-lying areas between the mountains and coast were used for sugar or cattle grazing (Wilson and Spear 2008:14). The newly-established sugar economy necessitated the extension of rail lines into the area, and a new settlement grew up around the railroad station at Kawaihāpai (Moblo 1991:4; Filimoehala 2003:14).

Waialua Plantation/Halstead Plantation/Waialua Agricultural Company/Waialua Sugar Company-Mill. In 1865, Levi and Warren Chamberlain started a sugar plantation in Waialua that ultimately failed and Robert Halstead bought the Chamberlain plantation in 1874 under the partnership of Halstead & Gordon. Gordon died in 1888, and the plantation was managed by the Halstead Brothers, Robert and his two sons, Edgar and Frank.[2] In 1898, Castle & Cooke formed the Waialua Agricultural Company and purchased the plantation from the Halstead Brothers.

By the end of 1898, a new mill was constructed, and the first crop harvested in 1899, producing 1,741 tons of sugar.[3] Castle & Cooke also expanded the acreage, built a railway system, and maximized ground and surface water storage and irrigation systems.[1] Between 1900 and 1906, four surface water collection systems were constructed, giving the Waialua sugar plantation the largest water storage capacity in the state of Hawaii. As a result of these efforts, sugar production increased from less than 5000 to 20,000 tons from 1900-1905. Mechanical loading of harvested cane began to replace manual labor using self-propelled machines in 1920.

The Waialua Sugar Mill and lands was acquired by Castle & Cooke one of Hawaii's Big Five trading and sugar industry management companies. By 1991, the mill was producing eight percent of sugar in Hawaii as the Waialua Sugar Company, a subsidiary of the Dole Food Company. However, the plantation was unable to increase the tons of sugar per acre yields. The Waialua Sugar Mill finally closed in October, 1996 due to profit concerns and became the last sugar plantation on the island of Oʻahu. By 1999, the old sugar workers camp was still inhabited by former Filipino laborers.[10] The area currently serves as an industrial park for the North Shore of Oʻahu (Wiki-WSM 2012).

At the time the Waialua Agricultural Co., Ltd., was organized in October, 1898, it took over the old Halstead Plantation with about 600 acres of cane, certain leases of large tracts of unimproved land covered with lantana and stones, several hundred acres of rice and ranch land, a small mill, one five million gallon pumping station, no reservoirs or railroads, one small set of steam plows and other equipment of a small plantation. We now have 70 million gallons per day pumping capacity, 30 miles of permanent railway, the Wahiawa reservoir, capacity 2,540,000,000 gallons, and 33 other reservoirs, ditches to bring out the water of the Poamoho, Helemano, Opaeula, Kawaiiki, Kamananui and Waimea gulches, a good mill, six locomotives, cane cars, six steam plow engines and plows, tractors, trucks, buildings and about 9,000 acres of cane…. Unfortunately for the Company and much to the disappointment of the many stockholders and everyone connected with the Plantation, we could not acquire a large wedge-shaped tract of land cutting the Plantation into two widely separated parts until April 1, 1905 – too late for planting a large area that year…. The most important and far-reaching events in the history of the Plantation were: securing a lease of, and later buying the land just previously referred to: the building of the

dam at Wahiawa, finished March, 1906; and the arrangement with the Hawaiian Pineapple Co., Ltd., in 1922 (WACO 1924: 6-7).

During part of the land history of Wahiawā/Helemano/Wai‘alua lands when it was owned by the Holt Estate, some of the lands were used by the Waialua Agricultural Company, Limited; Hawaiian Pineapple Company, Limited; and Castle & Cooke (Holt 1993:340-341).

The Waialua Agricultural Company, Ltd. was incorporated October 11, 1898 with an agreement by and between Joseph B. Atherton (President), Edward D. Tenney (Secretary), Benjamin F. Dillingham (Vice President), William A. Bowen (Treasurer), Henry Waterhouse (Auditor) and Mark P. Robinson. [Wm. W. Goodale was Manager] (WACO 1898, 1899). Their agents were Castle & Cooke, Ltd. of which J.B. Atherton was president.

They immediately began modifying the landscape with waterways, reservoirs, roads, bridges, fences, railroads, wells, mills, buildings, steam pumps and live stock. Over 900 acres of sugarcane was planted for the crop of 1900 in May 1899 “on unused lands that could be watered from the Kaukonahua stream” while the new mill was being built. The first pump was delivered in June, and was started in September. By October 2,500 more acres were cleared and plowed to get ready to plant for the crop of 1901. By the end of the year several hundred more acres were being cleared for the crop of 1902 (WACO 1899:11-12).

Photo 24. Aerial of DMR and bordering sugar fields (UH 1951)

A tremendous amount of capital was put into acquiring land with water sources, improvements, equipment and planting. “The plantation was now in debt to Castle & Cooke for more than half a million dollars” (Taylor et al. 1976: 130). Six pumps provided millions of gallons of water every day, mostly from artesian wells. Of the six, one pump was supplied by the springs and pond at Kawailoa. More pumps had to be ordered so that the crop of 1903 could be planted (WACO 1899:11-12).

Chronology of Waialua Sugar Company Lands (KSBE 2005)

1867
At public auction, Charles Reed Bishop purchases the first sugar operation undertaken by Levi and Warren Chamberlain which began in 1865 and failed two years later. Bishop decides to continue the 130 acres of cane with the help of his brothers and the assistance of Castle & Cooke as his agents.

1869
The operation is sold again to O.R. Wood with Castle & Cooke continuing as his agents.

1871
Castle & Cooke buys the plantation from O.R. Wood.

1875
Castle & Cooke sells the operation to Robert Halstead and Henry Gordon

1898
The entire plantation is again purchased by Castle & Cooke and incorporated on Oct. 12, 1898. In order to finance necessary capital improvements, 35,000 shares of stock are issued at a par value of $100. This enables the construction of flumes, siphons and ditches for irrigation which are still in use today.

1993
In response to the potential shutdown of sugar plantations statewide, Kamehameha trustees authorize staff to plan for the possible conversion of sugar land to other uses.

1995
Kamehameha Schools negotiates a two-year rent waiver with Waialua Sugar Company in order to assist them in staying in business in exchange for ownership of all infrastructures upon lease surrender.

1996
With Waialua Sugar Company’s assistance, five acres are taken out of sugar and tuberose is planted as the first non-sugar crop by A & K Nursery (tuberose.235 ac).

1997
Additional acreage is converted to other crops, with 300 acres put into seed corn and 50 acres into watermelon.

1998
Waialua Sugar Company celebrates its 100th anniversary and gives notice of voluntary surrender of the 24,000 acres leased from Kamehameha Schools. Trustees approve the Ahupua’a ‘O Kawailoa Master Plan Concept and the issuance of 15-year cultivation agreements for farmers.

1999
Kamehameha Schools takes over operation of the area previously under lease to Waialua Sugar Company. As such, the infrastructure which was installed between 1898 and 1950 continues to provide water and electrical service to Kamehameha land.

The O‘ahu Railway and Land Company (OR&L) was founded by Benjamin Franklin Dillingham, a self-made businessman who arrived in Honolulu as a sailor in 1865. After falling from his horse and breaking his leg while riding in the countryside, Dillingham was forced to stay in Hawai‘i and recuperate. He decided to make the island kingdom his home. He later leased James Campbell’s ‘Ewa and Kahuku lands to start two sugar plantations and obtained a government railroad charter from King David Kalākaua on September 11, 1888. Dillingham broke ground in March 1889 with a goal of connecting the 12 miles (19 km) between Honolulu and ‘Aiea (as demanded in the charter) by fall 1889. On November 16, 1889, the king’s birthday, the OR&L officially opened, giving free rides to more than 4,000 curious people.

By 1892 the line was 18.5 miles (29.8 km) long, reaching ‘Ewa sugar mill, home of Dillingham's ‘Ewa Plantation Company property. Although progress stalled during f the late Kingdom and early Republican periods, by 1895 the railroad had passed through the junction of Waipahu, traversed the ‘Ewa plain, and was going around the Wai‘anae coast to a sugar mill there. After issuing gold bonds in January 1897, the company extended the railroad around rugged Ka‘ena Point to Haleiwa by June 1897 where Dillingham built a hotel. By December 1898 the main line was complete, stretching past Waimea Bay and Sunset Beach all the way to Kahuku and the Kahuku sugar mill past the northernmost tip. Although a circle-island line was proposed, it was never seriously considered.

The OR&L was not only a sugar cane railroad. While it served several sugar mills and plantations, it also hauled end products, equipment and workers. The sugar plantations sometimes had their own lines. As a common carrier, the OR&L carried freight, passengers, mail and parcels. For instance, besides sugar and pineapples, the railroad hauled garbage from Honolulu to a dump on the Wai‘anae Coast, sand from Wai‘anae to Honolulu during the development

of Waikīkī, and served the major military bases: Pearl Harbor, Hickam Field, Barber's Point Naval Air Station, Schofield Barracks, and Wheeler Army Airfield. After the December 7, 1941 attack on Pearl Harbor, the OR&L became a major player in wartime transportation. The railroad continued its regular freight operations as well as handling massive amounts of military-related traffic. The OR&L became the chief transporter of civilian base workers, sailors, soldiers, airmen and marines, both from Honolulu to their bases, or from those bases back to Honolulu. In 1944 and 1945, the OR&L carried nearly two million riders. Then passenger traffic and gross revenues dropped more than fifty percent. The railroad's fate was sealed by the 1946 Aleutian Islands earthquake and the resulting 55-foot (17 m) tsunami that struck on April 1, 1946. And from September 1, 1946, through November 18, 1946, 22,000 sugar workers struck 33 of Hawaii's 34 sugar plantations. The strike had a major impact on Hawai'i, and OR&L's freight dropped to record lows. Although the OR&L rebuilt the tracks destroyed by the tsunami and continued operations during the strike, the decision was made to shut down the entire operation at the end of that year (Wiki-OR&L 2013).

> During those days everybody have Hawaiian newspaper, this *Kua Koa*. And then another newspaper, *Aloha Aina*. You see, a train used to run down all the camps (as far as Kahuku). Every Friday they used to deliver the paper and we go down to the depot and wait for the paper. My dad subscribe to them all the time. So they read in Hawaiian, my dad, you see. So, how I come to learn how to read Hawaiian because, although I familiar with the Hawaiian language I listen how my dad read. And when he get through, when he read it, *pau*, I would get the paper and I would try to read myself (Aila 1977).
>
> We didn't have a horse. We walk to Kawaihapai, to the station, and if we want to go to Waialua, we walk to Kawaihapai. It's about maybe two miles and a half from where we lived. And catch a train, you know. [The train ran] everyday. One trip each way. And catch it [to Waialua and] coming back from Kahuku. Maybe once a month I used to come into the city [Honolulu] with my mother. We used to come with my mama. My grandfather left some money, you know. And then, when he died, so we come into town, maybe my mother go to the bank get about ten dollars. In those days ten dollars go for a lot of stuff, you know. I still remember. First, you know, we go to my nephew's home at Kaka'ako. We stay there. From there, well, maybe I don't go to the bank, only my mama…I stay home play with those kids. And she going get the money and then when she come back, we go the store to buy certain thing, and we buy whatever we want and we catch the train that evening, and come back. Sometime we sleep for one night or two or three nights and we come back (Aila 1977).

The military utilized the Kawaihāpai lands in several ways beginning in the late 1920s. Filimoehala (2013:14) summarizes military activities as follows:

> Modern military use began in 1927 at the north end of Kawaihāpai (McGerty and Spear 2001). It was mainly used for housing and agriculture before World War II (WWII), after which it was developed into a large active airfield. Following the war, the airfield was renamed Dillingham Air Force Base and was used primarily for defensive training purposes and as a missile launch site. It was transferred from the Department of the Air Force to the Department of the Army in 1975 and is currently used for small private planes and tourism (McGerty and Spear 2001).

The war (military) altered lives and land in many ways according to WACO (1942) report.

> Probably not since the early days of its organization has the Waialua Agricultural Company, Limited encountered so many operating difficulties as were faced by the staff during 1942. The temporary loss of many of our department heads, overseers, and workers to the armed forces, the lending of many of our men and much of our equipment for war work, the necessary restrictions due to blackout hours and the complete blacking out of the factory to enable it to operate twenty-four hours a day all combined to make our work difficult….
>
> Due to the fact that nearly all of our men and equipment were necessarily engaged in war work, we did not start harvesting until three weeks after our scheduled date. The army had requested that we clear and keep cleared nearly 1,000 acres of land for its purposes. Regardless of previous

> plans, we were forced to plow under large areas of cane that were not old enough to harvest economically….
>
> Our preliminary experiments in vegetable cultivation in this district, which is not particularly suited to the production of temperate zone crops, came in good stead this past year. Early in season we planted to vegetables a number of areas. These crops were raised in cooperation with the Office of the Military Governor. A total of 287,703 pounds of lima beans, over 100,000 pounds of string beans, 15,000 pounds of carrots and other produce were raised and marketed. In addition to this 1,233,524 pounds of Irish potatoes were grown as a plantation enterprise.

The location of the 11th FA "Summer Camp" appears to have been the Kawaihāpai Military Reservation on O'ahu's North Shore, the site of a bivouac, and firing point for artillery pieces (coast and field). The reservation evolved into the Mokuleia Military Reservation, then into the present day Dillingham Military Reservation (US Militaria Forum 2013).

Photo 25. 11th FA Summer Camp 1926

The following comes from Bennett (2009 and 2010):

> Mokuleia Army Air Field (AAF) and Military Reservation (MR) were located in the Kawaihāpai Ahupua'a (ancient Hawaiian land division) of the District of Waialua on O'ahu's North Shore. It was established as the Kawaihāpai MR between 1925 to 1927 as a bivouac, and artillery firing point for army units stationed at Schofield Barracks and at Coast Artillery forts on O'ahu.1
>
> The original reservation consisted of 67 acres built along the O'ahu Railway and Land Company main line to Kahuku from Honolulu, an additional 583 acres was officially acquired by the Army in 1946 by means of a "Declaration of Taking" filed in court. Secretary of War, Robert P. Patterson signed the legal instrument in 1946 which stated that the land of Mokulē'ia, Aku'u, Kawaihāpai, Keālia, and Ka'ena, Waialua, O'ahu, Territory of Hawaii; Mokuleia Ranch and Land Company, et al. "is taken…to provide for a military airfield, an ordnance storage area, and related military purposes incident thereto. The said land has been selected by me for acquisition by the United States for use in connection with such purposes, and such other use as may be authorized by Congress or by Executive Order, and is [r]equired for immediate use." 2
>
> The reservation is positioned on the narrow western end of the Waialua Plain between the Waianae Mountain Range and the ocean. The coastline is relatively flat which rises to a maximum elevation of 20 feet in some areas. The terrain rises gradually to a steep scarp at the southern boundary of the reservation.3 The airfield was a satellite field of Wheeler AAF for the Army Air Forces with construction starting in 1941. It was occupied by aircraft of the Hawaiian Air Force seven days after the bombing of Pearl Harbor and officially activated in 1942 and used extensively for training of Army Air Forces airmen.
>
> Mokuleia AAF was built during World War II by army engineers of the Honolulu District Engineer's Field Area 13, headquartered in the former R.C.A. building at Kahuku Army Air Base (AAB). Field Area 13 was created to construct Haleiwa AAF and Kahuku AAB, later assigned to develop Mokuleia AAF.5 (Bennett 2010).
>
> Mokuleia Airfield [was] renamed to Dillingham Airfield for the late Henry Gaylord Dillingham, KIA over Kawasaki, Japan on July 25, 1945 in a B-29, and son of Walter Dillingham of the O'ahu

Railway and Land Company and Hawaiian Dredging fame. The main runway (8/26), when completed, was the longest on O'ahu at some 9,000 feet long by 75 feet wide (Bennett 2009). [See also North Shore.com 2005]

Photo 26. Camp Kawaihapai - Dillingham Field (Hawaii Aviation 2013).

The majority of the information about Camp Kawaihapai/Dillingham Field below is from the *Hawaii Aviation* website:

> Army use of 67 acres of land just south of the O'ahu Railroad & Land Company (OR&L) railway in Mokuleia began in 1922 with the establishment of Camp Kawaihapai as a communications station. In the 1920s and 1930s, the site was also used as a deployment site for mobile coast artillery which was transported by railroad.
>
> By December 7, 1941, a fighter airstrip had been established on additional leased land and Mokuleia Airstrip had been established. P-40 aircraft were deployed at North Shore airstrips at Kahuku, Haleiwa and Mokuleia when the Pearl Harbor attack took place. U.S. Army Air Corps aircraft taking off from Haleiwa destroyed several attacking aircraft. Mokuleia Airfield was improved to a 9,000-foot by 75-foot paved runway, a crosswind runway and many aircraft revetments from 1942-1945. By the end of World War II, Mokuleia Airfield could handle B-29 bombers.
>
> In 1946, the U.S. Army acquired the additional 583 acres of leased land by condemnation with compensation. In late 1946, the U.S. Army Air Force became the U.S. Air Force by order of President Truman so Mokuleia Airfield became an Air Force installation. In 1948, the airfield was inactivated and renamed Dillingham Air Force Base in memory of Captain Henry Gaylord Dillingham, a B-29 pilot who was killed in action over Kawasaki, Japan on July 25, 1945. Captain Dillingham was the son of Walter H. Dillingham who was a noted pilot on O'ahu in the 1930s. Henry was also the grandson of Benjamin F. Dillingham who founded the OR&L which evolved into Hawaiian Dredging Company and the Dillingham Corporation.
>
> The state leased Dillingham from the Air Force in 1962 for general aviation use on a short-term basis. In about 1974, the Air Force transferred the base to the Army. The state acquired a longer term lease from the Army in 1974 and in 1983 signed a 25-year lease. Hangars for fixed wing aircraft and gliders, bathrooms and a Unicom Tower/fire station were added in 1985-1986. Master plans for Dillingham were accomplished in 1980 and 1993 along with an environmental assessment in 2000.
>
> The Defense Authorization Act of 1990 provided that the 67 acres of ceded land of old Camp Kawaihapai be transferred to the state after an agreement on future joint-use of the airfield was reached. An environmental assessment was completed in 2000.
>
> The 2001 Legislature passed Act 276 [HB 1679] that changed the official name of the airfield located at Kawaihāpai, formerly known as Dillingham airfield, to Kawaihāpai airfield. The Act will take effect upon the completion of the transfer of the airfield back to the State by the U.S. Army. In 2004, there were 68,503 air operations at HDH and the airfield was not available for general aviation use for only four hours because of priority military need. In 2008, Dillingham Airfield was a general aviation airport operated by the Hawaii Department of Transportation under a 25-year lease from the U.S. Army. The state leased 272 acres of the 650 acre Dillingham Military Reservation and operated the single 5,000-foot runway primarily for commercial glider and sky diving operations.
>
> Known as HDH, the field ia a joint-use airfield with the Army having first priority for air-land operations and helicopter night-vision training. The airfield is not lighted for night operations by general aviation. The state Department of Transportation operates and maintains the airfield and utilities systems. The State entered into a new 25-year lease with the Army in 2009 and has a Joint-Use Agreement (MOA) with the Army for the field. Future improvements and initiatives include a taxiway extension, water system upgrade and additional hangars for gliders and powered aircraft. Sites for private hangar construction is available.
>
> The state expects that HDH will serve general aviation for decades into the future. The gliderport and hangar areas will be named Kawaihāpai, which means lifted water because of a past artesian spring. Kawaihāpai was the original Hawaiian name of the immediate vicinity. The Kawaihāpai Gliderport and skydiving facilities at HDH are part of the Hawaii tourism industry (Hawaii Aviation 2013).

According to Bennett (2010) a cold war missile launch site was part of the Dillingham Air Force Base.

> Dillingham Air Force Base saw the establishment of a Nike-Hercules Missile Launching site in January 1961, designated as site "OA-84." One of four sites located on the island. The Nike-Hercules guided missile was a nuclear-capable weapon.
>
> Administration headquarters and acquisition radar were located in the Waianae Range near "Peacock Flats" at general coordinates: 21.545851N - 158.194944W (2018 feet elevation). Twelve portable missile launchers were located at the airfield manned by a Platoon of Battery C, 2nd Battalion, 298th Air Defense Artillery Gp., Hawaii Army National Guard, who manned the battery. Each Launcher Platoon consisted of three sections, manned by a crew chief plus eight to ten crewmen each section was responsible for maintaining and preparing four missiles for launching.
>
> Typical launch sites were equipped with emergency power supplied by two diesel-powered Cummins V-12s, each about 12 feet high, rated at 150 kW each. Each launcher included a 30 kW motor generator that provided the means to elevate and depress the missile launcher. The administration, barracks and mess hall buildings were provided commercial power supplied by the Hawaiian Electric Company The missile battery launch and acquisition sites closed down in March 1970 (Bennett 2010).

Dillingham Field Burial Disturbance/Removal. In 1997 the Shirai *ohana* went through a documenting process and declared lineal descendants of burials at Dillingham Field. However, this did not stop the

disturbance and removal of *'iwi* or bones from their family burials in 2005 when truckloads of sand were removed from the area. Thomas Shirai is not sure where the sand went – he believes some went to a private Mokule'ia home. DOT sent a letter of apology to the Burial Council in 2006, but it wasn't until 2007 that a letter of apology was sent to the Shirai family (Aguiar 2007; KHON 2005; KHON 2007). In December 2007 Shirai received a "Christmas present" – the *'iwi* of his Tutu great-great-great-grandmother Napuakau Kakulu in a brown cardboard box. He and two OHA staff wrapped the *'iwi* in *kapa* cloth and placed them in *lauhala* baskets and re-interred them back where they came from near Dillingham Field (Pereira 2007).

Forest and Natural Area Reserves. Both the Mokulē'ia Forest Reserve and the Pahole Natural Area Reserve are state-owned conservation lands. The following excerpts are from an environmental assessment report (DLNR 2003). The Pahole Rare Plant Facility is located in the south corner of Mokulē'ia Forest Reserve [pp 7-8]. [See Appendix F for list of endangered plants and plant species of concern]

> The Forest Reserve System was established in 1903 to protect the vital mountain watersheds. The Mokuleia Forest Reserve surrounds Pahole Natural Area Reserve and also supports the endangered O'ahu 'elepaio as well as various species of rare, threatened and endangered plants…. Protecting and actively managing native ecosystems on a landscape level is necessary to secure the long-term viability of these systems and to recover endangered species. Mokuleia Forest Reserve occupies approximately 3,341 acres, to the east and west of Pahole Natural Area Reserve.
>
> The Natural Area Reserves System (NARS) was established in 1970 by the State Legislature to "preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites, of Hawaii." Chapter 195, HRS. The 658-acre Pahole Natural Area Reserve was established in 1981 to protect rare lowland native mesic and dry forest and habitat for endangered species. Pahole Natural Area Reserve supports the endangered O'ahu 'elepaio (*Chasiempis sandwichensis ibidis*), the endangered O'ahu tree snail (*Achatinella mustelina*), at least 18 species of endangered plants, candidate plants, and plant species of concern, and additional native species of plants and animals.
>
> Pahole Natural Area Reserve ranges in elevation from approximately 1,200 to 2,590 feet, and receives an average annual rainfall of 57 to 66 inches. The runoff is rapid, and erosion occurs on the well-drained soils on slopes along drainage ways. Eroded spots, stony areas, and outcrops are present in the Reserve. The lower elevations of the Reserve contain dark friable soils with a surface layer of silt clay that is moderately to strongly acidic. At the upper elevations, the well-drained soil is strongly to extremely acidic. The surface layer of this soil is reddish-brown silt clay overlying ironstone or saprolite.
>
> A privately controlled paved road to the abandoned Nike site and Pahole Rare Plant Nursery runs close to the north side of the Reserve. A jeep trail abuts the paved road near Peacock Flat and traverses the Mokuleia Forest Reserve upslope to the Mokuleia Trail head and Pahole Natural Area Reserve entrance. The trail continues into Pahole Natural Area Reserve, runs along its eastern boundary, and continues beyond the Reserve's northeastern boundary.
>
> The Pahole Natural Area Reserve is accessible to the public by way of an improved road and the Mokuleia Trail. Activities that are compatible with the NARS mandate are allowed, including scientific research, hiking on designated trails, camping, public hunting during designated seasons, and cultural practices are allowed in the Reserve. Some of these activities require permits. Motorized vehicles and mountain bikes are not permitted.
>
> The entire Pahole Natural Area Reserve is considered to be a sensitive habitat, particularly for the endangered O'ahu 'elepaio (*Chasiempis sandwichensis ibidis)*, one species of the endangered O'ahu tree snail (*Achatinella mustelina*), three snail species of concern, and many rare native plant species. Pahole Natural Area Reserve has been designated as critical habitat for the 'elepaio and for 25 threatened and endangered plants on O'ahu by the U.S. Fish and Wildlife Service. The Natural Area Reserve also includes lowland native mesic and dry forests, which are becoming increasingly rare in Hawai'i.
>
> *Flora*
> The Pahole Natural Area Reserve protects some of the best examples of lowland native mesic and dry forest remaining in the Hawaiian Islands. These forests are noted for their species diversity and richness, and are becoming increasingly uncommon. Native natural communities within the Reserve include koa/'ohi'a (*Acacia/Metrosideros*) lowland mesic forest, 'ohi'a and uluhe (*Metrosideros and Dicranopteris*) lowland mesic forest, lonomea (*Sapindus*) lowland dry forest, O'ahu diverse mesic forest, *'a'ali'i* lowland dry shrubland, and an intermittent stream.
>
> The species richness in the [Pahole NAR] is found in the sub-canopy trees, shrubs, and ferns. At least 168 native plant taxa have been reported from the Reserve, including 58 rare and endangered species. Several of these plants are locally common in the Pahole Natural Area Reserve, but are not found elsewhere in Hawai'i. At least 18 endangered plant species, candidate plant species, and plant species of concern are present within the [NAR]. A sizeable portion of the Reserve is dominated by non-native vegetation. The near extirpation of native plants and their replacement by alien species in these areas are the result of rooting, disturbance of native ground cover, and weed dispersal by feral pigs.
>
> *Fauna*
> Native birds known to occur in the Pahole Natural Area Reserve are the 'apapane (*Himatione sanguinea*), 'amakihi (*Hemignathus virens*), kolea or Pacific golden plover (*Pluvialis fulva*), and the endangered O'ahu 'elepaio (*Chasiempis sandwichensis ibidis*). One lone male '*elepaio*, but no nesting pairs, has been observed in the project area. One species of the endangered O'ahu tree snail (*Achatinella mustelina*), three snail species of concern, and at least three additional snail species have been reported from the Reserve. Given the relatively intact condition of the native forests in the project area, it can be assumed that the site supports native insects and other invertebrates as well (DLNR-DOFAW NARS 2003). A species of moth of the Cosmopterigidae family, *Hyposmocoma centronoma* is endemic to O'ahu - the type locality is Kawaihāpai. The larvae feed on *Metrosideros* species (Wiki-Hypo 2013).

Forest Trails. There are several hiking (and biking) trails that criss-cross the Mokulē'ia Forest Reserve and the Pahole NARS – most likely trails utilized from pre-Contact periods (e.g., Na Ala Hele: Mokuleia Trail; Kuoakala Trail; Peacock Flats Trail; Kealia Trail; Kuaokala-Makua Rim Trail; and Dupont Trail (one of the oldest on O'ahu).

Archaeological fieldwork was conducted and an ethnographic site visit was made in the early part of this year.

The following archaeological summary is from Filimoehala (2013).

> The majority of archaeological fieldwork in Kawaihāpai has been undertaken in the coastal flats or the lower foothills of the *ahupua'a*. Due to the remote and inaccessible nature of the project area, very little fieldwork has been conducted in the vicinity. Archaeological reconnaissance survey for the fence line of Pahole Natural Area Reserve, located 400 m [1,312 ft] southeast of PRPF did not identify any cultural resources or historical properties (Zulick 2003). No archaeological sites or historic properties are known to exist within the project area. Table 6 includes sites in Kawaihāpai found outside of the project area.

Table 5. Archaeological Sites Previously Recorded in Kawaihāpai Ahupuaʻa (Filimoehala 2013).

Site No.	Reference	Name/Description	Function	Period
190	Thrum 1907, McAllister 1933	Kawailoa	*Heiau*	Traditional
191	McAllister 1933	Puʻu o Kekili	*Koʻa*	Traditional
192	McAllister 1933	Hidden Waters	Springs	Traditional
193	McAllister 1933	Kuakea	*Koʻa*	Traditional
416	Handy and Handy 1972, Rosendahl 1977	Terraces	Agricultural	Traditional
3747	Pietrusewsky 1988	Human remains	Burial	Traditional
4440	Drolet and Schiltz 1992 b	Remnant stone wall	Unknown	Unknown
4441	Drolet and Schiltz 1992b	Stone wall	Cattle wall	Historic
4442	Drolet and Schiltz 1992 b	Terrace	Unknown	Unknown
4777	Drolet and Schiltz 1992a	Stone wall	(component of Settlement Cluster 1)	Habitation Trad/Hist
5766	Perzinski and Hammatt 1999	Human remains	Burial	Traditional
6638	Oʻ Hare et al. 2003	Subsurface cultural layer	Unknown	Traditional
6884	Tulchin and Hammatt 2008	Stone walls	Cattle wall	Historic
6885	Tulchin and Hammatt 2008	Terraces/Walls	Agricultural	Traditional
6886	Tulchin and Hammatt 2008	Terraces/Walls	Agricultural	Traditional
6887	Tulchin and Hammatt 2008	Modified overhang shelter	Habitation	Traditional
6888	Tulchin and Hammatt 2008	Terraces/Walls	Agricultural	Traditional
Site 2	Mitchell 1987	Wall	Military	Historic

Filimoehala (2013) provides the following summary in the Archaeological Assessment for the proposed DAGS Pahole IRF:

> No archaeological or historical properties have been identified within the project area, and the closest previously identified archaeological site is nearly 2 km [1.2 miles] distant. These results are not surprising considering the mountainous location of the PRPF, and the expectation for limited traditional and post-Contact activities at these elevations (e.g., bird hunting, harvesting of timber and plants) which have restricted archaeological visibility. The limitation of archaeological sites to the lowland areas of Kawaihāpai follows typical patterns of traditional Hawaiian subsistence and cultural practices. Given that the majority of the construction activities will be accomplished within the existing graded/modified footprint of the facility, it is not anticipated that cultural materials will be encountered. However, any construction activities outside of previously impacted areas should be monitored. Specifically, the removal and relocation of the three water storage tanks to the southern margin of the facility will require ground disturbance in an area that may not have been affected by previous construction.

Ethnographic Site Visit

The site visit to PRPF complex was made on May 10, 2013. Mr. Timothy Aki drove his truck until he volunteered to unlock the gates (six) and re-lock them, all the way up to PRPF - at that point I drove. We were accompanied by Mr. & Mrs. Thomas Shirai, Jr. We took leisure walks around the PRPF, taking photographs of the various facilities, used and unused structures, areas where the proposed facilities will be located, views from PRPF, and vegetation in and around the proposed Pahole IRF area. After a couple of hours, Mrs. Shirai needed to go home (she had just come from the night shift at work). Everyone felt privileged to have visited the site.

Photos 27 & 28. Two of six gates on the route to PRPF

Photo 29. In front of HECO facility

Photo 30. Thomas Shirai and Tim Aki at nursery.

Photos 31 & 32. Jackie & Thomas Shirai and Timothy Aki at *mauka* Kawaihāpai.

Modern *Mo'olelo*

The following *mo'olelo* or recollections are from more current newspaper articles (e.g., Shirai) and past oral histories (e.g., Aila).

The following memories are from Thomas Shirai, Jr. (2006).

> I had the privilege to be raised in Mokulē'ia by my grandparents, David and Abigail Kea'o. Through them, I've learned much about my grandfather's '*ohana* and their relationship to the northwest coastline of Waialua, which encompasses Kamananui, Mokulē'ia, Auku'u, Kawaihāpai, Keālia and Ka'ena….
>
> The Bishop Museum's 1933 publication entitled "Archaeology of O'ahu" by McAllister featured my grandfather's *kupuna* and grandmother Annie Keahipaka, who shared some family stories and knowledge of Waialua….
>
> In the Bishop Museum's 1940 publication entitled "The Hawaiian Planter," my great-great-grandfather Kaaemoku Kakulu shared the name of a freshwater spring called Ka'aie'a located in the mountains just past Camp Erdman where sweepage from Ka'aie'a crossed the roadway and entered the ocean. There it created a *muliwai* (river mouth)…. Sweepage from Ka'aie'a made its way to the ocean up to 1998 when it was capped and never flowed again….
>
> Before I came along, my grandfather was a taro farmer and a fisherman who specialized in lobster fishing. He would paddle his canoe with my grandmother and uncle from a place he called McInerny…located on the shoreline at Auku'u, which is adjacent to Kawaihāpai, and paddle to his fishing grounds. Ka'ena was one of his grounds. He learned these skills from his grandfather, Kaaemoku Kakulu, who was the last *konohiki* of Kawaihāpai. The McInerny family allowed my grandfather to leave his canoe on the parcel that they owned during that time.
>
> After catching the lobster, he would put them in 100 lb burlap bags and load them onto the train ay Kawaihapai Station to be delivered to Kekaulike Market to a family that operated a fish stall. Later in the week, he would catch the train and pick up his money in Honolulu (Shirai 2006).

The following is from an article written by Thomas Shirai, Jr. honoring Ms. Webb and her contributions to the Waialua District:

> Elizabeth Lahilahi Napuakaumakani Webb was born on April 12, 1862 at Kapuukolo, Honolulu and died January 2, 1949 at Lunalilo Home at the age of 86 years old. She was a lady-in-waiting for Queen Liliu'okalani. For the purpose of this writing I wish to acknowledge her relationship here in Waialua Moku. As a past employee of Bishop Museum and Lifetime Historian of the Daughters of Hawaii (founded at Dillingham Ranch at Mokulē'ia in 1903), she was instrumental in gathering information from Kupuna about Waialua featured in publications entitled Archaeology of O'ahu (McAllister 1933) and The Hawaiian Planter (Handy 1940) later compiled into *Sites of O'ahu.* This included an organized site visit to Kūkaniloko Birth Stones (Daughters of Hawaii were the first stewards of Kūkaniloko) with Waialua Kupuna.
>
> She was beloved and *hanai* by my Grandfather's (David Peahi Keao Jr.) Ohana who were among those that shared information about Waialua Moku however, with an emphasis on the Northwest Coastline encompassing the Ahupuaa of Kamananui, Mokulē'ia, Kikahi, Aukuu, Kawaihāpai, Keālia and Kaena which they had much land holdings from the time of the *Mahele* or earlier. Among her cultural expertise was *lauhala* weaving. It was her, Annie Keahipaka (Great-great-grand Aunt) and my Great Grandmother Clara Napuakekau Kakulu Keao that wove the *lauhala* mats for the flooring of Haleiwa Hotel. This is first-hand knowledge instilled to me from my Grandfather not known to our Ohana and Community because he came from an older generation with direct interaction with these Kupuna. My Grandfather and his Ohana shared because of preservation for the future. The publications of Samuel Manaiakalani Kamakau (he was born in 1815 at Mokulē'ia) were translated by a committee that included her. Lastly, she was a member of the Outdoor Circle for over 30 years. The Outdoor Circle is very active here on the North Shore. This is a long overdue *ho'okupu* for this highly deserving Kupuna who contributed to Waialua and the Hawaiian Culture. *Me Ke Aloha Pumehana* (Shirai 2013).

The following article was about the post-recognition of Thomas Shirai, Jr.'s grandfather's heroic deed:

Posted on: Tuesday, January 30, 2001

Certificate a reminder of family's hero

By Tino Ramirez
Advertiser North Shore Bureau

WAIALUA — Earlier this month, Thomas Shirai Jr. received a manila envelop mailed to him from Washington, D.C., by U.S. Sen. Daniel Akaka. The envelc contained a plaque and sheet of paper Shirai had sought for years: recognition from the Coast Guard for an act of heroism by David Peahi Keao Jr., his grandfather, more than 60 years before.

It was a sweet moment for Shirai. Although Keao died in 1998 and Shirai had wanted the certificate awarded to his grandfather by a high-ranking officer, it is something that will remain in the family for generations, a reminder of what kir of person his grandfather was.

"I took it upon myself, even after he passed away, to do something about it," sa Shirai. "You cannot forget that kind of touching thing. I'm proud of my grandfather and what he did."

Shirai's family once owned land at Kawaihapai, a land division near Ka'ena Point, where they farmed taro and fished. On March 16, 1940, Keao and his brother, William, had finished setting lobster nets off Kawaihapai Beach when they heard two soldiers call for help.

Through rough surf and strong currents, Keao brought the soldiers to shore, one from the bottom of a channel in the reef.

In January the next year, Keao was awarded a Silver Lifesaving Medal for the rescue. While the medal is still in the family, the certificate that went with it wa lost and Shirai was unable to replace it until Akaka's office began assisting last summer.

Keao frequently talked about the incident and it became part of the family's history, said Shirai.

The tale apparently had an effect on Shirai, who feels a strong connection to his grandfather in many ways. In 1984, while serving in the Coast Guard on Lake Michigan, Shirai saved two people from drowning in stormy conditions.

Past Oral History

Mr. Louis J. Aila, Jr. was interviewed by June Gutmanis in Makaha, O'ahu on March 5 and June 9, 1977. Mr. Aila was born in Waialua [Kanikiula], June 27, 1901 and while growing up, he spent time living in Kawaihāpai as well as Waialua. As an adult he was a laborer for Honolulu Iron Works, joined the National Guard in 1916 and served in the Army during WWI. After his discharge he worked as a stevedore, cane hauler for Ewa plantation, a housepainter, a conductor with Honolulu Rapid Transit and a musician. Excerpts from this interview are cited in this section.

> I went elementary school in Kawaihapai. You hardly hear that name now. That's where the Dillingham Airfield is now. But, according to the map, it says Mokuleia, but majority of the area of that airfield is in Kawaihāpai District. That's where I was brought up, raised. [I was born] in Waialua - Waialua town, but way toward the mountain. The place they call Kanikiula. People now-days, they don't know that name. They doesn't know, see? Only the old timer, like, older than I, they know what Kanikiula mean. But you talk to the young generation now, they don't know. Only what they know is Waialua. On the road to Haleiwa when you pass one of the town, they call Kaihuwai. Okay, when you come from Wahiawa you coming down through that pineapple field, cane field and you kind of going down. And some garage and stores on the right and you get a bridge, Two Bridge (Twin Bridge), they call it. You get the first bridge and the second bridge. So you pass these two bridges, that area is called Kaihuwai. That's why they have stores there. They have show-house there. And then our community center is there, you know. And you pass that and you go in little further down, is a cane field on two sides, and when you hit the first road that go across cane field, and you turn right. Go mauka between these cane fields, oh, maybe about quarter of a mile up, and you turn right…oh, maybe one block. That's where used to be, that's where I was born. That place was originally my grandfather's place, Louis Johnson. I was about eight or nine [when I moved to Kawaihapai] [Aila 1977].

Photo 33. Makai view from mauka Kawaihāpai Ahupua'a; metal cable lines in foreground.

ETHNOGRAPHIC DATA AND ANALYSIS

The Ethnographic Survey (oral history interview) is an essential part of the Cultural Impact Assessment (CIA) because the ethnographic data helps in the process of determining if an undertaking or development project will have an adverse impact on cultural properties and practices or access to cultural properties and practices. The following are initial selection criteria:

- Had/has Ties to Project Location(s)
- Known Hawaiian Cultural Resource Person
- Known Hawaiian Traditional Practitioner
- Referred By Other People

The consultant for this Cultural Impact Assessment was selected because he met the following criteria: (1) consultant grew up, lives or lived in Kawaihāpai, Mokulē'ia and vicinity; (2) consultant is familiar with the history and *mo'olelo* of Kawaihāpai, Mokulē'ia and vicinity; and (3) consultant is a cultural practitioner and recognized *konohiki* of the area. A copy of his signed "Consent" form is provided in (Appendix G).

In order to comply with the scope of work for this cultural impact assessment (CIA), the ethnographic survey was designed so that information from the ethnographic consultant would facilitate in determining if any cultural resources or practices or access to them would be impacted by the implementation of the ICSD Radio Facilities Reconditioning at Pahole Rare Plant Facility project. To this end the following basic research categories or themes were incorporated into the ethnographic instrument: Consultant Background, Land Resources and Use, Water Resources and Use, Cultural Resources and Use; Anecdotal Stories and Project Concerns. Except for the 'Consultant Background' category, all the other research categories have sub-categories or sub-themes that were developed based on the ethnographic raw data (oral histories) or responses of the ethnographic consultant. These responses or clusters of information then become supporting evidence for any determinations made regarding impacts on cultural resources and/or practices including access.

Each person interviewed is asked to talk about their background; where they were born and raised, where they went to school and worked, and a little about their parents and grandparents. This category helps to establish their connection to the project area, their area and extent of expertise, and how they acquired their proficiency. In other words, how they meet the selection criteria. Ethnographic consultants either have family or personal ties to the project vicinity and/or are familiar with the history of the area.

The only person interviewed was Mr. Thomas Shirai, who was raised in the area now referred to as Mokulē'ia. His family was once land owners of the project *ahupua'a* Kawaihāpai for generations and Mr. Shirai is considered an official cultural resource person for the area from Haleiwa to Ka'ena in the district of Waialua.

Biographic Profile. There is always a danger of not allowing the consultant's "voice" to be heard; of making interpretations that are not theirs; and of asking leading questions. To remedy this, the "talk story" method is used and allows for a dialogue to take place, thereby allowing the consultant to talk about a general topic in their own specific way, with their own specific words. All of the excerpts used are in the exact words of each consultant or paraphrased to insert words that are "understood" or to link sentences that were brought up as connected afterthoughts or related additions spoken elsewhere in the interview. The following "Consultant Background" provides an overview of the consultant, as well as information about his family.

Thomas Shirai, Jr. My name is Thomas Shirai, Jr. (born 1961) I was raised in Mokulē`ia by my grandparents. That was from childbirth because my father had tuberculosis so he was patient at Lē`ahi Hospital. So my mom and I, after I was born at Kapiʻolani Hospital, went down to be raised in Mokulēʻia. In Hawaiian culture, as you know, I'm the oldest grandchild, so that's the one that gets all the attention; they really *mālama* that one. And so when my dad got well, then I moved back to town with them and I went school in town. But on the weekends and every spare moment - holidays, vacation, whatever, I stayed with my grandparents. So I get two homes. And in that sense, I get two sets of parents.

I went to Mother Rice Pre-School and then I went to Ala Wai Elementary and Washington Intermediate School. I spent half a year at Kaʻimukī High School, because we lived right across Crane Park. My parents and grandparents gave me a rare option. I didn't go to school not because I was stupid. I stopped going to school. Things change you, adolescence changes you. So they asked me, "What are we going to do to rectify this problem?" They were shocked when I said I like go live with grandma and grandpa. No questions. Just like how the board is unanimous.

My grandmother was the custodian at Waialua High School for about thirty years, from 1940 to 1978. I had more cousins than friends, because this is my stomping grounds. It was all family, uncles, aunties, and so forth. Choke cousins. So I get to go to school with my cousins, and my friends that I knew from small kid, summer- fun days, down here in Waialua, spending the whole summer with my grandparents. So having that kind of environment, plus the family, *`ohana* style, it put me back on track. And that's it, I cannot remember nothing bad. I cannot.

When I was young, I didn't spend too much time with younger people my age. I spent a lot of time with older *kupuna*. I couldn't play with them - I just had to sit by my grandpa. They're talking, even though I don't know what they're saying, but a few bits and pieces I'd catch. With that kind of things and the interests, hobbies, I was introduced to at a very young age, like archaeology. I'm sure you can appreciate this. You know by eleven years old I knew more about Waialua than one teacher because that's my grandpa's family. And we went there because some of the objects….I have an appreciation for archaeologists and this will be a surprise to you. My hobby that introduced me to this was called collecting antique bottles. And guess what? I had the source, the source was my grandpa. He knew where all the plantation camps was and he was of an older *kupuna* generation.

It was great for all those things, but not spectacular. But the knowledge gained from that, and the family values of *ʻohana* during those type of outings all throughout Waialua. All the plantation camps to all the way up the mountain, you know every place. The joyful thing is, it wasn't like a formal showing, I just listened and I just watched, a lot of observing, no questions. I remembered all that. And he had friends, his classmates, that worked for the plantation and he was able to get passes to do bottle-collecting in the early 1970s. And he was a very trustworthy person - he wasn't the type to go there and just dig everything up and make it a mess. But, like I said, the knowledge gained, the history, the culture, all those other things, all from one man, my grandpa. His name was David Pē`ahi Keao, Jr. In fact, his father's family is from Wailuku, Maui.

I didn't even have toys when I was small. I had Hawaiian history books, Hawaiian music records, those type of things. And my grandpa, he didn't want to be left out, so little did I know that that's the one that did it all. He wanted to participate and then from there, nature takes its course. So that's two things that really opened me about to what I have is collecting antique bottles and playing music for a very long time. You have to learn the meanings, you don't just go act. You do your homework.

My mom was Laverna Tailomi Keaʻau Shirai. My father's name was Thomas Toshio Shirai, Sr. My mother was three-quarters Hawaiian, one-quarter Chinese. So I get plenty Hawaiian. I take offense when people call me part-Hawaiian. I'm not. [My father is] pure Japanese. Hawaiʻi Japanese, born on the Big Island, Hawaiʻi-*ko*. But I was very supported, when I was a baby and in younger days, a lot of support from my *ʻohana*, my aunties, my uncles. A lot of encouragement. My grandma's name is Abigail Kalomi Akau - she was born in ʻOʻōkala, but she was raised in Salvation Army Mānoa Orphanage, right where I currently reside, up the road, is where they met.

For that part, the publication *Archaeology of Oʻahu* and the *Hawaiian Planter*…, my grandpa's family was the cultural informants for Waialua. Handy's one and McAllister, the one before they made everything into *Sites of Oʻahu*. David Keao's father, David Maikaʻi Keao. There are other names. The other informants on there is a known lady, another *kupuna* of my grandpa, Annie Keahipaka. She shared a lot of our family stuff. Her and Kaʻaemoku Kakulu [kane]. Those were the main three, I'm gonna go on because I get the records. I brought some materials to show you. There are two things that they were very, very good at. One being taro cultivation (and here you are, I'm talking to a descendant of a taro farmer) and fishing. They had their own fishing *ko`a*. And they had their own agricultural *heiau* located on Kawaihāpai. Kaʻaemoku Kakulu was considered the last *konohiki*. So you can see already…and it's reflected. I'm also a genealogist. I did mine; I've been doing it a long time. Some of the resources that you would not think would be that helpful have verified everything. Like phone directories, it gives the people's names and it gives their occupation or what they do. I have one there that says Kaʻaemoku Kakulu, fisherman, Mokulēʻia. And stuff like that. I didn't bring them all, because it would be too much.

Kaʻaemoku Kakulu is my great-great-grandfather. That's my grandpa David Keao, Jr.'s grandpa. David Maikaʻi Keao would make it my great-grandpa. And Annie Keahipaka would make that his great-great grandaunt. However, there is something on there too. He recognizes her because his maternal grandmother, the wife of Kaʻaemoku Kakulu, died at a very young age. So he recognizes Annie Keahipaka as his grandma but we know the real one is Kahu. I've got it all down. This place right here is also part of it too, where we are right now (Haleiwa McDonald's).

I couldn't go play with the kids. Although I wanted to go play with my cousins, but I was learning this kind stuff. I can play their games but, "Boy come over and sit down. Just listen and listen and listen and watch." And then when you go school, the public education system, I bring home books that I borrow. One of books I borrowed, *Hawaiʻi: A Pictorial History*, or *Sites of Oʻahu*, I bring ʻem home, my grandpa would read the book. "Boy, where you get this book from?" Then he read ʻem, and then he go like this, then he goes, "That's my grandpa in the book." And then I'm going, "Wow, what this name mean?" Then he starts sharing and I'm like "Wow, unreal!" And that's how I used to get credit in my Hawaiiana class. I bring ʻem to the school, I bring ʻem to the class, and come to find out the Hawaiiana teacher went to Waialua High School with _____…that's my aunty too. So mo betta, automatic "A" because they know already. Because that's the elder in the family tree, they know, they're not going to say, who's this and who's that. They're not going question. That's what I had - all those kind of things….

Just like anything, to do a more in-depth family genealogy, like how they gotta dig, they go through the Spanish Inquisition; I had to go through that with him [grandpa]. "Why you want to do this for? Why? Why you want to know for?" And one day I just caught him at the right time and I explained to him, and my mother was there. And then he said, "Okay." Because like every family we get skeletons, things they no like you know. I said I no care about that kind stuff. I just like know about my family. That's when I was already in my 30s. I'd come ask him when I hit a dead end, "What is this?" The thing is this: vague clues, but I catch them. You can appreciate too. We even get one noted *kumu hula* - you ever heard of that chant "Lili`u E?" That's my family's chant. It was recorded by my great-great grandpa's uncle. His name was Antone Keao [and John Kaulia]. And I've shared that kind of information with huapala.org, the hula songs website, to let them know….

If you pick up a issue of *The North Shore News*, I wrote a tribute to Lahilahi Webb. You know her accolades already. The article will focus on what she means down here in Waialua and what she means to our family. That lady was *hanai*'d by my family. It is because of her that my grandpa's family, they shared plenty with Handy [Handy & Handy *Hawaiian Planters*]. She was working for Bishop Museum - she knew how to talk to the *kupuna*. They loved her so much; they made her a part of the family. My grandpa told me, if you ever pay tribute to one lady, a Hawaiian historian, remember that lady. He keeps saying that, and so I decided to write one because I felt she wasn't getting the same kind of recognition deserved, like others. I don't want to name names because, you know. And come to find out, when I read her obituary I was like, "Oh my!" Wow, she was a lady-in-waiting! [Thomas]

After High School.

I served in the United States Coast Guard. I'm a highly decorated Coast Guardsman, for Search & Rescue - that's what I did, but on boats at two Search & Rescue stations [based] in the mid-west, Chicago and Wisconsin, of all places - far away from home. I'm only the second Hawaiian to get that award. And I was presented that medal in 1984 at the United States Department of Transportation by Secretary Elizabeth Dole. I get one picture of that too. [I was in] nine years. And then I went to _____ in school and I got stationed here in the back of Whitmore [Village]. And I'm a founding member of the Coast Guard group, Sand Island. And then I got out - home sick. Since we're talking about Coast Guard and life-saving, my grandfather during World War II - 1940, he received a Silver Life-Saving Medal for saving a G.I. that almost drowned at Kawaihāpai Beach. The Commanding Officer of Schofield Barracks, they have that in the archives and I get a copy of that.

Now I'm an airport controller with DOT. I've been there for twenty years, going be 21 years - right out of the military. You know what is funny? Kawaihāpai. My genealogy is an airfield, I work at an airport. My *tūtū* was the top man at the airfield, I work in one tower too, like him, overlooking plenty things. My job is like one air traffic controller.

That's what I can share the place that I'm from, I'm going to live and die in this community. Annie Cox Keahipaka, her ancestor is Chief Elani, the one from [Ewa] O'ahu, her ancestor's name is Andrew E. Cox, Andrew Elani Cox, another branch of the royalty. That's the name of Waialua High School before, Andrew E. Cox, because that was part of their land too. My prayer is to find and grasp it and be that interested in it as I was and share and not be a conversational piece only. Plenty things, we even have a picture of Pua'ena Point with a picture of the Pohaku Pu'ena, and get Annie Cox in the pictures.

Land Resources and Use

Land resources and use changes over time. Evidence of these changes is often documented in archival records. Cultural remains are also often evident on the landscape and/or beneath the surface and provide information regarding land resources and use. However, oral histories can give personal glimpses of how the land was utilized over time and where the resources are or may have been. The specific place names are often forgotten over time or in this case can get lumped into one name as in Waialua, which the district but is used as a reference to the general area. Mokulē'ia, which is a name of an *ahupua'a* in the district of Waialua, but is often referred to the general area from Mokulē'ia Ahupua'a towards Ka'ena. Some of this general area is sometimes referenced as 'Dillingham' because of Dillingham Ranch and Dillingham Field. Mr. Shirai shares information about his *ohana* connection to Kawaihāpai Ahupua'a, but the general areas his *ohana* are also connected to is referred to as Mokulē'ia or Waialua and specifically Ka'ena.

Mokulē'ia and Kawaihāpai

We're from there [Mokulē'ia]. We're related at Kawaihāpai. When I said we own land, I didn't mean 1910, 1920, 1930 - it goes back to the original [Royal] Patents [from] the Mahele, or before. And I have records of all that. That's how much I've done.

There are two things that they [my great-great grandparents] were very, very good at; one being taro cultivation and fishing. They had their own fishing *ko'a*. And they had their own agricultural *heiau* located on Kawaihāpai. Ka'aemoku Kakulu was considered the last *konohiki*.

My grandmother washed their [Army soldiers] clothes because they lived at Kawaihāpai Camp. Things like that. They know how to exchange to be good neighbors and get all the relationship. But my grandfather is testament, he was a carpenter extraordinaire known in this community. Many houses prepared and built because of him.

Kawaihāpai-Mokulē'ia and Agriculture

You better believe it, they get their own taro. That's for the Ho'opili Project. I shared that during the hearing. I said there is a variety of taro, they showed the productivity and the quality. Everybody get their own, it's call *Kāī o 'Ewa*. My grandpa them, the taro they grow, it's not the one you see Honolulu Poi and all that. It's *kāī*. *Kāī* was grown in here, not the kind *lehua*. It's documented in history.

But here the taro story, this is the family method of taro, Kawaihāpai for him. You ever heard of the Pu'e system? Mounds; they put the huli inside and the water goes in between, that's his method. They do them different over here, they like plenty grow on top when they make the mounds and they talk about the '*makua* stunt' but in another sense that he goes through, he says, they put them temporarily in there but only one so he gets one big one and you break off all the keiki and get one, one, one. Even though they say going stunt, he's looking at it like he like big kine, one big one for each one you pull, one-three foot one. He run his taro patch like high tide and low tide. That's the first thing he goes up there to water.

Now what's unique about Mokulē'ia…Mokulē'ia literally means "land of enchantment," which means spirituality, agricultural productivity. That's why the things grow nice.

What Liholiho did, I might as well tell you the verse about Mokulē'ia region. [Sings]

O Ka Ehu
Ehu 'O Ke Kau
Ka Moena Pawehe
'O Mokulē'ia.

The patterned mat of Mokulē'ia. That's agriculture. I'll show you the weblink with all that kind, don't worry if you miss it, I get it. I put two and two together, everything kind of makes sense. Too direct to be coincidental; too direct. When I saw that I was like…the agricultural productivity. Did they tell you they get their own taro?

I'll show you something too. Let me just put this down. [showing document with names] This is an actual survey of one of our *lo'i,* this is our land, my grandfather's land, far land, the middle land, and that's the ocean. That's one of several parcels. But you going see it says Kahala. This was also a *lo'i* - at one time and they used to lease it to the Chinese because they get salt water coming out. They never have that kind variety [written down] Nani'u, Keahilele and Puaokapole. What is unique is sometimes it's listed as Pu'uokapolei.

What is unique is that this is our main line, the Ke'ahilele. They're all related but that's our direct line. And the other one is Kalauohaena. What makes more encouraged is when I do the research,

when I see some of the names, it says Puaokapolei. It's coincidental, that this one and this one is from `Ewa. It makes sense! Here's another one, this one they get other genealogies. You ever heard the Hawaiian homestead over there. They get Kaupe'a. That's 'Ewa. My ancestor's name is Kaupe'a. And my grandpa told me the 'Ewa people is connected to Waialua.

And you know, I get his [grandpa's] poi pounder. Not one small one, the buggah is at least nine pounds. And the way it's shaped, just like perfect shape. Not cheap nothing. And he hide 'em so nobody touch. And then I found 'em. Well, he showed me that kine stuff before. But then I keep 'um, take picture. Unreal.

We go down there, then you make a back left, the name of the street is Mahina'ai. You know what that is? Bread basket. Doesn't that make sense? All the street names. Then when we come down to the next street it says Lā'aupā'ina. I make a joke out of this so people connect a little bit. You take it apart. *Lā'au* = medicine. *Pā'ina* = party. Well this is not a party. Longs Drugs. It's a pharmacy. All the medicine comes from the mountain over there, Mokulē'ia.

The last one about Mokulē'ia, I got the privilege of seeing what they call the Mokulē'ia Collection in the museum, a small collection of Hawaiian artifacts through Mrs. Kam, it was some mortars, my wife and I, and I was probably the first guy from Mokulē'ia that ever seen that and I took pictures…. The mortars, when I see the mortars and tell you *na'au pa'i'ana*, mortars are used for medicine and see all that. It says it had all kinds of medical and medicinal plants growing in the area and this is part of it and I truly believe that this is part of it.

Peacock Flats is something and funny in my house. We listen to the story of *'Āinahau* and Princess Ka'iulani with the peacocks. I went look at that story, my grandmother, Miss Clara Lee, had the same thing down over here. And then that place over there, is named Peacock Flats. Now, in my grandpa's room he get paintings and stuff. He get two silhouettes of two peacocks on top the wall. Now I know the meaning is, he talking about his land. And when I said, "*Ka Moena Pawehe 'O Mokulē'ia,*" the patterned mat of Mokulē'ia. You know the curtain for close the closet, the thing look like that, checkerboard. And I was like, "Jeez this guy is in tune. This is not coincidental because the thing is nice design. He's in tune with this land. They had a parcel over there [at Peacock Flats].

[The Hawaiian name for Peacock Flats] I would just say Mokulē'ia. He [grandpa] would know, I don't know. The closest name I can say is Makalea Valley. We get something bad going down on the *makai* side now that I want to see be ridden of.

Mokuleia Field

My mom was a lieutenant in the Civil Air Patrol and 1952 she was named Outstanding Cadet in the Territory of Hawai'i. That's when it was called Mokulē'ia Field.

Kawaihāpai and Dillingham Field

[They (ohana) owned mauka to makai] the whole [Kawaihāpai] *ahupua'a*. This is where now the Army has their training inside Dillingham Military Reservation, that's DMR. Here's the backup of like what I said. Here you see Ka'aemoku Kakulu, fisherman Mokulē'ia. You can see all the different names. It has years and years. I went through everything. This is all on microfilm or the book. I went page by page, microfilm by microfilm. I spent many, many hours.

I would like you to please recognize one person, happens to be my grandpa's mother, my great-grandmother, and her name is Clara Napuakekau Kakulu Kea'au. I'm going to elaborate right now on her. That's all her land. She is just like me, the baby during the *kupuna*'s age. That's the special one. Get the namesake, the connection to the *kupuna*, the direct line. He can see the jealousy and animosity and all that kind stuff. That's all her parcels, she get more land than her father, Ka'aemoku Kakulu. How you like that? When I said my grandma's maternal mother's

grandma died young, because she had TB also, they wanted to protect her. Annie Keahipaka, her maiden name is Annie Cox - you know the one from Waimea, that's her family - the Keli'iwaiwaiole's and all that. She married my grandpa's grand uncle, and that was John Keahipaka. That's the second wife. He considers, because of that *hanai* from them, but maternally that's the aunty and the uncle. That's not one complete *hanai*. We think of *hanai* like Lahilahi Webb. But the idea is there. She's the only child, when you get all this kind Bureau of Conveyances mentioned in these deeds this kind policies and it starts off like everything else, it starts off happy and ends up sad. Because they take away land, turn their problems, Army take land for make base, airfield. But the idea is that that's my legacy.

This is special land that once belonged to my family. The Army knows that. At least now I can have a seat at the table, whereas 50, 60, 70 years I could not. No can. But now I can. And I see it as a way of trying to make right, by letting me sit at the table and give input and tell the real story and share with them, and also in the same agreement that they preserve my family legacy and protect the land from land-grabbing. And treat it just like how you would do a classified file. Not for public - only the Army. And they understand that. So I've done all that, those types of things to participate, to ensure that where I want to go, there's no curfew, there's no red tape. And it's not abusive like I'm going stay five days, I'm going camp. Look, today's my *tūtū*'s birthday, I want to go on [the land] for two hours. I just want to park my truck there, have a cup of coffee, or whatever, do some remembrance, and then leave - something simple. And that's why you get the Mālama Makua, that's fine. I keep it simple. I no ask for much. But when you guys get meeting about this, I better be on that mailing list. Even if you going cut one tree down, where is it? Kawaihāpai. I want to know where. Because with that comes digging up grounds, because with digging up grounds, means bones.

Dillingham Airfield to Kawaihāpai Airfield

In 2002 I asked my legislator to re-name Dillingham Airfield to Kawaihāpai Airfield. It was passed. I didn't want it be just to show favoritism to my family, I want the name of the *ahupua'a* put back so that all the *kupuna* can be happy. But before Dillingham Airfield it was Mokulē'ia Field, but to me, although Dillingham is an icon of Hawai'i, because his son died, they wanted to re-name that and use that [name]. How dare they do that to one native Hawaiian place? With doing that you erase all the Hawaiian culture over there, the history, the legacy, the people, everything. Make only like military history and I never like that. My legislator was very receptive to that kind of thing. And he said he going do it and he did it. It was something like what Shad them did for Kalaeloa - I modeled it after that. And it wasn't a big thing. I felt, when I do all this kind things, that I'm being protective. They don't want a big scene. And they want to talk directly to that person - and in this case, the Governor, and the legislators. And they did. And so they supported those efforts. Your legislator, I hate to say this, Joe Souki, he was not nice. But then, he abandoned it. It was 2002 and he wanted to have it take effect in 2050. What an _____! But, the time the conference committee wen' *pau*, he when look like somebody wen' beat him up. The *kupuna* wen' touch him, or god wen' get to him, and then he just came up to me and shake my hand like I'm sorry. And I looked at him, I could have said a lot of things, I said, "Okay." I did everything subconsciously, it went with the *mo'olelo* of the place, the *kauna* of the place when I did everything about Kawaihāpai. It all lines up, I did it all. And so, I get modern *ho'ailona* that followed me around when I was doing those kind of things to *mālama* that place. Because I wanted to give credit to King Liholiho, when they had Aloha Airlines, they get their planes named after *ali'i*. I worked at the airport. When I drive around, just in close proximity, the plane named Liholiho stay right by, every place I go. That's them talking, saying that that's a good thing, what I'm doing.

I went ask two *kahu*s. The name of Kawaihāpai is because two *kahu*s. The documented version is two *kahu* were praying. What did I do? I wanted to change the airfield name. I get two Hawaiian *kahu*s that I know, one going pray, one going send testimony. You need everybody. And that's the kind stuff I've been sensitive to and why I think I've gotten more than my predecessors, my other family members that haven't gotten. They couldn't see those kind things. But when they

find out, I said, "I told you so." Because I had the same amount of time as them and you look at my folder, more thick than yours. Come to find out Kūkaniloko. My *tūtū* was part of that kind stuff. Everything add up. Every small bit makes my foundation more *pa'a*. And all those kind things. My wife told me," You know, sometimes…" I says, "You know what dear, this rich a legacy, I'm not going to turn my back on them. When they want me to share, I'm gonna share. I don't care if the people in there no like, I would expect them to….I'm not bragging about my involvement, I'm sharing how special." And she says, "You know, some people said they would be talking _____." I says, "Yeah, but if you look at the history book, get our family name, get grandpa's name in there. And what they're talking about, get grandpa's name." And they no say nothing. Maybe that's because the other line get reservation, the wrong information.

Mount Ka'ala Connection

Mount Ka'ala - they get that goddess *Kaiona*…now I share something. James Kaiona was one of the *kupuna* that lived at Kawaihāpai. Guess who was our administrator for his affairs? John Keahipaka, husband of Annie Keahipaka. You can appreciate this, I know it was sad. You remember the era when it was shame for be Hawaiian? You cannot speak Hawaiian, you cannot do that. When I was growing up, once in awhile - only two times I heard him [grandpa] - this is when I was small. But when I was older, I heard him only one time - just one sentence. But the way he was saying the sentence, how he was expressing, I was like. You know Grandpa chanting? My mother says, "He's looking at Mt. Ka'ala, because that's what they do when they do their Hawaiian culture things." Just like they get all those other protocols you see nowadays. He knows exactly what he's doing. And they go, "No he's not." I says, "You look good." And then everybody get all chicken skin. And he never say nothing after, he just went, "Dah-dah-dah-dah-dah," and shut up afterwards.

Pahole Rare Plant Facility - Mokulē'ia Forest Preserve

No [sites], they built this [facility] already. If there was [cultural resources], it's [gone]. I don't feel there's any impact because there's foliage already growing. [The new towers] no [affect], I see it as all good. It's already on structures that are there already. Even if it's in the heights, it's way up in the mountain, even if you can see 'em. And this one, 65 feet. Not even, maybe. But these are on constructions, not like they going demolish 'em and build one whole big wing or something.

And what is unique…it's part of the Mokulē'ia Forest Preserve. And you know what, you can appreciate this too, Mokulē'ia get its own hibiscus. Rare, native indigenous Hawaiian hibiscus, white. Yeah, we get our own. It's God's truth. "Mokulē'ia something hibiscus" whatever. And it's not a regular forest preserve. Mokulē'ia Forest Preserve is supposed to be classified as a dryland forest. He had part of this land, not on his deed but….

Maybe it comes to mind also, we got that historical book called *The Wind Gourd* by Moses Nakuina [*The Wind Gourd of La'amaomao*] and Moses Nakuina is also from Waialua, he was born in Kamani, Waialua, which is what we call Haleiwa and his wife is Emma Nakuina and one of his winds that is in the publication comes from Mokulē'ia. I don't know it off hand, I'd have to look it up and I got that idea by looking at the cloud formation [at PRPF], the current of the winds and it makes sense when you see the gliders.

Photo 35. Cloud - wind currents

And in getting up to this facility [PRPF] we passed through an area where the great historian, Samuel Kamakau, was born…in Mokulē'ia, back in Makaleha Valley and so there a lot of feeling of welcome over here, everything fell into place today.

Water Resources and Use

The Hawaiian word for fresh water is *wai;* the Hawaiian word for wealth is *wai wai.* This is because of the value the ancient Hawaiians placed on fresh water, which was crucial for growing taro, the staple of the Hawaiian people using the '*auwai* or irrigation system. Fresh water was also crucial in the lifecycle of stream inhabitants such as the *'o'opu* and '*opae*, as well as some of the marine life that depended on the benefits of brackish water areas. Fresh water was valuable in other ways such as natural springs.

Kawaihāpai Name Mo'olelo

The name Kawaihāpai - it's extremely important. That meaning you see from Pukui and Elbert is not the meaning. It's based on the word *hāpai. Hāpai*, it literally means "to carry" or "to lift" and in religion it means "blessed water." The *ho'ailona* is all those agricultural sites that have been documented around that area - they called it a bread basket. In fact, King Liholiho described it as a patterned *lauhala* mat or a chess board. If you know the chess board, you have dark squares, light squares; those represent those who build the agricultural plots. And so when you see a plot, like Hanalei Valley, it gives you all the different *lo'i*, like that, that's what the meaning is. There're a lot of things….

Kawaihāpai - the meaning I just gave you, *blessed water*.

And here's the special thing about Kawaihāpai, you know the water source, the water comes right out of the mountain. When you going towards Honolulu, try look Mount Ka'ala, if it's clear, it looks like a pregnant woman. That's one of the stories, the water come out over there because the *hāpai* and the *kohe* is right there and the Kawaihāpai. It doesn't get better than that, it's not just about the Kunia Ladies, it's about that, Kawaihāpai right there if you looking at that and maybe the lady is Kaiona, you never know because that's a wahine. And the name of the water, that comes out is Waikumuole, water without source.

Next point, on the Mokulē'ia and Waialua get a big aquifer bigger than Pearl Harbor. That's why over there for one small place, get plenty Hawaiian history. All the streams you get over here past the high school, the different *muliwai* like the one by the Polo field, Napolipoli stream feeding all this, you know what I'm saying.

The main parcel at the *ahupua'a* of Kawaihāpai was owned by my family. Because there was the water! That's where the water comes out of. So you get that kind parcel, they don't just hand it out to anybody.

You actually see the foundations before you reach the airfield, the foundation of the railroad tracks. There's one right there before the *makanani*, they get their own watercress and get '*opae* in the stream.

All that kind stuff, my Mom said get [*'o'opu*].

Marine Resources and Uses

The sea can be a great resource to people with access to its bounty. Kawaihāpai Ahupuaʻa was part of a coastal environment settlement, the former inhabitants fished and gathered there, but they were also connected to the *mauka* lands when fishermen used landmarks to find fishing spots in the ocean. It was also a place of recreation and continues to be, with the many beach parks in the area.

Ohana Fishing Resources

And the fishing *koʻa* - maybe they never have a thousand acres like the Campbell Estate, but they get where the main thing, the food resource stay, and they're in charge of that. A lot of history. And since you said it was, again, for the hundredth time, this project was in Kawaihāpai *ahupuaʻa*, I will put together a pdf that would generalize information to give you a background and you can actually report.

You know what I found that was unreal? At my house, just two years it took, I 51 years old, it took me this long for find out, I never know my grandpa had his own *pōhaku*, the fishing god kind; he had his own upright stone. And he had it so camouflaged that all the dirt and all the leaves cover it every day. I clean outside every day, one day I just go clean it and after I seen publications of Jan Beckett and all that kind through the years, I when look real good, I when shoot water on it, I cried right there. I grabbed the stone, I look ʻem, I clean ʻem up, sure enough when I turn ʻem up, that's one real McCoy, upright stone. I was like, "Oh my goodness." I tell my wife, I says, "You know, all I gotta do is show mama them, if _____was alive and uncle them, he get his own stone." He no need elaborate how much Hawaiiana he know. He leave ʻem. And then I when clean ʻem up. I make one ti leaf; I make ʻem all nice. Wow, all these years, and I took a picture of it to put in my own genealogy record. That's the fishing god kind.

You think I explaining you this about grandpa, get *ʻaumakua*, *mano*. Yes, he Christian but we not talking about worship. That's his legacy, part of his genealogy. I says it contributes to why he's documented just like that. Fisherman, why you think they get the work "fisherman" in the phone book, because it all makes sense. They no can understand that. No make holy holy roller kine stuff to me; I know where to draw the line. But I saw that, I was like, "Wow!"

But it's such an unreal place over there, that whole coastline. He was primarily a lobster fisherman. How you like this...lobster was 25 cents a pound. And he did that to subsidize, his monies from his fishing skill, that's part of why we get the house. Hundred pound burlap bag full of lobster.

And I can tell you this, the people that he really *aloha* to, the neighbors that gave him the warmest welcome, was the McInerny family. You know the one that make the Spectrum Hawaiʻi and the McInerny Store? They were very kind to his family. My grandpa get his own canoe. They let him park ʻem on top the beach over there. He'd share a catch with them. He shared with the Army too.

Fish Influences

Mokulēʻia. Even the street names from where I live, the subdivision, the thing reflect the bread basket. You know our subdivision is Pō iki, right above where I live. You know what the name of the street is? Au Street, Akule Street, Apohihi Street, you know -- fish. The fish *koʻa* is all outside there. ʻĀweoweo Street. Special, eh?

Cultural Resources and Use

This category represents traditional Hawaiian cultural resources and practices and other ethnic resources and practices. The traditional Hawaiian cultural resources and practices, includes the pre-contact era, as well as cultural practices after contact. Cultural Resources can be the traditional *wahi pana* or sacred places, any cultural gathering place, or the tangible remains of the ancient past. One of the most significant traditional Hawaiian cultural resource is the *heiau* or place of worship. Other places of great significance for all cultures are the burial places of loved ones.

Kawaihāpai Burials/Iwi Kupuna

The Society of Hawaiian Archaeology published an article of my family. You remember GPR, the ground penetrating radar? Guess where the test site, Kawaihāpai on my family land. Dr. Lawrence B. Conyers, University of Denver, he's the one. You know what, that damn thing works. All burials I said where my ancestors were buried, they had hits; and I cried because it showed that my grandfather knew what he was talking about and he was telling the truth and I made a copy of that and if you get chance I want to buy a hard copy of that edition. It mentions over there that Mr. Shirai's ancestors, they found them, possible burials and possibly found rubbish pit with household rubbish and substantiates our *kauhale*, my grandpa's house. Our family home is mid-field of that airfield, the coconut trees, that's where the house on the fifty yard line and you don't get to put your house there unless you are somebody special. It runs right into, in angles and goes into Mokulēʻia Beach Park and the fish shrines were right over there on the beach and to verify how productive it is when they have the spear fishing contest the many fish they bring up over there. But I always throw in this wrench to the City and County. Why you guys name Mokulēʻia Beach Park when the thing is in Kawaihāpai? Why you do that kind of stuff?

Even if you going cut one tree down, where is it? Kawaihāpai. I want to know where. Because with that comes digging up grounds, because with digging up grounds, means bones….. The news article said they did [dig up bones] but the sad part was eight years before they did that, my grandpa, my mom, myself, and my wife, we spent the entire afternoon with State Historic Preservation Division sharing about this kind stuff, where our family graveyard is. So they knew. We told them no dig over there. And they never like listen. And lo and behold! And for me, it was very hurtful. Of course, you know the desperation and we did all that kind stuff. There's a very bad story of what happened when they did that. At a different time I'll tell you about that.

Significant Waialua Cultural Sites

There are parcels throughout Waialua …. Now these parcels that are out there are very significant because they just so happen to be some of the most important cultural sites on this coastline or in Waialua. One being Leina Kahanani, that's one. You know the stone over there in Kaʻena Point? That's on our family parcel.

Significant People and Their Influence

There are some very special people that are from Mokulēʻia. One being Samuel Kamakau, 1815 Mokulēʻia, Makaleha Valley. You know at Kawaiahaʻo Church, the first Hawaiian ordained *kahu* of Christianity, Reverend Kekela, he was born here at Mokulēʻia….all these kind of people.

The one that did the book, the tribute was by King Liholiho, he's the one that recognized the *kauna* of what Mokulēʻia was. And I honored him because he wrote a song, *Kalena Kai*, for many, many years, hundred something years, Charles E. King was credited with that, he didn't write that. That's King Liholiho's *manaʻo*. He went…when he came down here in the 1820s. You'll see it on huapala.org.

The gift to the Hawaiian people is, we get King Kalakaua them, they're all musically talented, Na Ali'i. To me, that shows our people, as encouragement, before those four asserted their royalty, this kind of *ali'i* knew how to do chants and music. And you know who else did that? Wrote one chant about Mokulē'ia, this area, Queen Ka`ahumanu. So we're talking long time. That's way before King Kalakaua, Queen Lili'uokalani. She contributed part of the chant entitled "*Mālama Nui*." You familiar with that? "*Hale'au'au*…" She wrote about that place. King Liholiho wrote a verse about that place too: "*O Kawena kai, Hale'au'au, a o Līhue, i mālama nui*." So when I saw that, I goes, "Oh my goodness. This is before Kamehameha." And where did he assert his throne? Schofield Barracks area. So I saw that. Just like one game. You just added five more genealogies or three hundred more years to your history, Thomas. Trying to put this, I've come to conclude; hey the reason I got this land is more early than Māhele. Maybe they was part of his entourage, to go there and take care of things. I like that one, the Lo ali'i - I like that.

That kind of history even continued to the modern, "*Na Leo Pilimehana*." We get our own Dean of Hawaiian Music, born in Waialua, Charles Keaau Davis. Dr. Davis knows all the Hawaiians. We have some significant people born that contributed to Hawai'i that are from Waialua and Mokulē'ia.

So it's those kind of things…I think what I'm trying also to share with you is quality of information, not quantity. And in modern day too, the *Kahauanu Lake Trio*, the guitar player, Al Machida is my grandpa's nephew, and we used to go watch that kind people play music, part of my education. He no say nothing, we just go and so, it's there…quality kind people.

Oh, and the *Daughters of Hawai'i* was formed in 1903 at Mokulē'ia Dillingham Ranch. And they were the first stewards of Kūkaniloko, and I can appreciate that. There's some that say, "Oh they're a bunch of *haole*s." So what? Nobody else wanted to do something, so they did something. And Lahilahi Webb was their lifetime historian. And that's another reason why she came and talked to my grandpa's family. They did it not to show off with people, but because they want everybody to know, preservation of history and culture.

And the main guy down there, because one of my grandpa's line branches, one *kupuna wahine*, and guess what her Hawaiian middle name is? Kuali'i. They don't give them that kind of name unless they're related to them.

Project Recommendations/Comments

This special section is included when ethnographic consultants make any recommendation and/or comments about the project in general.

If I did make one pre-request, it would be, when you guys finalize everything, the EIS and everything what you guys going do for your project, please make a presentation to the North Shore Neighborhood Board and the Mokulē'ia Community Association and just go through me, I'll be the liaison.

I just want to say a couple of things. I'm really thankful for this site visit [Pahole rare Plant Facility], I know that after the older generation has made their passing I feel very lucky to come up here to a place that my family was steadfast in and I just can't say more to being grateful…. I also have just one curiosity among this place and that would be if we could research how they got the name 'Pahole' applicable to this area here? Even the fact that we are on the mauka side in an ahupua'a called Kawaihāpai, perhaps we could take this back and rename this to Kawaihāpai Nursery, or something of that sort that is applicable. Because we had already in place Act 276 that changed the airfield, Dillingham Airfield name to Kawaihāpai Airfield and that hasn't been done. It is an old name that hasn't been acknowledged and I feel it is part of the education process for the general public. There's no harm in it.

My family has been up here [Kawaihāpai] before the Mahele and my family, my kupuna from that era; when it was made available, land grants (this is not Land Commission Award so that's government lands holding directly from the government), was made available and they bought it. They were not materialistic people, the *'āina* itself, we are not talking about monetary [inaudible] stuff and they made use of it, subsisted and stuff. I would say that I'm the first person of the younger generation of my kupuna that has come onto this area that we were steadfast in and I feel extremely lucky, it's nothing in words that can explain it's just there and that's all to it. I can't elaborate on words, it's just amazing, the panoramic views and the essence of the place [PRPF], the serenity, and it's quiet and peaceful even though we hear an air conditioner and plane and things of that sort. It's a great day, a great day.

There's no word that can explain, why also this place [PRPF], this Waialua area has been protected, spiritually and in documentation form because of what's here. It's not publicized, you can't just come up and I'm happy about that otherwise it will become just another tourist attraction and we don't want that.

CIA SUMMARRIES and ASSESSMENT

This cultural impact assessment (CIA) is based on two guiding documents: Act 50 and Environmental Council Guidelines (1997) [see Appendices A & C].

Act 50 [State of Hawai'i 2000]. H.B. NO. 2895 H.D.1 was passed by the 20th Legislature and approved by the Governor on April 26, 2000 as *Act 50*. The following excerpts illustrate the intent and mandates of this Act:

> 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 Hawai'i. 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.

Summary of Findings

The following summaries are based on the information presented in the previous sections: the traditional (cultural) and historical literature background review and the ethnographic data and analyses. References are not cited unless it is new information and not already cited in the text above. These summaries condense the information above, but also serve to focus on a few significant individuals and events in history in relation to the project lands, in the *ahupua'a* of Kawaihāpai, District of Waialua, O'ahu Island, as well as give a broad overview of land, water and cultural resources and uses in the general area, as they reflect cultural resources (properties) and practices and access to them.

Summary of Significant People and Events. According to traditional and historical material, most of the land in Hawai'i has gone through land modifications over time, including the lands of Kawaihāpai Ahupua`a, and have witnessed the comings and goings of many significant people. Some of these people may have contributed substantially not only to the history of this area, but of O'ahu Island and the rest of the Hawaiian Islands as well. There were several people and events noted in the oral histories. Some of these significant entities traversed these lands or vicinity.

Legendary Entities. The forested zones were considered the realm of Hawaiian deity, especially Kū and sometimes Lono and Laka, but it was also where medicinal plants and hardwoods were gathered. The Pahole Rare Plant Facility complex was heavily modified by military and civilian use in modern times (WWII era) for communication facilities, water tanks and nurseries. In other sections of Kawaihāpai it was believed that Menehune lights were seen in waters off Kawaihāpai. In ancient times the people of the area were also visited by Hi'iaka, sister of volcano goddess Pele. Hi'iaka asked for water but when her request went unfulfilled she called upon the four hidden waters: *Ulunui, Koheiki, Ulehulu,* and *Waiakaaieas.*

Pre-Contact *Ali'i Nui*. The *ali'i nui* or *ali'i 'ai moku* would have jurisdiction over all of O'ahu's lands, assigning lesser chiefs or *konohiki* to oversee each *moku* or *ahupua'a.* Interestingly most of the O'ahu chiefs are descendants of the Nana'ulu line. Nana'ulu married his sacred sister Kapumaleolani and they had a daughter named *Kahauomokuleia*. But it was through his union with another wife Ulukou that the line was passed down through their son Nanamea, to fourteen generations later to Maweke who became a ruling chief of O'ahu. His great-grandson Mulielealii who with his wife Wehelani had three famous sons: Kumuhonua II (who became the 1st *Ali'i Aimoku* of O'ahu), Olopana and Moikeha, and a daughter Hainakolo. Mulielealii's brother Keaunui was a chief of 'Ewa, Waianae and Waialua.

O'ahu *Ali'i Ai Moku*:

1st	Kumuhonua II
2nd	Eleluukahonua
3rd	Kahokupohakano
4th	Nawele
5th	Lakona (ruled 'Ewa/Waianae/Waialua; his cousins Maelo ruled Kona, O'ahu and Kaulaulaokalano ruled Ko'olau; Lakona's wife Alaikauakoko was once the wife of Kanipau 4th Ali'i Ai Moku of Hawai'i Island who was usurped by the Pili line – Kanipau exiled himself to Moloka'i, but his grandson Kalapana later became a Mo'i of Hawai'i Island)
6th	Kapae-a-Lakona
7th	Haka-a-Kapae (O'ahu chiefs revolted and killed Haka at his fortress near Waewae, Līhue, then 'elected' Mā`ilikūkahi who was a descendant of Moikeha - 1st Alii Ai Moku of Kauai and brother of Kumuhonua II; Moikeha's grandson Kaha'i was a famous voyager who sailed to Kahiki, Wawae, Upolu and Sawaii and brought back *ulu* that was planted at Pu'uloa, 'Ewa; Haka's granddaughter would later start the Kuali'i line of O'ahu chiefs)
8th	Mā`ilikūkahi (11 generations from Moikeha, brother of Kumuhonua II; born at Kūkaniloko birthstones and 'coronated' at Kapukapuakea Heiau in Waialua; from Maweke & Paumakua lines; raised at Wahiawa, Kanewai and Waialua, but later made Waikīkī his permanent residence; ended human sacrifices; Hilo and Maui chiefs raided O'ahu ('Ewa) during his time & were defeated in Kipapa Gulch)
9th	Kalona-iki (born at Kūkaniloko; second son of Lōlae-o-Halona married Keleanuinohoanaapiapi - sister of Kawaokauhele, father of Pi'ilani – their children were all born at Kūkaniloko; his brother Kalona-nui was the father of Kalamakua who also married Keleanuinohoanaapiapi and had La'ielohelohe who was bethrothed to Pi'ilani – together they were progenitors of the very famous Pi'ilani line of Maui ruling chiefs)
10th	Piliwale (oldest son of Kalona-iki; his daughter and granddaughter became 1st and 2nd female ruling chiefs of O'ahu – all were born at Kūkaniloko; another daughter Kohepalaoa married her famous spear-throwing cousin Kaholialale, son of Piliwale's brother Lō-Lale and Keleanuinohoanaapiapi)
11th	Kūkaniloko (w) (1st female ruling chief of O'ahu; born at Kūkaniloko and carried the sacred name; married Luaia, grandson of Maui co-ruling chief Kaka'alaneo - with brother Kakae; and cousin of Pi'ilani, Maui Ruling Chief)
12th	Kalaimanuia (w) (born at Kūkaniloko – ruled for 65 years, famous for building fishponds at what is now Pearl Harbor and various *ahupua'a* surrounding those waters; her son Kaihikapu was also famous for building fish ponds)
13th	Ku-a-Manuia (given lands of Kona and Ko'olaupoko, greed got him killed)
14th	Kaihikapu-a-Manuia (grew up in Waimanalo/Ko'olaupoko; married Kaunuiakanehoalani, chiefess of Ko'olau, great granddaughter of LōLae and Kelea and daughter of Kanehoalani; their son Kākūihewa grew up in Waipio, Waiawa, Manana, and royal residences in 'Ewa, Waikīkī and Kailua - a very famous O'ahu ruling chief.)
15th	Kākūihewa (born at Kūkaniloko; taken to Ho'olonopahu by grandfather Kanehoalani; 48 chiefs present at birth - e.g., Makohau, Ihukolo, Kaaumakua, Pakapakauana; sacred drums Opuku & Hawea sounded at his birth; he married Kahaiaonuiakahuailana or Kaea-a-Kalona, daughter of Napulanahumahiki, son of Hao and Aunt Kekela - with this union

Koʻolauloa united with Waianae and Waialua; he had several other very well connected wives of the various Oʻahu, Maui and Kauai branches; when Kākūihewa died Oʻahu was divided between his three eldest sons: Kanekapu-a-Kuhihewa (ruled from Kailua); Kaihikapu-a-Kakuihewa (2nd son ruled Waikiki and ʻEwa); and Kauakahinui-a-Kakuihewa.

16th Kanekapu-a-Kuhihewa (set up court and ruled from Kailua; he is the ancestor of Papaikaniau, mother of Maui Moʻi Kekaulike; his wife Kalua-o-Hoohila was a descendant of Haka's granddaughter)

17th Kahoowahaokalani (Koʻolaupoko chief, Maweke line; ruled from Kailua; his mother descended from Haka of Oʻahu & Ilihiwalani of Kauaʻi; he married Kawelolauhuki a Kauai chiefess)

18th Kauakahi-a-Kahoowaha (he also ruled from Kailua; introduced the *kapu-moe* to Oʻahu from his *ohana* on Kauaʻi, from Oʻahu it went to Maui to Kekaulike; he married Mahulua and they had Kualiilanipipililanioakaiakunuiakealuanuuokuiialiikahalau - Kualiʻi)

19th Kualiʻi (born in Kailua - raised in Kailua and Kualoa, the sacred drums Opuku and Hawea were sounded at his birth; famous for his *Law of Niaupio Kolowalu*; Kualii defeated ohana Waialua army at Kalena on plains of Heleauau [Haleʻauʻau, Līhue] and later defeated ohana army of ʻEwa at Malamanui and Paupauwela uniting Oʻahu again; he was one of Oʻahu's most famous rulers; he was married to Maui chiefess Kalanikahimakeialii, daughter of siblings Kaulahea II and Kalaniomaiheuila - Kaulahea II was also the father of Maui *aliʻi nui* sibs Kekaulike and Kekuiapoiwanui I who were parents of Kamehamehanui, Kahekili & Kalola and grandparents of cousins Kalanikupule, Kiwalaʻo and Liliha Kekuiapoiwanui; half-sibs Kiwalaʻo and Liliha Kekuiapoiwanui were parents of Keʻōpuolani, sacred wife of Kamehameha I; the sons of Kualiʻi and Kalanikahimakeialii - Kapiohoʻokalani and Peleioholani – were cousins of both Maui and Hawaii Island ruling chiefs, as well as Kauai Island *aliʻi nui*)

20th Kapiohookalani (after Kekaulike's death, Kapiohookalani invaded Molokai; he was defeated and slain by Alapaʻinui [half sib of Kekuiapoiwanui I and uncle of Maui Moʻi Kamehamehanui and Kahekili] at Kawelo)

21st Kanahaokalani (was six years old when his father was slain at Kawelo, so his uncle Peleiohōlani, who was ruling Kauai at the time, was brought back to be regent ruler of Oʻahu; Kanahaokalani died the following year at seven years old)

22nd Peleioholani I (several battles were avoided because he was first cousin of Alapaʻinui, ruling chief of Hawaiʻi Island; however when half-sibling brothers Kauhiaimokuakama and Kamehameha nui went into battle with each other over the domain of Maui after the death of their father Kekaulike, they asked their uncles Peleiohōlani and Alapaʻinui to help them with warriors and weapons, the first cousins went into battle from Honolua Bay to Puʻunene where they once again called a truce, but this time after tens of thousands of their warriors died. This was Maui's biggest civil war)

23rd Kumahana (he was just a youth when he became ruling chief and was deposed in 1773)

24th Kahahana (born at Kūkaniloko to ʻEwa chief Elani and Kaionuilalahai daughter of Kualiʻi, making him grandson of Kualiʻi, nephew of Peleioholani, cousin of Kumahana and great-grandson of Kaulahea II; grandson of Kekaulike; and nephew of Kahekili II and raised in Kahekili's Maui court; Kahahana was voted ruling chief by the Oʻahu Council of Chiefs; he was later tricked by his uncle Kahekili and when he did not give Kahekili control of Kualoa; he was later killed at Maunakapu, near Moanalua – he was the last of the Kualiʻi ruling line)

Contact/Post-Contact/Historic *Aliʻi mui*

[The next two *Aliʻi Ai Moku* were not Oʻahu-born chiefs although they were related many times over; this was also in a period referred to as Contact (1778)/Post-Contact and Historic. Oʻahu conquered by Maui.]

25th Kahekili II (also 25th Maui Moʻi; fanatical warrior and well-known athlete; said to be the biological father of Kamehameha I; with half-sister Kauwahine they had Kalanikūpule)

26th Kalanikūpule (also 27th Maui Moʻi, after killing his uncle Kaʻeokūlani who was half-brother of his father Kahekili II and father of Kauai ruling chief Kaumualiʻi, last king of Kauaʻi; Kalanikūpule was later slain by Kamehameha I who was possibly his half-brother)

Kingdom of Hawaiʻi

Kamehameha I conquered Oʻahu in 1795. In 1803 he settled on Oʻahu where he placed his chiefs over all the lands and put the chiefs and their men from Hawaiʻi Island to work farming the lands of Oʻahu. Kamehameha I essentially became the king of all the islands except for Kauai. When Kamehameha I died, his successor was his son Liholiho (Kamehameha II) with Kaʻahumanu as the Kuhina Nui or regent. They successfully "kidnapped" their cousin Kaumualiʻi who under duress turned Kauai over to the Kamehameha rulers.

Waialua Moku. Gideon Laʻanui, brother-in-law of Kaʻahumanu and nephew of Kamehameha I, was the *konohiki* of the entire *moku* of Waialua during Kaʻahumanu's time. The following comes from Alameida (1996 and 2003):

> After the death of Kahekili Keʻeaumoku in 1824, his sister, Lydia Kekuapiʻia Namahana, also known as Piʻia, inherited the entire *moku* of Waialua (Kameʻeleihiwa, *Native Land and Foreign Desires* 1992:120). Laʻanui, nephew of Kamehameha I and husband of Piʻia, in testimony before the Land Commission, said that, "Keʻeaumoku [86] died in 1824, and then Kaʻahumanu gave Waialua to Piʻia from cape to cape, from the upland to the sea and from that side to that side yet, it had no *ku" (ʻHi kupono,* independent land division within the *ahupuaʻa*). (Native Testimony, Laanui to Land Commission, vol. 5, 494. A H). [The term *ʻHi kupono* refers to a land division within the *ahupuaʻa.*] After Piʻia died in 1829, Kaʻahumanu said to Laʻanui, "Your *wahine* has died and you are my *kaikaina,* you shall live in our house and my lands, which are yours from your *wahine,* shall be yours as in her bequest" (Laanui to Land Commission, vol. 5, 494. AH) (Alameida 1996: 86).
>
> Then, in her *kauoha,* or oral testament, Kaʻahumanu left all her lands to her niece, Kinaʻu, daughter of her sister Kaheiheimalie (Kameʻeleihiwa, *Native Land and Foreign Desires* 1992:123). In his testimony, Laʻanui also said that Kinaʻu had told him, "You return to Waialua and live, you shall be for me [*sic*]—you return as *luna* [landlord or supervisor] of the land you occupy—your lands from your *wahine* [female; wife] shall be yours" (Laanui to Land Commission, vol. 5, 494. AH) (Alameida 1996: 86).
>
> After the death of Kinaʻu, daughter of Kamehameha I, all of her lands in Waialua were inherited by her infant daughter Victoria Kamamalu. Although only nine years old at the time of the *Māhele,* Kamamalu was the third largest land holder in the kingdom. However, she gave up all of her lands between the *ahupuaʻa* of Kamananui and Kaʻena inclusive to the government to satisfy the one third commutation requirement set by the Land Commission (*Buke Mahele* (1848) 130, AH). [Kamehameha III] Kauikeaouli, the *moʻi,* designated these lands at the western end of Waialua district as government lands, distinct from those he reserved for himself. The *ʻāina* of Kawaihāpai, Kamananui, Mokulēʻia, Keālia, and Kaʻena became land that the *makaʻāinana* and foreigners were able to purchase in fee simple (Alameida 2003:40).

Two sons of Kinaʻu became kings after the death of Kamehameha III - Alexander Liholiho or Kamehameha IV and Lot Kapuāiwa Kamehameha V; they were followed by William Charles Lunalilo, nephew of Kamehameha I and descendant of Piʻilani through both of his parents – he was the last of the Kamehameha line.

David La‘amea Kalākaua and later his sister Lydia Kamakeha/Lili‘uokalani descendants of Maui and Hawai‘i Island chiefly lines were the last rulers of the Kingdom of Hawaii.

According to Thomas Shirai, Ka‘aemoku Kakulu was considered the last *konohiki* of Kawaihāpai.

Historic People and Events.

Mahele

> In the land-claim testimonies for Kawaihāpai, one name was mentioned by three different individuals. Niho had several land claims at Kawaihāpai. In his third claim he said, “the land was bounded on the north by the land of Mahiahume; east by the land of Kaewaewa; south by the *po‘alima* [literally, the fifth day] of Napahi*” (Native Testimony, Niho to Land Commission, vol. 2, 4 9 1 AH). A claim by Kalalawalu said that his land “is bounded on the north by the land of Niho; east by the land of Haule; east by Hulu; and west by the land of Kaewaewa; south by the *po‘alima* of Napahi; west by the *po‘alima* of Napahi” (32 Native Testimony, Kalalawalu to L a n d Commission, vol. 2, 5 0 9 AH). The claim of Haule states that his first claim “is bounded on the north by Kaanaana; east by Paele; *po‘alima* of Napahi; south by the land of Hoikamalii; west by the land of Moewaa” (Native Testimony, Haule to Land Commission, vol. 2, 524. AH) (Alameida 1996:85-86). [*This would imply that Napahi was the *konohiki* at that time.]

Significant Practices Pre-Contact and Post-Contact. Prior to and after the first people came to O‘ahu, the lands of the Kawaihāpai would have been lowland dry and mesic forest, woodland and shrubland to sandy beaches. The annual rainfall in this zone is between 20-80 inches; it was warm to hot with seasonal drought. The plains or lower slopes, dry ridge tops and cliffs would have supported *pili* (*Heteropogon contortus*) grasslands or *kāwelu* (*Eragrostis variabilis*). The dry or mesic shrubland vegetation may have included *‘a‘ali‘i* (*Dodonaea viscosa*), *‘ākia* (*Wikstroemia* species), *ko‘ko‘olau* (*Bidens* species) and *‘ūlei* (*Osteomeles anthylidifolia*). Dry forest areas would have included *‘ōhi‘a* (*Metrosideros polymorpha*), *koa* (*Acacia koa*), *lama* (*Diopyros sandwicensis*), *wiliwili* (*Erythrina sandwicensis*) and rarer trees on ridges. Mesic forests of *‘ōhi‘a, koa* or *lama* and rarely *olopua* (*Nestegis sandwicensis*) or *halapepe* (*Pleomele* species) could be found in gulches, on lower slopes and less-disturbed areas. Once widespread mesic forests are now rare; this was where hardwoods and medicine plants were gathered.

Prior to human settlement native birds populated the mesic forests; they would have included *‘elepaio* (*Chasiempis sandwicensis*), *‘apapane* (*Himatione sanguine*), *‘amakihi* (*Hemignathus virens*) and the *pueo* or Hawaiian owl (*Asio flammeus sandwichensis*) - a subspecies of short-eared owl that is endemic to Hawaii. The *pueo* continues today to be an *‘aumakua* or family guardian for several Hawaiian families. The Hawaiian hoary bat or *‘ōpe‘āpe‘a* (*Lasiurus cinereus semotas*) was the only endemic terrestrial mammal in Hawaii prior to the first human settlement that has survived.

Kawaihāpai ancient cultural practices and properties included:

> Kawailoa Heiau (Site 191). Only a portion of two terraces remains. The upper terrace is 66 feet long and 4 feet high, and is excellently paved with small stones a few inches in size. The southwest limits cannot be discerned. On the east end is a wall 1.5 feet high which can be followed for about 10 feet. The lower terrace was 25 feet wide with a facing 2 feet high, which can only be traced a short distance. The houses (*kahua hale*) in which the *kahunas* (sic) lived were known as “Paweo”, according to Hookala. This is undoubtedly the site referred to by Thrum as Paweu, “a small heiau 58 by 65 feet at the base of the hill; badly damaged by freshets.” (McAllister 1933 In Sterling & Summer 1978:99-100).
>
> Hidden Waters (Site 192), mountain side of Kawailoa Heiau, Kawaihāpai. These are four hidden waters upon which Hiiaka called when she was refused water by the old inhabitants. Their names, as given by Hookala, are *Ulunui, Koheiki, Ulehulu,* and *Waiakaaieas* (McAllister 1933 In Sterling & Summer 1978:100).
>
> Thomas Shirai Ohana Burials and former *kalo lo‘i* lands of Kawaihāpai.
> Fishing Shrine (Site #193) - Kuakea fishing shrine (*ko‘a*), Kawaihāpai was formerly located on the beach in a direct line with Kawailoa Heiau. Nothing marks the site which was destroyed.

Some of the lower areas were converted to terraces for dryland taro and sweet potato agriculture. A large area of terraces between the cliff and the elevated coral, mostly in Kawaihāpai, though some extend into Keālia was recorded by Handy & Handy (1940). Other lower areas were used to gather *pili* grass for thatching *hale* roofs.

By the mid-1800s the lands of Kawaihāpai were a part of Dillingham Ranch with the lower lands between the mountain and the coast cultivated with sugarcane or used for cattle grazing. The O‘ahu Railway and Land Company went around Ka‘ena Point through the coastal lands including Kawaihāpai, to Haleiwa picking up carloads of sugarcane.

However, the military began using 67 acres of the northern end of Kawaihāpai around 1922 with the development of Camp Kawaihāpai as a communications station followed later by an airfield in 1927 alongside the railroad line. Mokulē‘ia Army Air Field and Kawaihāpai Military Reservation was established as a bivouac and artillery firing range for units stationed at Schofield Barracks. By 1946 the Army acquired an additional 583 acres in Mokulē‘ia, Aku’u, Kawaihāpai, Keālia, and Ka’ena for a military airfield, an ordnance storage area, and related military purposes; Dillingham also discontinued the OR&L at this time.

The airfield was a satellite field of Wheeler AAF for the Army Air Forces with construction starting in 1941. It was occupied by aircraft of the Hawaiian Air Force seven days after the bombing of Pearl Harbor and officially activated in 1942 and used extensively for training of Army Air Forces airmen.

During the war [1940s] almost 1,000 acres of the sugarcane lands were cultivating vegetable crops for war needs.

Cold War Missile Launching Site and Pahole Rare Plant Facility. In the 1960s Dillingham Air Field established the Nike-Hercules Missile Launching site, designated as site “OA-84” - one of four sites located on the island. The Nike-Hercules guided missile was a nuclear-capable weapon. The administration headquarters and acquisition radar were located at what is now Pahole Rare Plant Facility (PRPF). The missile battery launch and acquisition sites closed down in 1970.

Pahole IRF is located in the east-south-south west end of the PRPF which is located in the southern end of the Mokulē‘ia Forest Reserve next to the northern end of the Pahole Natural Area Reserve which was established in 1981 to protect rare lowland native mesic and dry forest and habitat for endangered species.

Cultural Impact Assessment

According to the Environmental Council Guidelines, the types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, religious and spiritual customs. The following actions were taken to meet the EC Guidelines Criteria for conducting this cultural impact assessment based on the SOW:

1) conduct historical and other culturally related documentary research;

Documentary research, particularly on identifying traditional and cultural uses of the area, was completed. Much of what is known about the traditional and cultural uses of the area comes from written records that tell of its prehistory (e.g. *mo'olelo;* 19th century ethnographic works); and the stories associated with early coastal and upland area uses by early Hawaiians and early historic land use.

2) identify individuals with knowledge of the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or *ahupua'a*; or with knowledge of the area potentially affected by the proposed action [e.g., past/current oral histories];

Attempts were made to identify individuals who have expertise concerning the types of cultural resources, practices and beliefs found within the vicinity of the Project Site (PRPF). The efforts were specifically directed towards identifying people who have long histories to share about the project site and/or the *ahupua'a* of Kawaihāpai. The project lands have been in restricted use since before 1941. However, one of the most knowledgeable people connected to people and events of these lands was identified and interviewed. A second person who worked at the PRPF complex was contacted but had moved off-island and was not interviewed.

3) identify and describe the cultural resources, practices and beliefs located within the potentially affected area;

Archival research in Chapter 3 (Cultural and Historical Background Review) and ethnographic research in Chapter 4 (Ethnographic Data Review and Analysis) identified potential cultural resources, practices and beliefs within the project lands.

The Pahole ICSD Radio Facility is located in the current Kawaihāpai Ahupua'a section of the Mokulē'ia Forest Reserve, which was once considered a dryland mesic forest where hardwoods and medicine plants were gathered by ancient Hawaiians. However, since the lower area of Kawaihāpai was restricted for military use for over 90 years there is no one living who recalls accessing the *mauka* lands to gather resources. The project lands were modified in the 1960s for restricted military use. However, there are trails continually used for hiking on various ridges nearby and the general surrounding area is a habitat for native flora and fauna.

4) and assess the impact of the proposed action on the cultural resources, practices and beliefs identified.

In regard to the undertaking there is No Significant Impact on any cultural resources, practices or beliefs in the immediate area of the proposed project (Pahole IRF). However, keep in mind:

- Excavating may expose ancient artifacts lost or forgotten by their previous owners on their way to ancient gathering practices or even an occasional battle across the ridges;
- The likelihood of ancient burials are almost nil, however the ancient practice of *make pau* (buried where you die) should be kept in mind as people out gathering or fighting wars were buried where they fell unless they were *ali'i nui;*
- The proposed area was replanted with native plants which should continue to be maintained;
- The area where the relocation of irrigation tanks is proposed has a couple of young *koa* trees – care should be taken not to harm them during the construction/relocation phase if at all possible.

This report has met the goals and objectives set forth for this CIA study. The project site is a parcel that has been heavily modified by historic military/civilian activities spanning over 50 years and currently is in use by military and civilian agencies.

[NOTE from Thomas Shirai: If I did make one pre-request, it would be, when you guys finalize everything, the EIS and everything what you guys going do for your project, please make a presentation to the North Shore Neighborhood Board and the Mokulē'ia Community Association and just go through me, I'll be the liaison.]

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APPENDIX A

Act 50 — 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 HAWAI`I

A BILL FOR AN ACT
RELATING TO ENVIRONMENTAL IMPACT STATEMENTS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAI`I:

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 Hawai`i. 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] welfare, social welfare, and cultural practices 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

APPENDIX B
Guidelines for Assessing Cultural Impacts

Adopted by the Environmental Council, State of Hawai`i

November 19, 1997

INTRODUCTION

It is the policy of the State of Hawai'i 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.

II. 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 [consultants], 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 ahupua'a 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 types of cultural resources 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 manmade 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 ahupua`a;

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 precise location of human burials is likely to be withheld from a cultural impact assessment, but it is important that the document identify the impact a project would have on the burials. At times an informant [consultant] may provide information only on the condition that it remains in confidence. The wishes of the informant should be respected.

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.

III. 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 circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.

4. Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.

5. A discussion concerning historical and cultural source materials consulted, 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.

6. 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.

7. 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.

8. An explanation of confidential information that has been withheld from public disclosure in the assessment.

9. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.

10. 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.

11. 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 C

Scope of Work (SOW)

Cultural Impact Assessment [in accordance with OEQC Guidelines]

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 ahupua`a;

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, 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.

Methods

The specific tasks listed below expand on the above scope of work:

- Conduct historical and cultural background research (i.e., business records, land records; archival documents, literature, reports, letters, photographs, journals, or newspaper files) to locate material that will provide broad patterns of the history of the project area such as subsistence, religious, recreational, and commercial uses of the land; as well as settlement and residential patterns of the area and region; major family groups that inhabited, used or controlled lands within the project area and region; documented legends, myths, or traditional histories associated with the area; and descriptions of traditional practices, customs and beliefs associated with identified traditional cultural practices;

- Prepare a semi-structured ethnographic research instrument that will include questions that will generate general biographical information, association with and knowledge of the project area, its history and use;

- Prepare a consent form to be used as written agreement with any individual interviewed concerning the review of content and use of information recorded during the interview

- Identify individuals knowledgeable with the project area.

- Conduct and record ethnographic interviews with knowledgeable individuals. If feasible individuals shall participate in field inspections (Makana to be given)

- Transcribe recorded interviews (Approximate time, 6-8 hrs/per hr of recording)

- Prepare a report that will include an overview of the archival material, and an analysis of the ethnographic data.

APPENDIX D

Agreement to Participate in Ethnographic Survey

Project Title: **Pahole Rare Plant Facility Cultural Impact Assessment (CIA)**
Mokulēʻia Forest Reserve
Kawaihāpai Ahupua`a, Mokulēʻia, Oʻahu, Hawaiʻi

Interviewer: Maria "Kaimi" Orr, M.A.
Kaimipono Consulting Services LLC
(808) 375-3317 kaimi@lava.net

You are being asked to participate in an ethnographic survey conducted by an independent interviewer from Kaimipono Consulting Services LLC (KCS) contracted by International Archaeological Research Institute, Inc. (IARII) to prepare a Cultural Impact Assessment (CIA) as part of an environmental compliance document prepared by Belt Collins Hawaii LLC (BCH) for the Department of Accounting and General Services, Division of Public Works, State of Hawaiʻi. The interviewer will explain the purpose of this survey/project, the procedures to be used, the potential benefits and possible risks of participating. You may ask the interviewer any question(s) in order to help you to understand the process. If you then decide to participate, please sign on the second page of this form. You will be given a copy of this form to keep.

I. Nature and Purpose of the Study

The purpose of this ethnographic survey is to gather information about the project lands of Pahole Rare Plant Facility/Nike Tower Site through interviews with individuals who are knowledgeable about this area, and/or about the history of these lands. The objective of this survey is to provide ethnographic data for the CIA.

II. Explanation of Procedures

After you have voluntarily agreed to participate and have signed the consent page, the interviewer will tape record your interview and have it transcribed later. The interviewer may also need to take notes and/or ask you to spell or clarify terms or names that are unclear. Data from the interview [ethnographic survey] will be used in a report that provides context for the book.

III. Discomforts and Risks

Foreseeable discomforts and/or risks may include, but are not limited to the following: having to talk loudly for the recorder and video; being recorded and/or interviewed; providing information that may be used in a report, which may be used in the future as a public reference; knowing that the information you give may conflict with information from others; your uncompensated dedication of time; possible miscommunication or misunderstanding in the transcribing of information; loss of privacy; and worry that your comment(s) may not be understood in the same way you understand them. It is not possible to identify all potential risks.

IV. Benefits

This survey will give you the opportunity to express your thoughts/knowledge (*mana`o*), which will be listened to and shared; your knowledge may be instrumental in the preservation of significant historic information.

V. Confidentiality

Your rights of privacy, confidentiality and/or anonymity will be protected **if you so desire**. You may request, for example, that your name and/or sex not be mentioned in write-ups, such as field notes, on tape, on files (disk or folders), drafts, reports, and future works; or you may request that some of the information you provide remain "off-the-record." In order to ensure protection of your privacy, confidentiality and/or anonymity, you should immediately advise the interviewer of your desires. The interviewer will ask you to specify the method of protection, and note it on this form below.

VI. Refusal/Withdrawal

You may, at any time during the interview process, chose to not participate any further and ask the interviewer for the tape and/or notes. Please note that you will be given an opportunity to review your transcript, and to revise or delete any part of the interview.

VII. Waiver

Part I: Agreement to Participate

I, _____, understand that Maria "Kaimi" Orr, an independent interviewer contracted by *International Archaeological Research Institute, Inc.* will be conducting oral history interviews with individuals knowledgeable about the project lands of the **Pahole Rare Plant Facility**. The oral history interviews are being conducted in order to collect cultural and historic information of the area.

I understand I will be provided the opportunity to review my interview to ensure that it accurately depicts what I meant to say. **I also understand that if I don't return the revised transcripts after two weeks from date of receipt, my signature below will indicate my release of information for the report. I also understand that I will still have the opportunity to make revisions during the draft review process.**

_____ I am willing to participate.

_____

Signature **Date**

_____

Print Name **Phone**

_____

Address

_____

ZipCode

_____

Email Address

MAHALO NUI LOA

Part III: Personal Release of Interview Records

I, _____, have been interviewed by *Maria "Kaimi" Orr* of *Kaimipono Consulting Services LLC*, an independent interviewer contracted by *International Archaeological Research Institute, Inc.* I have reviewed the transcripts of tape recordings of the interview and agree that said documentation is complete and accurate except for those matters specifically set forth below the heading "CLARIFICATION OR CORRECTIONS" below.

CLARIFICATION OR CORRECTIONS:

I further agree that KCS, IARII and BCH may use and release my identity and other interview information, both oral and written, for the purpose of using such information in a report to be made public, subject to my specific objections, to release as set forth below:

SPECIFIC CONDITIONS TO RELEASE OF INTERVIEW TRANSCRIPT:

_____

Signature **Date**

_____

Print Name **Phone**

_____

Address

_____

Zipcode

_____

Email address

MAHALO NUI LOA

APPENDIX E

ETHNOGRAPHIC SURVEY

Basic Research Instrument for Oral History Interviews

This research instrument includes basic information as well as research categories which will be asked in the form of open primary questions which allow the individual interviewed (Ethnographic Consultant) to answer in the manner he/she is most comfortable. Secondary or follow-up questions are asked based on what the Consultant has said and/or to clarify what was said. The idea is to have an interview based on a "talk-story" form of sharing information. Questions will NOT be asked in an interrogation style/method, NOR will they necessarily be asked in the order presented below. This research instrument is merely a *guide* for the interviewer and simply reflects general categories of information sought in a semi-structured format. Questions will be asked more directly when necessary.

The Consultants were selected because they met one or more of the following criteria:

- Had/has Ties to Project Area/Vicinity
- Known Hawaiian Cultural Resource Person
- Referred By Other Cultural Resource People
- Referred By Other People

[NOTE: Introduction of Pahole rare Plant Facility CIA Project is done before the Ethnographic Consultant signs the Consent Form, usually during the initial phone call to make interview appointments.]

[NOTE: This part of the interview, #1-4 is mutual sharing and rapport building. Most of the information for research categories "Consultant Background" and "Consultant Demographics" come from this section, but not exclusively.]

1. *To start please tell me about yourself…Name? Where/When you were born?*

   [This information can be addressed in a couple of ways. After the interviewer first turns on the tape recorder, the following information will be recorded: Day/Date/Time/Place of Interview; Name of Consultant (if authorized by Consultant); Name of Interviewer; Initial Questions: Have you read the Agreement to Participate? Do you have any questions before we begin? Will you please sign the Consent Form? The interviewer will explain again the purpose of the interview.

   The interviewer will then ask the Consultant to "Please tell me about yourself—when/where were you born? Where did you grow up? Where did you go to school?" This general compound question allows the Consultant to share as much or as little as he/she wants without any pressure. Some of the information for #1 may already be known to the interviewer.]

2. *History: Your `ohana/family background; Hawaiian connection (if any)?*

   [Much of the information for questions #2, 3, and 4 usually comes from the "monologue" answer to Question #1. If it does not, then these questions will be asked. The answers in this section usually establish how the Consultant meets the criteria; how the Consultant developed his/her information base, etc.]

3. *Youth: Where lived? Grew up?* [This may have been answered in #1]

4. *Schooling*? *Where? When?* [This may have been answered in #1]

[NOTE: The next part of the interview, #5-7 reflects information sought for the following research categories: Land, Water, Marine, Cultural Resources and Use as well as Significant People and Events. The questions are open-ended so as NOT to "put words in the mouths" of the Consultants. The answers will help in assessing if any cultural properties or practices (or access to them) will be impacted by the proposed project.]

5. *Please tell me what you know about the lands of the Project Area?*

   [NOTE: Generally when people share information about a specific topic/place, they usually state where their information came from. If it isn't volunteered, it is asked as a follow-up question(s). A map of the project area should be available to confirm that interviewer and consultant are talking about the same place. Photos would also help if a field trip is not possible. The best scenario would be to be "on-site" at some part of the interview…although this is not always practical.]

6. *What are your recollections and/or personal experiences of this area?*

7. *Do you know any stories/legends/songs/chants associated with these areas?*

   [NOTE: Possible follow-up questions if information not in their answers:

   - How are you or your family connected to the Project lands?
   - What year(s) were you and/or your family associated with these lands?
   - What was this place called when you were growing up or working here?
   - Can you describe what the area looked like—natural and/or man made things?
   - To your knowledge what kind of activities took place in this location?
   - Do you know of any traditional gathering of plants, etc in the area?
   - Please describe any other land/water use? Resources?
   - What was the historic land use? Sugar? Pineapple? Ranching? Agriculture?
   - **[Have map ready for marking.]**
   - Do you know about any burials in the project area? [last resort question]
   - Do you know of any cultural sites in the project area or vicinity? [last resort question]

8 *Is there anyone you know who can also tell me about the project area?*

   [NOTE: Usually in the course of the interview, Consultants suggest other people to interview.]

9. *As soon as the tape of this interview is transcribed I will send you two sets. Please review your transcript and make any corrections and/or additions, then sign both copies of the Release Forms thereby allowing the information to be used by the interviewer, and other Project Partners. Then mail one set back in the enclosed stamped-addressed envelope* (*or email corrected version*).

10. *If your revised transcript is not returned within* ***two weeks*** *of date of receipt, it will be assumed that you are in concurrence with the transcript material and your information will then be incorporated into any draft reports. However, you can still make changes during the draft review process.*

MAHALO NUI LOA

APPENDIX F

Endangered Plants, Candidate Plants, and Plant Species of Concern Known from the [Fenceline] Project Area Pahole NARS/Mokulē‘ia Forest Reserve (DLNR Fish & Wildlife – NARS)

Scientific Name	Common Name	Federal Status
Alectryon macrococcus var. *macrococcus*	Mahoe	Endangered
Alsinidendron obovatum	None known	Endangered
Chamaesyce herbstii	Akoko	Endangered
Cyanea longiflora	Haha	Endangered
Cyrtandra dentata	Haiwale	Endangered
Diellia falcata	None known	Endangered
Delissea subcordata	None known	Endangered
Flueggea neowawraea	Mehamehame	Endangered
Hesperomannia arbuscula	None known	Endangered
Phyllostegia kaalaensis	None known	Endangered
Schiedea nuttalli	None known	Endangered
Platydesma cornuta var. *decurrens*	None known	Candidate
Pteralyxia macrocarpa	Kaulu	Candidate
Cyanea membranacea	Haha	Species of Concern
Labordia kaalae	Kamakahala	Species of Concern
Melicope cinerea	Alani	Species of Concern
Melicope sandwicensis	Alani	Species of Concern
Ochrosia compta	Holei	Species of Concern

Native Animals Known from the [Fenceline] Project Area Pahole NARS/Mokulē‘ia Forest Reserve

Scientific Name	Common Name	Federal Status
Vertebrates		
Chasiempis sandwichensis ibidis	O‘ahu ‘Elepaio	Endangered
Himatione sanguinea	‘Apapane -	
Hemignathus virens	‘Amakihi -	
Pluvialis fulva	Kolea -	
Invertebrates		
Amastra rubens	none (snail)	Species of Concern
Achatinella mustelina	Pupu Kani Oe	Endangered
Auriculella ambusta	none (snail) -	
Auricullela (new sp. aff.) *perpusilla*	none (snail) -	
Leptachina sp.	none (snail)	Species of Concern
Pleuropoma sandwichiensis	none (snail)	Species of Concern

APPENDIX G

SIGNED CONSENT FORMS

V. Confidentiality

Your rights of privacy, confidentiality and/or anonymity will be protected **if you so desire**. You may request, for example, that your name and/or sex not be mentioned in write-ups, such as field notes, on tape, on files (disk or folders), drafts, reports, and future works; or you may request that some of the information you provide remain "off-the-record." In order to ensure protection of your privacy, confidentiality and/or anonymity, you should immediately advise the interviewer of your desires. The interviewer will ask you to specify the method of protection, and note it on this form below.

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Part I: Agreement to Participate

I, _____, understand that Maria "Kaimi" Orr, an independent interviewer contracted by International Archaeological Research Institute, Inc. *will be conducting oral history interviews with individuals knowledgeable about the project lands of the* ***Pahole Rare Plant Facility****. The oral history interviews are being conducted in order to collect cultural and historic information of the area.*

I understand I will be provided the opportunity to review my interview to ensure that it accurately depicts what I meant to say. ***I also understand that if I don't return the revised transcripts after two weeks from date of receipt, my signature below will indicate my release of information for the report. I also understand that I will still have the opportunity to make revisions during the draft review process.***

_____ *I am willing to participate.*

Signature **Date**

Thomas I Shiraishi Sr 637-4690

Print Name **Phone**

P O Box

Address

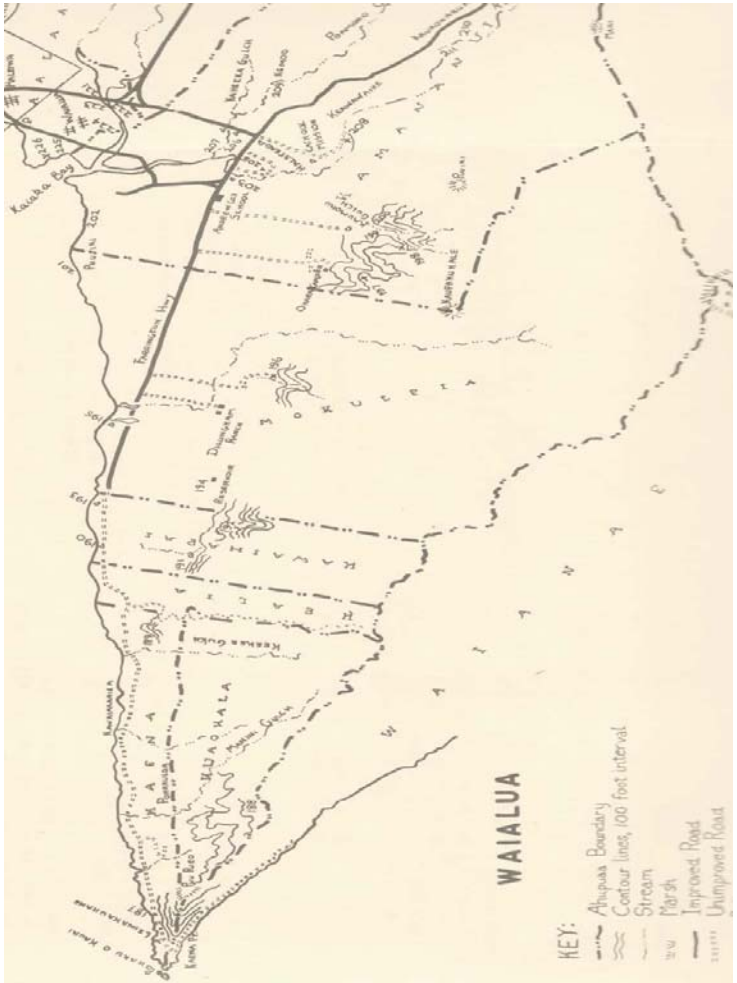
Waialua 96791

ZipCode

Kawaihapai@hawaii.rr.com

Email Address

MAHALO NUI LOA



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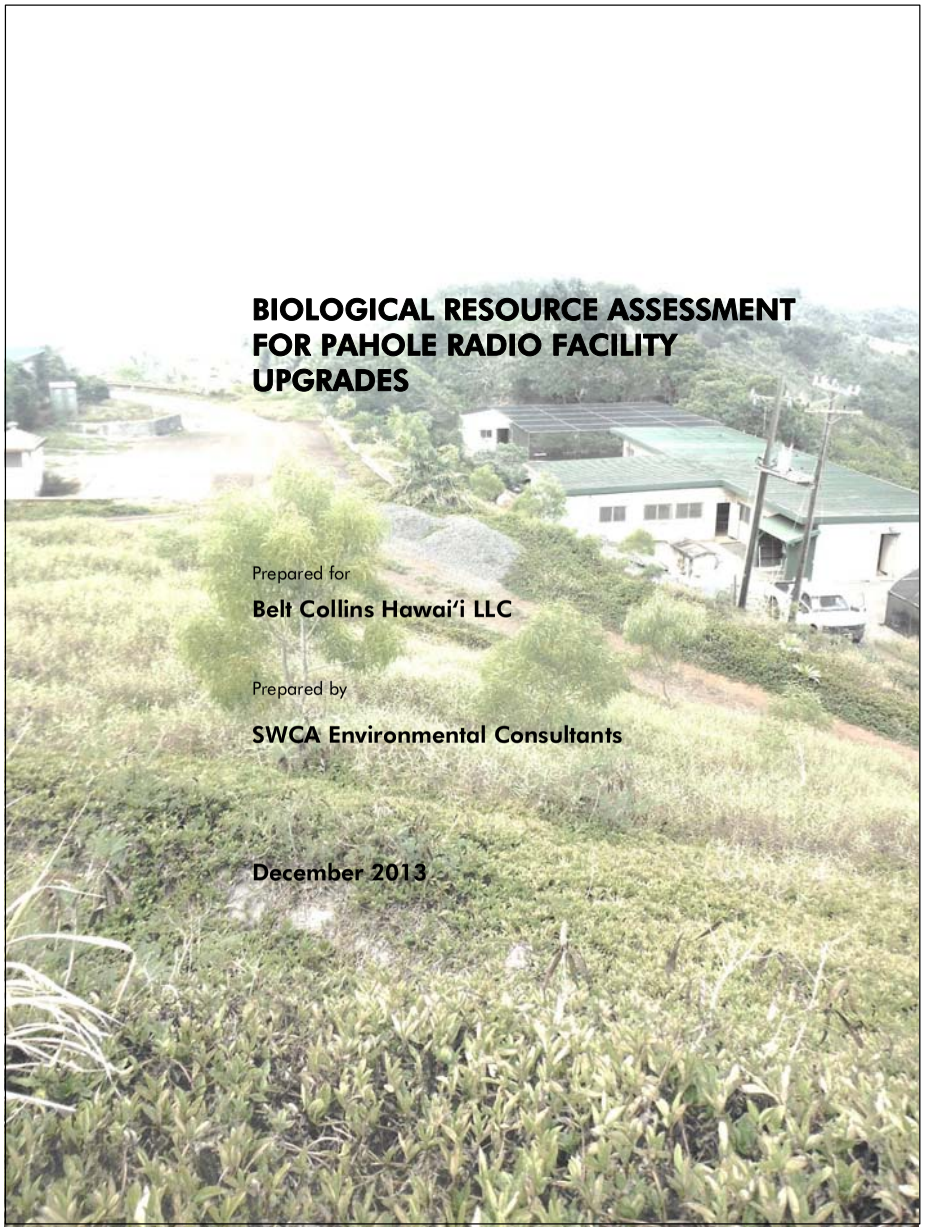
APPENDIX D

Biological Resource Assessment



BIOLOGICAL RESOURCE ASSESSMENT FOR PAHOLE RADIO FACILITY UPGRADES

Prepared for

Belt Collins Hawai'i LLC

Prepared by

SWCA Environmental Consultants

December 2013

BIOLOGICAL RESOURCE ASSESSMENT FOR PAHOLE RADIO FACILITY UPGRADES

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SWCA Project No. 23461.00, Phase 1

December 2013

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1. INTRODUCTION

Belt Collins Hawai‘i LLC (Belt Collins) is preparing an environmental assessment (EA) for the State Department of Accounting and General Services, Information and Communication Services Division to implement improvements at six radio facility sites on the Island of O‘ahu. SWCA Environmental Consultants (SWCA) was tasked by Belt Collins to conduct a biological resource assessment at one of these sites, referred to as the Pahole Radio Facility (Figure 1), in October 2013, in support of the EA for the project. Proposed work at the Pahole Radio Facility site involves relocating irrigation tanks, replacing portions of the chain link fence, relocating an overhead line, adding new electrical equipment, and upgrading other facilities (Figure 2). Some trees may be cut back along portions of the access road for larger equipment to travel up to the project site.

This report summarizes the findings of the assessment conducted by SWCA Biologists Tiffany Thair (botanist), Ling Ong (zoologist), and Bryson Luke (field technician) on October 16, 2013. An additional snail survey was conducted by Ling Ong and Brenden Holland (malacologist) on October 28, 2013.The objectives of the natural resource assessment are as follows:

1. Identify and document the presence and relative abundance of plant species and vegetation communities in the project site.
2. Identify and document the presence and relative abundance of bird, mammal, amphibian, reptile, and invertebrate macrofauna that occur in the project site.
3. Identify any state or federally listed candidate, threatened, or endangered species; species of concern; and/ or rare (either locally or statewide) species found or known to occur at the project site.
4. Describe any known resource issues and conflicts unique to the project site.

2. DESCRIPTION OF THE PROJECT SITE AND VICINITY

The Pahole Radio Facility site is in the Wai‘anae Mountain Range on the north shore of O‘ahu. It is within the Mokulē‘ia Forest Reserve (see Figure 1). The project site encompasses roughly 3 acres (1.2 hectares) and ranges from approximately 1,975 feet (602 meters [m]) to 2,025 feet (617 m) above mean sea level. The site is accessed from an unnamed road off Farrington Highway. The access road is not within the project site.

A number of federal, state, and city buildings and communications equipment exists within the project site, including Hawai‘i Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) Pahole Rare Plant Nursery; U.S. Army Environmental Nursery; City and County of Honolulu, and the State of Hawai‘i radio broadcast facilities. The former NIKE missile facility is also within the southeast part of the project site. The project site is mostly fenced, except for a portion along the northern and eastern boundaries. Land immediately surrounding the project site is undeveloped. The Pahole Natural Area Reserve (NAR) is approximately 1,476 feet (450 m) southeast of the project site.

The geology at the site consists of Kolekole Volcanics (Sherrod et al. 2007). The Natural Resources Conservation Service (NRCS) identifies the soil at the site as Kemoo silty clay, 35%–70% slopes (Foote et al. 1972).

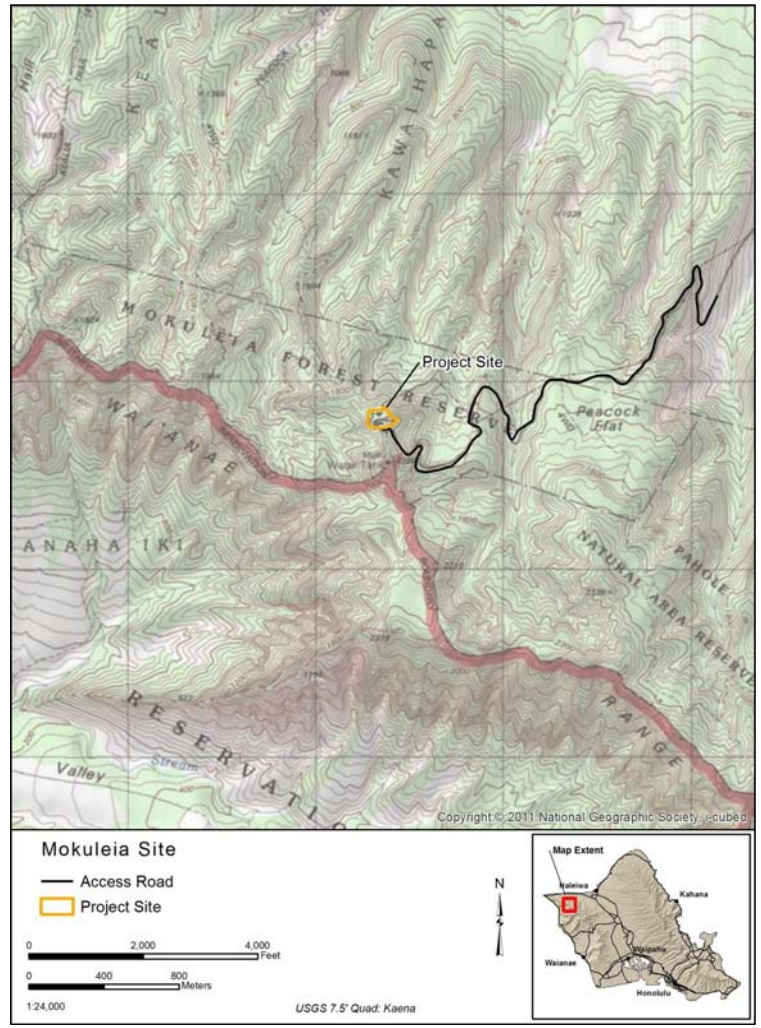

Figure 1. Project site.

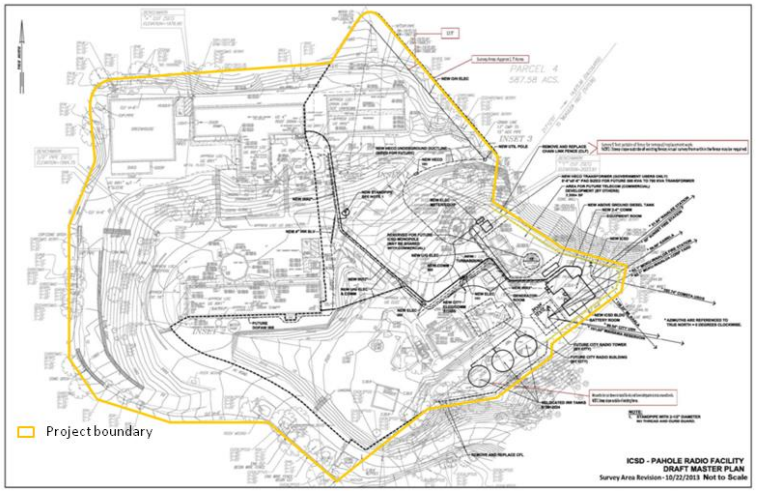

Figure 2. Draft master plan of project site from Belt Collins.

Mean annual rainfall for this area is approximately 51 inches (1,295 millimeters). Rainfall is typically highest from December to January and lowest in June (Giambelluca et al. 2013). The two rainfall gages near the site (Makua Range and Mākaha Stream) have recorded slightly below average rainfall for 2013 through the end of October (National Oceanic and Atmospheric Administration/National Weather Service, Weather Forecast Office Honolulu 2013).

3. METHODS

SWCA conducted a review of available scientific and technical literature regarding natural resources in and near the project site. This literature review encompassed a thorough search of refereed scientific journals, technical journals, and reports; EAs/environmental impact statements; relevant government documents; and unpublished data that provide insight into the natural history and ecology of the area. SWCA also reviewed available geospatial data, aerial photographs, and topographic maps of the site.

A field reconnaissance of the project site was conducted by three SWCA biologists on October 16, 2013. A follow-up mollusk survey was conducted in cooperation with Dr. Brenden Holland on October 28, 2013. The DOFAW Pahole Rare Plant Nursery and U.S. Army Nursery were not included in the survey area. A comprehensive survey of the access road was not performed. However, information was collected on the access road via personal communications and review of available literature.

3.1. Flora

One SWCA botanist conducted a pedestrian survey of the project site. All vascular plant species observed in the project site were documented, and notes were made on relative abundances (e.g., abundant, common, uncommon, and rare), communities, and disturbances. Areas more likely to support native plants were more intensively examined. Ornamental and native species growing in pots, planters, and containers, as well as plants in the two nurseries, were not included in the survey.

Plants recorded during the survey are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. It is likely that additional surveys conducted at a different time of the year would result in minor variations in the species and abundances of plants observed.

3.2. Fauna

Fauna surveys consisted of pedestrian surveys of the project site on October 16, 2013. A systematic fauna survey of the access road was not conducted. All birds, mammals, reptiles, amphibians, and invertebrate species seen or heard were noted. Because the project site is within critical habitat for the endangered O'ahu 'elepaio (*Chasiempis ibidis*), playbacks of O'ahu 'elepaio songs were conducted at six locations in the project site (Figure 3). Playback stations were separated by 144–341 feet (44–104 m). Songs were broadcast for 1 minute, followed by a listening period of 2 minutes, as recommended by VanderWerf et al. (2011).

Given the proximity of the project site to the Pahole NAR, which harbors one species of endangered O'ahu tree snail (*Achatinella mustelina*) and three snail species of concern (*Amastra rubens*, *Leptachina* sp. and *Pleuropoma sandwichiensis*) (Department of Land and Natural Resources [DLNR] 2003), areas in the project site more likely to retain moisture were examined for snails and their shells (Figure 4). The leaf litter and leaves of broad-leafed plants in these areas were sub-sampled. Searches for live snails and shells at each location lasted between 10 and 40 person minutes, depending on the size of the search area. Mollusk surveys were conducted on October 16 and 28, 2013.

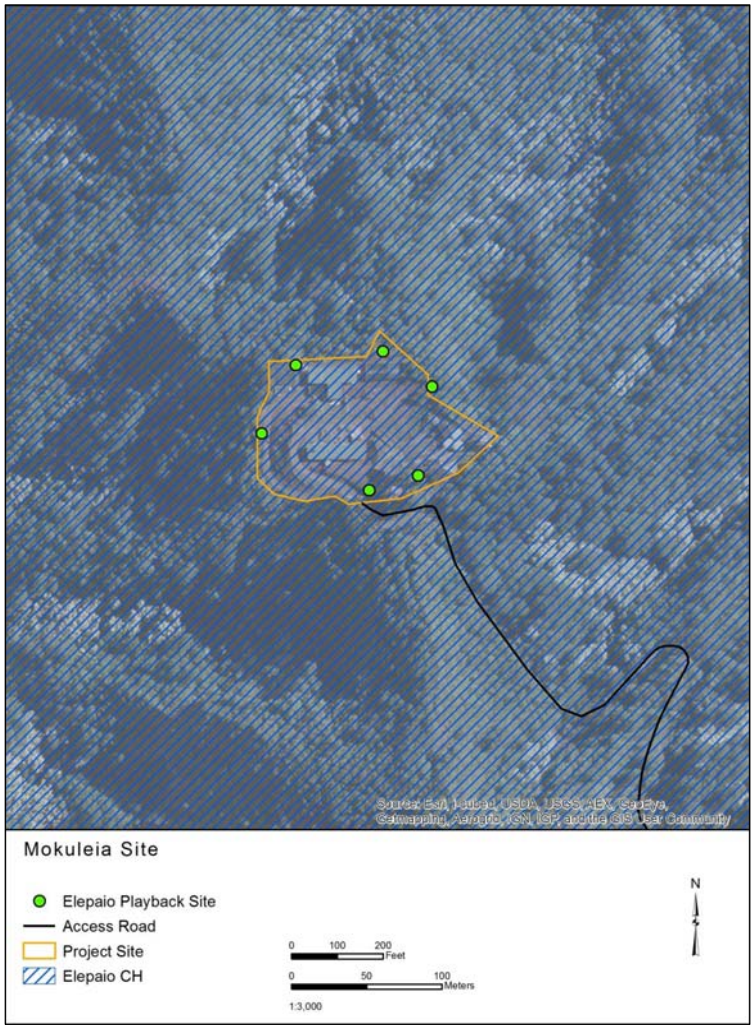

Figure 3. Designated O'ahu 'elepaio critical habitat (CH) in the project site and 'elepaio payback sites.

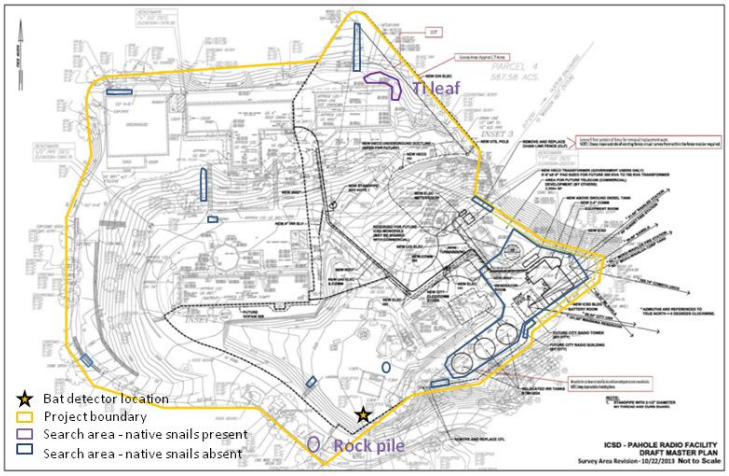

Figure 4. Bat detector location and areas sampled for snails at the project site.

One bat detector (Wildlife Acoustics Songmeter SM2BAT+) was deployed at the southern corner of the project site (see Figure 4). The detector recorded from 5:36 p.m. to 7:25 a.m. (30 minutes before sunset to 30 minutes after sunrise) for 12 nights from October 16 through the morning of October 28, 2013.

4. RESULTS

Most of the project site is disturbed from various activities that have occurred in the area over several decades. No state or federally listed threatened, endangered, or candidate species were seen at the project sited during the pedestrian surveys. The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) was recorded as present on-site by the bat detector.

The project site is also within critical habitat (Unit 1 - the Northern Wai‘anae Mountains) for the endangered O‘ahu ‘elepaio, as designated by the U.S. Fish and Wildlife Service (USFWS) (see Figure 3). Plant critical habitat occurs nearby the project site, including in portions of the access road to the site (see section 4.1.2).

4.1. Flora

4.1.1. Project Site

No state or federally listed threatened, endangered, or candidate plant species, or rare native Hawaiian plant species were observed at the project site. Sixty-seven (67) plant species were recorded at the site during the survey. Of these, 10 are native to the Hawaiian Islands. Indigenous (found in the Hawaiian Islands and elsewhere) plant species seen at the site include *Cyperus polystachyos*, pala‘ā (*Sphenomeris chinensis*), moa (*Psilotum nudum*), pūkiawe (*Leptecophylla tameiameiae*), naio (*Myoporum sandwicense*), and ‘a‘ali‘i (*Dodonaea viscosa*). Endemic (only found in the Hawaiian Islands) plant species include loulu (*Pritchardia kaalae*), olopua (*Nestegis sandwicensis*), koa (*Acacia koa*), and ‘ōhi‘a (*Metrosideros polymorpha*). Loulu, pūkiawe, olopua, and naio only occur as plantings. Appendix A provides a list of all plant species observed by SWCA biologists in the project site during the survey.

The vegetation in the project site is primarily dominated by non-native grasses and herbaceous species with scattered shrubs and trees. Thick mats of molasses grass (*Melinis minutiflora*), *Nephrolepis brownii*, *Neonotonia wightii*, and wedelia (*Sphagneticola trilobata*) occur within the site (Figure 5). Bermuda grass (*Cynodon dactylon*) and Spanish clover (*Desmodium incanum*) are locally abundant in the southern portion of the site, whereas Sydney blue gum (*Eucalyptus saligna*) is more common in the southern portion of the project site near the relocated tank area. The vegetation in the relocated tank area has been disturbed, exposing bare ground in some areas (Figure 6).

Christmas berry (*Schinus terebinthifolius*), Guinea grass (*Urochloa maxima*), and narrow-leaved plantain (*Plantago lanceolata*) are scattered widely throughout the site. Two endemic trees—koa and ‘ōhi‘a—are also common, although most appear to be planted rather than naturally occurring. Other plants found scattered sparsely throughout the site or occurring in a few small patches include ti (*Cordyline fruticosa*), monstera (*Monstera deliciosa*), Spanish needle (*Bidens alba*), and creeping indigo (*Indigofera spicata*).

Figure 5. Thick mat of molasses grass on slope and koa plantings.

Figure 6. View of the relocated tank area, showing disturbed ground.

4.1.2. Access Road

As stated in Section 3, a comprehensive survey of the access road was not performed by SWCA. However, according to Talbert Takahama at the NAR System, one listed plant species—the endangered *Bidens amplectens*—occurs along a portion of the access road on the north-facing side of the hairpin turn before the forestry gate at roughly 1,235 feet (376 m) in elevation (Figure 7). Approximately 50 individuals occur at this location and all are naturally occurring (personal communication, Talbert Takahama/NAR System Specialist IV, November 2013). No critical habitat for *Bidens amplectens* occurs in the vicinity.

Portions of the access road also transverse critical habitat for various listed plants (USFWS 2003, 2012). Critical habitat for *Euphorbia herbstii* and mēhamehame (*Flueggea neowawraea*) intersects with the upper elevation portions of the access road (Figure 8). These two critical habitat units are approximately 200 feet (60 m) and 420 feet (128 m) away from the project site, respectively.

In 2012, USFWS designated Lowland Mesic Unit 1, which encompasses a portion of the access road. This large unit is southeast of the project site and encompasses 4,448 acres (1,800 ha) (Figure 8). It is known to be occupied by 41 listed plants and contains unoccupied habitat for an additional 23 plant taxa (USFWS 2012). Small portions of the access road also intersect with portions of other plant critical habitat units (Figure 9), including ha‘iwale (*Cyrtandra dentata*), hāhā (*Cyanea superba*), *Schiedea obovata*, *Delissea subcordata*, and kulu‘ī (*Nototrichium humile*). According to specialists at the O‘ahu Branch of the NAR System, none of the listed plants that have critical habitat units intersecting with the access road occur along the access road to the project site (personal communication, Talbert Takahama/NAR System Specialist IV, November 2013).

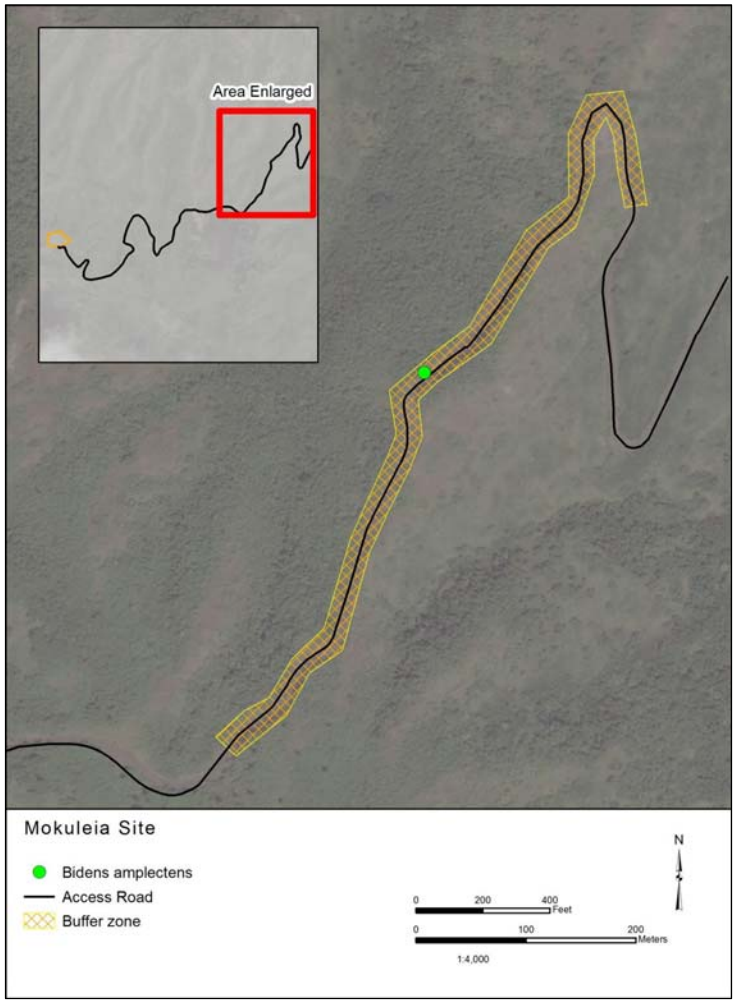

Figure 7. Location of *Bidens amplectens* along the access road and buffer zone.

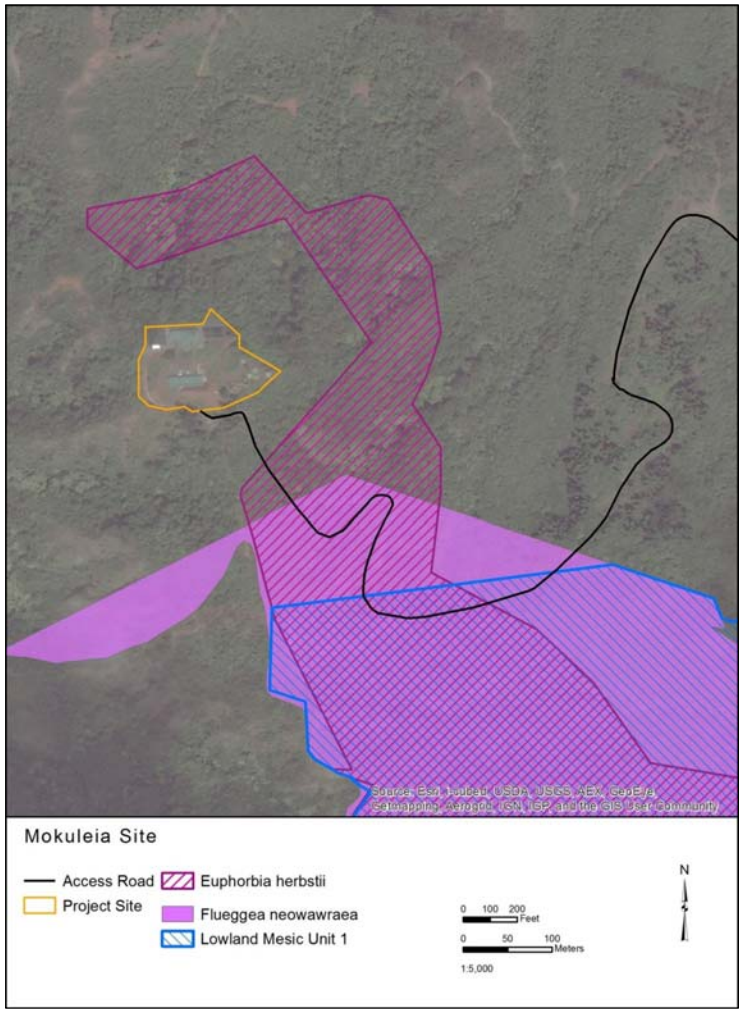

Figure 8. Designated critical for *Euphorbia herbstii* and mēhamehame (*Flueggea neowawraea*), as well as critical habitat Lowland Mesic Unit 1.

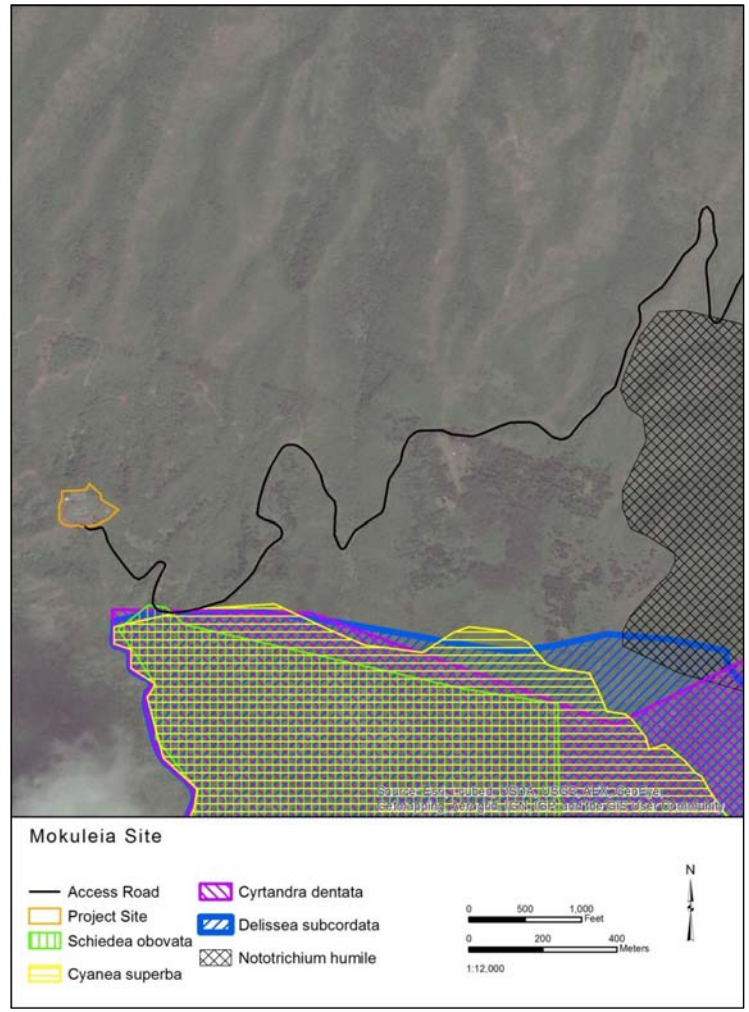

Figure 9. Designated critical for various listed plants within small portions of the access road.

4.2. Fauna

4.2.1. Avifauna

Bird species observed at the project site are species typically found in rural, disturbed habitat. Species diversity at the site is low, with only nine species encountered during the survey (Appendix B), including one migratory bird species, the Pacific golden plover (*Pluvialis fulva*). Two additional non-native bird species were detected incidentally along the access road to the project site (see Appendix B). No native species were detected. However, two native birds—‘apapane (*Himatione sanguinea*) and O‘ahu ‘amakihi (*Hemignathus virens*)—are known to occur in the nearby Pahole NAR and may occasionally be present at the project site (DLNR 2003).

No O‘ahu ‘elepaio were detected during the playbacks, which were conducted at six locations in the project site. O‘ahu ‘elepaio have not been detected within the Mokulē‘ia Forest Reserve since a lone male was last observed in 1991 (VanderWerf et al. 2011). The latest survey of the Mokulē‘ia Forest Reserve in 2007 did not detect any individuals (VanderWerf et al. 2011). O‘ahu ‘elepaio were also not present within the Pahole NAR during the latest 2009 survey. The last pair of O‘ahu ‘elepaio in Pahole NAR was detected in 1999, with a single male observed in 2000 (VanderWerf et al. 2011). Based on these results, O‘ahu ‘elepaio are not expected to be present at the project site.

4.2.2. Hawaiian Hoary Bat

Hawaiian hoary bats were detected on 50% of the nights the bat detectors were deployed (six of 12 nights). A bat pass is defined as two or more bat calls that are separated by less than 1 second. In all, 10 bat passes were detected for all nights combined (Table 1) and bat passes were detected between 7:45 p.m. and 1:15 a.m. The recorded bat vocalizations were search-phase calls, indicating that the bats were transiting through the airspace of the project site.

Table 1 Bat Activity at the Project Site

Survey Night	No. of Passes Detected
10/16	0
10/17	0
10/18	1
10/19	1
10/20	0
10/21	0
10/22	2
10/23	2
10/24	2
10/25	2
10/26	0
10/27	0
Total	**10**

4.2.3. Other Mammals

No mammals were seen during the survey, though it is possible for feral dogs (*Canis familiaris*) and cats (*Felis catus*) to enter the project site. Other mammals that can be expected on-site include mice (*Mus musculus*), rats (*Rattus* spp.) and mongoose (*Herpestes javanicus*).

4.2.4. Reptiles and Amphibians

The metallic skink (*Lampropholis delicata*) was detected in the project site. No amphibians were seen during the survey. None of the terrestrial reptiles or amphibians in Hawai‘i are native to the islands, so these are not species of interest.

4.2.5. Invertebrates

Mollusks: Two species of a single genus of native snails (*Tornatellides* spp., Subfamily: Tornatellidinae, Family: Achatinellidae) were found during the surveys. A few individuals (two to three) were found in the project site on ti leaves. An additional population (more than ten) was under rocks in the rock pile just inside the fence (see Figure 4).

A number of invasive snail species were found, including two predatory species—the rosy wolf snail (*Euglandina rosea*) and the garlic snail (*Oxychilus alliarius*). Additional species of snails include *Subulina octona* (Family: Subulinidae) and the Asian tramp snail (*Bradybaena similaris*). Slugs are actively managed on-site to protect the plants in the native plant nursery. No slugs were seen during the survey but can be expected to be present on-site.

Insects and Other Invertebrates: Native insects found at the project site include dragonflies, either the common green darner or the giant Hawaiian darner (*Anax junius* or *A. strenuus*), and a case-bearing caterpillar of an endemic moth (*Hyposmocoma* sp.). Non-native hymenopterans present include the Sonoran carpenter bee (*Xylocopa sonorina*), the honey bee (*Apis mellifera*), and the western yellowjacket wasp (*Vespula pensylvanica*). Non-native lepidopterans include the gulf fritillary (*Agraulis vanillae*) and the black witch moth (*Ascalapha odorata*). Other incidental insects observations include the purple-winged mantis (*Tenodera australasiae*) in the vegetation, as well as sow bugs (Order: Isopoda) and millipedes (Class: Diplopoda) in the leaf litter.

4.2.6. Fauna along the Access Road

Portions of the access road are within Oahu ‘elepaio critical habitat. The access road, similar to the project site, is close to Pahole NAR, which harbors one species of endangered O‘ahu tree snail (*Achatinella mustelina*) and three snail species of concern (*Amastra rubens*, *Leptachina* sp. and *Pleuropoma sandwichiensis*) (DLNR 2003). No surveys for the endangered O‘ahu tree snail or O‘ahu ‘elepaio were conducted along the access road, and it is currently unknown if these two listed species are present. Recommendations for surveys for these two species are provided in section 5.2 to avoid impacts to listed species from project-related activities occurring along the access road.

The Hawaiian hoary bat is a highly mobile species. Preliminary studies of a small sample of Hawaiian hoary bats (n = 18) on the Island of Hawai‘i have estimated short-term (1–2 weeks) core range habitat sizes of 84.3 acres (34.1 ha; n = 14) for males and 41.2 acres (16.7 ha; n = 11) for females (personal communication, F. Bonaccorso, U.S. Geological Survey, May 3, 2011). Given that the Hawaiian hoary bat was detected at the project site, portions of the access road could reasonably be expected to be within the home range of several individuals, and therefore bats could be foraging or roosting in trees along the access road.

5. DISCUSSION AND RECOMMENDATIONS

5.1. Flora

The vegetation in the project site is disturbed from previous land-use activities. Almost 84% of the plant species seen during the survey are not native to Hawai‘i. Although 10 native plant species occur in the site, these are mostly plantings on slopes and are not likely to be disturbed from the project. No threatened, endangered, or rare plants were found during the reconnaissance at the project site, and the designated plant critical habitat near the project site is not expected to be impacted. One endangered plant species—*Bidens amplectens*—is present along the access road, and several plant critical habitat units intersect with the access road. A critical habitat designation does not affect activities on state or private lands unless some sort of federal action (e.g., permit, license, or funding) is involved. If the recommendations listed below are followed, the proposed project is not expected to have a significant, adverse impact on botanical resources.

Access Road: One endangered plant—*Bidens amplectens*—is known to occur along a portion of the access road. Per guidance from DOFAW, SWCA recommends that vegetation cutting be avoided within 1,312 feet (400 m) of this location (see Figure 7).

No listed plant species occur in the critical habitat units within the access road. If vegetation needs to be cut along the access road in areas intersecting plant critical habitat, disturbance should be minimized to the maximum extent practicable. Contractors should be educated regarding the sensitivity of working in critical habitat.

Invasive Species: High-value conservation areas occur near the project site. To minimize the potential for introducing new invasive plants to the project site, SWCA recommends that off-site sources of revegetation materials (seed mixes, gravel, mulches, etc.) are certified weed-free or inspected prior to transport to the project site. All construction equipment and vehicles arriving from outside of the Island of O‘ahu should be washed prior to entering the project site. Construction materials arriving from outside of O‘ahu should be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful non-native species prior to transportation to the project site.

Landscaping: If landscaping is included as part of the project, SWCA recommends that native Hawaiian plants be used for landscaping around the project to the maximum extent possible. Potential native species that may be appropriate for landscaping at the proposed project site include koa, ‘ōhi‘a, loulu, and ‘a‘ali‘i. Additional information on selecting appropriate plants for landscaping can be obtained from the following websites:

- http://www.nativeplants.Hawaii.edu/
- http://www.plantpono.org/non-invasive-plants.php
- http://www.hear.org/alternativestoinvasives/pdfs/mcaac_hpwra_a2i_list.pdf
- http://www.hear.org/oisc/oahuearlydetectionproject/pdfs/oedposterwhatnottoplant.pdf

5.2. Fauna

One endangered animal species, the Hawaiian hoary bat, was detected on the project site. No other listed species or candidates for listing were observed at the project site during the survey. If the recommendations listed below are followed, the proposed project would avoid impacts to listed fauna and designated critical habitat at the project site. Critical habitat designation does not affect activities on state or private lands unless some sort of federal action (e.g., permit, license, or funding) is involved. Measures to avoid impacts to listed species along the access road are also included where possible, and

additional surveys for O‘ahu ‘elepaio and O‘ahu tree snails along the access road are recommended if vegetation cutting/disturbance occurs along the access road.

Avifauna: No O‘ahu ‘elepaio are expected to be present at the project site, and no impacts to O‘ahu ‘elepaio or its critical habitat due to construction at the project site are anticipated.

If trees need to be cut along the access road in areas intersecting with O‘ahu ‘elepaio critical habitat, SWCA recommends that trees be flagged and surveyed by a biologist for O‘ahu ‘elepaio prior to disturbance. If no O‘ahu ‘elepaio are detected, then no impacts to the species or critical habitat are anticipated. If O‘ahu ‘elepaio are detected, then the construction activities along the access road may need to be modified to avoid impacts to the species or critical habitat.

No native birds were detected on-site during the surveys, but ‘apapane and O‘ahu ‘amakihi may occasionally be present at the project site or along the access road. Construction may temporarily displace these native birds; however, it is expected that these birds would return when construction is complete, and no long-term impacts are expected. Construction may also temporarily displace the migratory Pacific golden plover if conducted during the migration season (September to May) (Pyle and Pyle 2009). However, it is similarly expected that these birds would return when construction is complete and no long-term impacts are expected.

Hawaiian Hoary Bat: The endangered Hawaiian hoary bat was detected transiting the project site on six of the 12 nights the bat detector was deployed. Only one to two detections were recorded per night. Bats may roost or forage at the project site because suitable roost trees (such as ‘ōhi‘a) and foraging cover (koa trees) are present (U.S. Department of Agriculture 2009). Suitable roost trees and foraging cover are also present along the access road and bats can similarly be expected to be present.

To prevent direct impacts to the Hawaiian hoary bat, the following are recommended for both the project site and access road:

- No trees taller than 15 feet (4.6 m) within the project site should be trimmed or removed between June 1 and September 15 when non-volant juvenile bats (bats that cannot fly) may be roosting in the trees.
- Any fences that are erected as part of the project should have a barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. For existing fences at the project site, the top strand of barbed wire should be removed or replaced with barbless wire.

SWCA expects that the implementation of these guidelines, which have been promulgated by the USFWS, will avoid all direct impacts to Hawaiian hoary bats.

Invertebrates: No endangered O‘ahu tree snails were documented at the project site. Native snails (*Tornatellides* spp.) were found at two locations during surveys—on ti leaves and under rocks in a rock pile (see Figure 4). To minimize impacts to native snails at the project site, the following measures are recommended:

1) If the removal of ti plants is required, this should be done by hand. Cut plants should be placed adjacent to ōhi‘a or other appropriate host plants (but not koa, which is an unsuitable host plant [personal communication, Brenden Holland/Malacologist, University of Hawai‘i, October 2013]) to enable the native snails to move onto new host plants.

2) The rock pile at the entrance to the project site should remain undisturbed.

O‘ahu tree snails could be present in the vegetation along the access road. If vegetation needs to be cut along the access road in areas above 1,312 feet (400 m), SWCA recommends that vegetation be flagged and surveyed for listed tree snails by a biologist prior to disturbance. Based on the results of these surveys, measures can be developed to avoid impacts to listed tree snails if they are present on the vegetation or in close proximity.

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Appendix A

CHECKLIST OF PLANTS OBSERVED AT PAHOLE RADIO FACILITY ON OCTOBER 16, 2013

The following checklist is an inventory of plant species observed by SWCA biologists on October 16, 2013, during the survey of the Pahole Radio Station project site. The plant names are arranged alphabetically by family and then by species into three groups: Ferns and Lycophytes, Monocots, and Dicots. The taxonomy and nomenclature of the ferns and lycophytes is in accordance with Palmer (2003) and Evenhuis and Eldredge (2011). The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999), Wagner and Herbst (2003), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012).

Status:

E = endemic = native only to the Hawaiian Islands
I = indigenous = native to the Hawaiian Islands and elsewhere
P = Polynesian = introduced by Polynesians
X = introduced/ alien = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact (Cook's arrival in the islands in 1778)

Relative Site Abundance:

A = Abundant = forming a major part of the vegetation within the project site
C = Common = widely scattered throughout the area or locally abundant within a portion of it
U = Uncommon = scattered sparsely throughout the area or occurring in a few small patches
R = Rare = only a few isolated individuals within the project site
* = Species only occurs as planting in the project site

Scientific Name	Common and Hawaiian Name(s)	Status	Abundance
FERNS AND LYCOPHYTES			
BLECHNACEAE			
Blechnum appendiculatum Willd.	----	X	R
LINDSAEACEAE			
Sphenomeris chinensis (L.) Maxon	pala'ā, palapala'ā	I	R
LOMARIOPSIDACEAE			
Nephrolepis brownii (Desv.) Hovenkamp & Miyam.	----	X	A
PSILOTACEAE			
Psilotum nudum (L.) P.Beauv.	moa, upright whiskfern	I	R

PTERIDACEAE			
Pityrogramma austroamericana Domin	golden fern, goldback fern	X	R
THELYPTERIDACEAE			
Cyclosorus x intermedius W.c. shieh & J.l. tsai	----	X	R
MONOCOTS			
AGAVACEAE			
Cordyline fruticosa (L.) A.Chev.	ti, kī	P	U
ARACEAE			
Monstera deliciosa Liebmann	monstera, split-leaf philodendrion, swiss-cheese plant	X	U
ARECACEAE			
Pritchardia kaalae Rock	loulu	E	R*
CYPERACEAE			
Cyperus gracilis R.Br.	McCoy grass, mau'u hunehune	X	R
Cyperus polystachyos Rottb.	----	I	R
POACEAE			
Andropogon virginicus L. var. *virginicus*	broomsedge	X	U
Chloris radiata (L.) Sw.	radiate fingergrass, plushgrass	X	U
Cynodon dactylon (L.) Pers.	Bermuda grass	X	C
Eleusine indica (L.) Gaertn.	wiregrass	X	R
Melinis minutiflora P.Beauv.	molasses grass	X	A
Melinis repens (Willd.) Zizka	Natal redtop	X	R

Setaria verticillata (L.) P.Beauv.	bristly foxtail, mau'u pilipili	X	U
Sporobolus indicus (L.) R.Br.	West Indian dropseed, smutgrass	X	U
Urochloa maxima (Jacq.) R. D. Webster	Guinea grass	X	C
STRELITZIACEAE			
Strelitzia reginae Dryander	bird-of-paradise	X	R
DICOTS			
AMARANTHACEAE			
Amaranthus viridis L.	slender amaranth, pakai	X	R
ANACARDIACEAE			
Schinus terebinthifolius Raddi	Christmas berry	X	C
APIACEAE			
Ciclospermum leptophyllum (Pers.) Sprague ex Britton & P.Wilson	fir-leaved celery	X	R
ASTERACEAE			
Ageratina adenophora (Spreng.) R.M.King & H.Rob.	Maui pāmakani, pāmakani haole	X	R
Ageratum conyzoides L.	maile hohono	X	R
Bidens alba (L.) DC. var. *radiata* (Sch.Bip.) Ballard ex Melchert	Spanish needle, beggartick	X	U
Bidens pilosa L.	Spanish needle, beggartick	X	U
Conyza bonariensis (L.) Cronq.	hairy horseweed	X	R
Sphagneticola trilobata (L.) Pruski	wedelia	X	A
BIGNONIACEAE			
Spathodea campanulata P.Beauv.	African tulip tree	X	R

EUPHORBIACEAE			
Euphorbia hirta L.	hairy spurge, garden spurge	X	R
Euphorbia hypericifolia L.	graceful spurge	X	R
Euphorbia hyssopifolia L.	----	X	R
Euphorbia prostrata Aiton	prostrate spurge	X	R
Phyllanthus debilis Klein ex Willd.	niruri	X	R
BUDDLEJACEAE			
Buddleja asiatica Lour.	huelo 'ilio, dog tail	X	R
EPACRIDACEAE			
Leptecophylla tameiameiae (Cham. & Schltdl.) C.M.Weiller	pūkiawe	I	R*
FABACEAE			
Acacia koa A. Gray	koa	E	C*
Chamaecrista nictitans (L.) Moench	partridge pea	X	U
Crotalaria lanceolata E.Mey.	rattlepod	X	R
Desmanthus pernambucanus (L.) Thell.	slender mimosa, virgate mimosa	X	R
Desmodium incanum DC.	Spanish clover, ka'imi	X	C
Indigofera spicata Forssk.	creeping indigo	X	U
Indigofera suffruticosa Mill.	indigo, 'inikō	X	U
Leucaena leucocephala (Lam.) de Wit	koa haole	X	U
Macroptilium lathyroides (L.) Urb.	wild bean, cow pea	X	U
Neonotonia wightii (Wight & Arn.) Lackey	----	X	A
OLEACEAE			

Nestegis sandwicensis (A.Gray) O.Deg., I.Deg. & L.A.S. Johnson	olopua	E	R*
MALVACEAE			
Sida acuta Burm.f. ssp. *carpinifolia* (L.f.) Borss.Waalk.	----	X	R
Sida ciliaris L.	----	X	R
Sida rhombifolia L.	----	X	U
Sidastrum micranthum (A.St.-Hil.) Fryxell	----	X	R
MELASTOMATACEAE			
Clidemia hirta (L.) D. Don	Koster's curse	X	R
MYOPORACEAE			
Myoporum sandwicense A.Gray	naio, bastard sandalwood	I	R*
MYRTACEAE			
Eucalyptus saligna Sm.	Sydney blue gum	X	C
Metrosideros polymorpha Gaud.	'ōhi'a, 'ōhi'a lehua	E	C*
Psidium cattleianum Sabine	strawberry guava	X	R
Psidium guajava L.	guava	X	R
POLYGALACEAE			
Polygala paniculata L.	milkwort	X	R
PLANTAGINACEAE			
Plantago lanceolata L.	narrow-leaved or English plantain	X	C
PROTEACEAE			
Grevillea robusta A.Cunn. ex R.Br.	silk oak, silver oak	X	U
SAPINDACEAE			

Dodonaea viscosa Jacq.	'a'ali'i	I	R
SCROPHULARIACEAE			
Castilleja arvensis Cham. & Schltdl.	Indian paintbrush	X	R
VERBENACEAE			
Lantana camara L.	lantana	X	R
Verbena litoralis Kunth	ōwī, oī	X	U

Appendix B

CHECKLIST OF BIRDS OBSERVED AT PAHOLE RADIO FACILITY ON OCTOBER 16, 2013

The following checklist is an inventory of bird species observed by SWCA biologists on October 16, 2013, during the survey of the Pahole Radio Facility project site. The bird species names are arranged alphabetically.

NN = non-native permanent resident, M = migrant

Common Name	Scientific Name	Status	On-site	Off-site
Northern cardinal	*Cardinalis cardinalis*	NN	X	
House finch	*Haemorhous mexicanus*	NN	X	
White-rumped shama	*Copsychus malabaricus*	NN		X
Common waxbill	*Estrilda astrild*	NN	X	
Zebra dove	*Geopelia striata*	NN	X	
Red billed leothrix	*Leiothrix lutea*	NN	X	
Pacific golden- plover	*Pluvialis fulva*	M	X	
Erkel's francolin	*Francolinus erckelii*	NN		X
Red-vented bulbul	*Pycnonotus cafer*	NN	X	
Spotted dove	*Streptopelia chinensis*	NN	X	
Japanese white-eye	*Zosterops japonicus*	NN	X	
	Total species		**9**	**2**

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APPENDIX E

Surface Soil Screening Survey Report

SURFACE SOIL SCREENING SURVEY REPORT
FOR
INFORMATION AND COMMUNICATION SERVICES DIVISION
PAHOLE RADIO FACILITY
RENOVATIONS AND OTHER IMPROVEMENTS
MOKULEIA, HAWAII

DAGS JOB NO. 12-10-0733
MNA PROJECT 01707_2

DECEMBER 19, 2013

Myounghee Noh & Associates

Environmental Studies and Consulting Services

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This report is prepared for:

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SURFACE SOIL SCREENING SURVEY REPORT
FOR
INFORMATION AND COMMUNICATION SERVICES DIVISION
PAHOLE RADIO FACILITY
RENOVATIONS AND OTHER IMPROVEMENTS PROJECT
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December 19, 2013

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LIST OF ABBREVIATIONS

bgs	below ground surface
BMP	Best Management Practice
DA	Decision Area
EAL	Environmental Action Levels
EPA	Environmental Protection Agency
HDOH	State of Hawaii Department of Health
ICSD	Information and Communication Services Division
IDW	Investigation Derived Waste
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
mg/kg	milligrams per kilogram
MNA	Myounghee Noh & Associates, L.L.C.
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
RMAIA	Richard Matsunaga & Associates Architects Inc.
SVOC	Semi-Volatile Organic Compounds
TPH	Total Petroleum Hydrocarbons
TPH-DRO	Total Petroleum Hydrocarbons – Diesel Range Organics
TPH-GRO	Total Petroleum Hydrocarbons – Gasoline Range Organics
TPH-RRO	Total Petroleum Hydrocarbons – Residual Range Organics
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

Myounghee Noh & Associates, L.L.C. (MNA), under contract with Richard Matsunaga & Associates Architects, Inc. (RMAIA), conducted a surface soil screening survey for the Information and Communication Services Division (ICSD) Pahole Radio Facility located in Mokuleia, Island of Oahu, Hawaii. The purpose of the soil screening was to identify the presence of potentially hazardous soil contaminants and associated risks that would be encountered during the earthwork for construction. The soil screening was limited to the areas anticipated to be disturbed by: the demolition of the former generator building; construction of new ICSD building and telecom facility; relocation of the three existing water tanks; and erosion control area.

During December 4-5, 2013, MNA conducted the surface soil screening survey. MNA defined seven Decision Areas (DA) based on the planned earthwork activities, as follows:

- DA-S1: Northeast side of former Generator Building to be demolished (Sample ID: 1707-S1)
- DA-S2: Northwest side of former Generator Building to be demolished (Sample ID: 1707-S2)
- DA-S3: Southwest side of former Generator Building to be demolished (Sample ID: 1707-S3)
- DA-S4: Erosion control area (Sample ID: 1707-S4)
- DA-S5: Proposed new Telecom Facility (Sample ID: 1707-S5)
- DA-S6: Proposed area for water tank relocation (Sample ID: 1707-S6)
- DA-S7: Proposed new ICSD Facility (Sample ID: 1707-S7)

Composite sampling technique was employed for soil samples. The soil samples were collected from the surface at 2 to 8 inch below ground surface (bgs). Each composite sample was prepared by collecting 10 sub-samples from each DA using a hand auger, and combining the sub-samples into a single laboratory sample. The composite samples were analyzed as follows:

- Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by the Environmental Protection Agency Method (EPA) 6010B and 7471A
- Polychlorinated Biphenyls (PCB) by the EPA Method 8082
- TPH as Gasoline, Diesel and Residual Range Organics (TPH-GRO/DRO/RRO) by the EPA Method 8015B

- Volatile Organic Compounds (VOC) by the EPA Method 8260B
- Semi-Volatile Organic Compounds (SVOC) by the EPA Method 8270C

The analytical results were compared to the Hawaii Department of Health (HDOH) Tier 1 Environmental Action Levels (EAL) for unrestricted (residential) land use above a drinking water resource and greater than 150 meters from surface water (Fall 2011).

Reportable levels of arsenic, cadmium, barium, chromium, lead, mercury, selenium, and silver were detected. All results were below the EALs for unrestricted land use except lead. The sample collected from DA-S6 detected lead at 270 milligrams per kilogram (mg/kg), which exceeded the Tier 1 EAL for unrestricted land use, 200 mg/kg. However, the concentration was well below the EAL for restricted land use (industrial/commercial land uses) and direct exposure action level for construction/trench worker, 800 mg/kg.

PCB including Aroclor-1254 and Aroclor-1260 were detected in the range of 0.024 to 0.55 mg/kg and 0.15 to 0.17 mg/kg, respectively. The total sum of PCB concentrations, however, was below the EAL, 1.1 mg/kg.

Reportable levels of TPH-GRO, TPH-DRO, and TPH-RRO were detected, and the results were below the EALs.

None of VOC were detected except acetone and para-isopropyl toluene. Acetone was detected in the range of 0.028 mg/kg to 0.75 mg/kg, below the EAL, 1.0 mg/kg; detection of acetone is likely from the laboratory instruments. Para-isopropyl toluene was detected in the range of 0.0065 mg/kg to 1.7 mg/kg; no EAL was established by HDOH.

SVOC including fluoranthene and pyrene were detected, well below the EALs.

During the soil sampling, no signs of soil contamination such as discoloration or chemical odors were observed, except for paint debris in the tower area ground surface, containing high level of lead. The paint debris was collected and analyzed, and the report is provided under a separate cover.

Based on the results of the screening survey, MNA recommends the following:

- The surface soil of the areas to be disturbed contains reportable levels of metals, PCB, TPH, VOC, and SVOC. All concentrations of detected analytes, except lead, are well below the EALs of unrestricted land use. Lead concentration exceeded the EAL of unrestricted land use, but it was below the restricted land use and direct exposure action level for construction/trench worker. Earthwork, however, may cause a potential exposure to the workers and the facility users via fugitive dust. The routes of exposure of impacted soil as fugitive dust are by inhalation, ingestion, and dermal contact. The Contractor shall use engineering controls such as water misting and wind barriers to control fugitive dust.
- No off-site disposal of the site soils is warranted. However, excess soil that will be transported off-site for re-use or disposal shall be tested to ensure compliance with the recipient guidelines and requirements.
- Use of Best Management Practices (BMP), such as dust control and erosion control, must be implemented to prevent surface runoff.

1.0 INTRODUCTION

Myounghee Noh & Associates, L.L.C. (MNA), under contract with Richard Matsunaga & Associates Architects Inc. (RMAIA), conducted a surface soil screening survey for the Information and Communication Services Division (ICSD) Pahole Radio Facility located in Mokuleia, Island of Oahu, Hawaii. The purpose of the surface soil screening was to identify the presence of potentially hazardous soil contaminants and associated risks that would be encountered during the earthwork for construction. The surface soil screening was limited to the areas anticipated to be disturbed by: the demolition of the former generator building; construction of new ICSD building and telecom facility; relocation of three existing water tanks; and erosion control area as presented in Appendix A, Figure 1.

2.0 FIELD SURVEY

2.1 Soil Sampling and Analysis

During December 4-5, 2013, MNA conducted the surface soil screening survey. MNA defined seven decision areas (DA) based on the planned earthwork activities as presented in Appendix A, Figure 2. The locations of the DA are described as follows:

- DA-S1: Northeast side of former Generator Building to be demolished (Sample ID: 1707-S1)
- DA-S2: Northwest side of former Generator Building to be demolished (Sample ID: 1707-S2)
- DA-S3: Southwest side of former Generator Building to be demolished (Sample ID: 1707-S3)
- DA-S4: Erosion control area (Sample ID: 1707-S4)
- DA-S5: Proposed new Telecom Facility (Sample ID: 1707-S5)
- DA-S6: Proposed area for water tank relocation (Sample ID: 1707-S6)
- DA-S7: Proposed new ICSD Facility (Sample ID: 1707-S7)

Composite sampling method was employed for soil samples. At each DA, one composite sample was collected. Each composite sample was prepared by collecting 10 sub-samples within the DA at 2 to 8-inch below ground surface (bgs), and combining the sub-samples into a single laboratory sample, as follows: (1) homogenized each subsample collected using a hand auger at 2 to 8-inch bgs; (2) transferred one cup of homogenized subsample into a stain-less bowl which will contain the 10 one-cup subsamples; (3) homogenized again and transferred appropriate amount of sample into laboratory-provided glass jars. The sample for Total Petroleum

Hydrocarbons as Gasoline Range Organic (TPH-GRO) and Volatile Organic Compound (VOC) analyses was also taken from this homogenized soil, using a 5-gram Terra Core® sampler.

All soil samples were logged, labeled, chilled, and delivered to the Curtis & Tompkins Laboratory for analysis. Each sub-sample was composited in the field, and all samples were further mixed by the laboratory before the analysis. The samples were analyzed by following methods, and a summary of the soil sampling and analyses is presented in Table 1.

- Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by the Environmental Protection Agency Method (EPA) 6010B and 7471A
- Polychlorinated Biphenyls (PCB) by the EPA Method 8082
- TPH as Gasoline Range Organics (TPH-GRO) by the EPA Method 8015B
- TPH as Diesel and Residual Range Organics (TPH-DRO/RRO) by the EPA Method 8015B
- Volatile Organic Compounds (VOC) by the EPA Method 8260B
- Semi-Volatile Organic Compounds (SVOC) by the EPA Method 8270C

No signs of soil contamination such as discoloration or chemical odors were observed during the field work, except for paint debris in the tower area ground surface, containing high level of lead. The paint debris was collected and analyzed, and the report is provided under a separate cover "*Targeted Hazardous Material Survey Report for Information and Communication Services Division Pahole Radio Facility Renovations and Other Improvements Project, Mokuleia, Hawaii.*"

2.2 Decontamination and Investigation Derived Waste

Decontamination requirements were reduced by using disposable sampling tool, Terra Core® samplers. Stainless-steel cups and auger were decontaminated with Liquinox/water solution and double-rinsed with tap water and distilled water. Investigation Derived Waste (IDW) was minimized through the selection of sampling techniques and the use of disposable sampling equipment. IDW included disposable personal protective equipment (PPE) and disposable sampling tools. Less than one trash bag of PPE and disposable sampling tools were generated and disposed of in a municipal waste dumpster.

Table 1. Summary of Surface Soil Sampling and Analysis

Decision Area	Sample ID	Sample Type	Sampling Depth (inch below ground surface)	Analytes (EPA Analytical Method No.)					
				Total RCRA 8 Metals (6010/7000)	PCBs(8082)	TPH-GRO (8015)	TPH-DRO/RRO (8015)	VOCs (8260)	SVOCs (8270C)
DA-S1	1707-S1	Composite	2 - 8	X	X	X	X	X	X
DA-S2	1707-S2	Composite	2 – 8	X	X	X	X	X	X
DA-S3	1707-S3	Composite	2 – 8	X	X	X	X	X	X
DA-S4	1707-S4	Composite	2 – 8	X	X	X	X	X	X
DA-S5	1707-S5	Composite	2 – 8	X	X	X	X	X	X
DA-S6	1707-S6	Composite	2 – 8	X	X	X	X	X	X
DA-S7	1707-S7	Composite	2 - 8	X	X	X	X	X	X

Abbreviations:
PCB Polychlorinated biphenyls
RCRA Resource Conservation and Recovery Act
SVOC Semi Volatile Organic Compounds
TPH-DRO/RRO Total Petroleum Hydrocarbons as Diesel/Residual Range Organics
TPH-GRO Total Petroleum Hydrocarbons as Gasoline Range Organics
VOCs Volatile Organic Compounds

3.0 ANALYTICAL RESULTS

The analytical results for contaminants were compared to the Hawaii Department of Health (HDOH) Tier 1 Environmental Action Levels (EAL) of soil for unrestricted (residential) land use above a drinking water resource and greater than 150 meters from surface water (State of Hawaii, Department of Health, 2011). The complete laboratory reports are provided in Appendix B.

3.1 Metals

Reportable levels of arsenic, cadmium, barium, chromium, lead, mercury, selenium, and silver were detected. All results were below the EALs for unrestricted land use, except lead. The sample collected from DA-S6 (Sample ID: 1707-S6 in the proposed water tank relocation area) detected lead at 270 milligrams per kilogram (mg/kg), which exceeded the Tier 1 EAL for unrestricted land use, 200 mg/kg. However, the concentration was well below the EAL for restricted land use (industrial/commercial land uses) and direct exposure action level for construction/trench worker, 800 mg/kg. A summary of analytical results for metals is provided in Table 2.

Table 2. Summary of Soil/Metals Analytical Results

Sample ID / Analytes	Analytical Results for Surface Soil Samples (Unit: mg/kg)							Tier 1 EALs (mg/kg)
	1707-S1	1707-S2	1707-S3	1707-S4	1707-S5	1707-S6	1707-S7	
Arsenic	ND (0.27)	16	ND (0.26)	ND (0.23)	ND (0.25)	ND (0.24)	ND (0.23)	24
Cadmium	48	39	37	48	31	34	32	14
Barium	1.5	1.7	0.98	1.4	1.2	1.3	0.9	1,000
Chromium	230	230	190	250	220	250	220	1,100
Lead	39	35	7.3	130	18	**270**	7.6	200
Mercury	0.19	0.22	0.25	0.51	0.73	0.067	0.029	4.7
Selenium	15	11	8.7	14	18	ND (0.49)	5.7	78
Silver	0.84	0.93	0.84	1.1	1.3	0.82	0.71	78

Bold values indicate levels above the HDOH Tier 1 EAL.
Criteria: Hawaii Department of Health, Tier 1 Soil EAL with unrestricted land use above a drinking water resource and greater than 150 meters from surface water (Fall 2011)
Acronyms and Abbreviations:
EAL: Environmental Action Levels ND: Not Detected
mg/kg: milligrams per kilogram (00): Reporting Limit

3.2 Polychlorinated Biphenyls

Aroclors are commonly known trade names for PCB mixtures produced from approximately 1930 to 1979. There are many types of aroclors and each has a distinguishing suffix number that indicates the degree of chlorination (U.S. EPA, 2013). Aroclor-1254 and Aroclor-1260 were detected in the range of 0.024 to 0.55 mg/kg and 0.15 to 0.17, respectively. The total sum of

PCB concentrations was below the EAL, 1.1 mg/kg. A summary of analytical results for PCB is provided in Table 3.

Table 3. Summary of Soil/PCB Analytical Results

Sample ID / Analytes	Analytical Results for Surface Soil Samples (Unit: mg/kg)							Tier 1 EALs (mg/kg)
	1707-S1	1707-S2	1707-S3	1707-S4	1707-S5	1707-S6	1707-S7	
Aroclor-1016	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	1.1 (Total)
Aroclor-1221	ND (0.024)	ND (0.024)	ND (0.024)	ND (0.024)	ND (0.024)	ND (0.024)	ND (0.024)	
Aroclor-1232	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	
Aroclor-1242	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	
Aroclor-1248	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	ND (0.012)	
Aroclor-1254	ND (0.012)	ND (0.012)	ND (0.012)	0.38	ND (0.012)	0.55	0.024	
Aroclor-1260	ND (0.012)	ND (0.012)	ND (0.012)	0.17	ND (0.012)	0.15	ND (0.012)	

Criteria: Hawaii Department of Health, Tier 1 Soil EAL with unrestricted land use above a drinking water resource and greater than 150 meters from surface water (Fall 2011)
Acronyms and Abbreviations:
EAL: Environmental Action Levels
mg/kg: milligrams per kilogram
ND: Not Detected
(00): Reporting Limit

3.3 Total Petroleum Hydrocarbons

Reportable levels of TPH-GRO, TPH-DRO, and TPH-RRO were detected; the results were below the EALs. A summary of analytical results for TPH is provided in Table 4.

Table 4. Summary of Soil/TPH Analytical Results

Sample ID / Analytes	Analytical Results for Surface Soil Samples (Unit: mg/kg)							Tier 1 EALs (mg/kg)
	1707-S1	1707-S2	1707-S3	1707-S4	1707-S5	1707-S6	1707-S7	
TPH-GRO	0.73	0.77	ND (0.16)	4.1	0.64	1.1	ND (0.2)	100
TPH-DRO	52	44	4.2	19	33	30	12	100
TPH-RRO	99	84	13	100	59	55	56	500

Criteria: Hawaii Department of Health, Tier 1 Soil EAL with unrestricted land use above a drinking water resource and greater than 150 meters from surface water (Fall 2011)
Acronyms and Abbreviations:
EAL: Environmental Action Levels
mg/kg: milligrams per kilogram
ND: Not Detected
(00): Reporting Limit
TPH-DRO: Total Petroleum Hydrocarbons as Diesel Range Organics
TPH-GRO: Total Petroleum Hydrocarbons as Gasoline Range Organics
TPH-RRO: Total Petroleum Hydrocarbons as Residual Range Organics

3.4 Volatile Organic Compounds

None of the VOCs were detected except acetone and para-isopropyl toluene. Acetone was detected in the range of 0.028 to 0.75 mg/kg below the EAL, 1.0 mg/kg. Acetone is a common laboratory solvent, and detection in the sample is likely from the laboratory instruments. Para-isopropyl toluene was detected in the range of 0.0065 mg/kg to 1.7 mg/kg; no EAL was established by HDOH for this contaminant (Table 5).

Table 5. Summary of Soil/VOC Analytical Results

Sample ID / Analytes	Analytical Results for Surface Soil Samples (Unit: mg/kg)							Tier 1 EALs (mg/kg)
	1707-S1	1707-S2	1707-S3	1707-S4	1707-S5	1707-S6	1707-S7	
Freon 12	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	---
Chloromethane	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	0.1
Vinyl Chloride	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	0.072
Bromomethane	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	0.22
Chloroethane	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	1.1
Trichlorofluoromethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
Acetone	ND (1.3)	0.75	0.04	0.092	0.11	0.16	0.028	1.0
Freon 113	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
1,1-Dichloroethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.097
Methylene Chloride	ND (1.3)	ND (0.023)	ND (0.023)	ND (0.019)	ND (0.019)	ND (0.024)	ND (0.024)	0.11
Carbon Disulfide	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
MTBE	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.028
trans-1,2-Dichloroethene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	2.7
Vinyl Acetate	ND (3.3)	ND (0.059)	ND (0.056)	ND (0.047)	ND (0.046)	ND (0.059)	ND (0.061)	---
1,1-Dichloroethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.097
2-Butanone	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	---
cis-1,2-Dichloroethene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.31
2,2-Dichloropropane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
Chloroform	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.023
Bromochloromethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
1,1,1-Trichloroethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	23
1,1-Dichloropropene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
Carbon Tetrachloride	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.087
1,2-Dichloroethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0021
Benzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.3
Trichloroethene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.26
1,2-Dichloropropane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.052
Bromodichloromethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0022
Dibromomethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
4-Methyl-2-Pentanone	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	---
cis-1,3-Dicholoropropene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
Toluene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	3.2
trans-1,3-Dichloropropene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
1,1,2-Trichloroethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0089
2-Hexanone	ND (0.67)	ND (0.012)	ND (0.011)	ND (0.0093)	ND (0.0093)	ND (0.012)	ND (0.012)	---
1,3-Dichloropropane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0015
Tetrachloroethene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.088
Dibromochloromethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0016
1,2-Dibromoethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.00037
Chlorobenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	2.2
1,1,1,2-Tetrachloroethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.015
Ethylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	3.7
Xylenes	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	2.1
Styrene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.91

Analytes \ Sample ID	Analytical Results for Surface Soil Samples (Unit: mg/kg)							Tier 1 EALs (mg/kg)
	1707-S1	1707-S2	1707-S3	1707-S4	1707-S5	1707-S6	1707-S7	
Bromoform	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.69
Isopropylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
1,1,2,2-Tetrachloroethane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0012
1,2,3-Trichloropropane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0013
Propylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
Bromobenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
1,3,5-Trimethylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
2-Chlorotoluene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
4-Chlorotoluene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
tert-Butylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
1,2,4-Trimethylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
sec-Butylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
para-Isopropyl Toluene	1.7	0.12	0.0065	0.016	0.016	0.015	ND (0.0061)	---
1,3-Dichlorobenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.57
1,4-Dichlorobenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.047
n-Butylbenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---
1,2-Dicholorobenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.75
1,2-Dibromo-3-Chloropropane	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.0009
1,2,4-Trichlorobenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.098
Hexachlorobutadiene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	0.18
Naphthalene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	4.4
1,2,3-Trichlorobenzene	ND (0.33)	ND (0.0059)	ND (0.0056)	ND (0.0047)	ND (0.0046)	ND (0.0059)	ND (0.0061)	---

Criteria: Hawaii Department of Health, Tier 1 Soil EAL with unrestricted land use above a drinking water resource and greater than 150 meters from surface water (Fall 2011)

Acronyms and Abbreviations:
EAL: Environmental Action Levels
mg/kg: milligrams per kilogram
ND: Not Detected
VOC: Volatile Organic Compounds
---: No criteria available
(00): Reporting Limit

3.5 Semi-Volatile Organic Compounds

None of the SVOC were detected, except fluoranthene and pyrene in DA-S2, northwest side of the former generator building. Fluoranthene was detected in DA-S2 at 0.0084 mg/kg; the result was below the EAL, 460 mg/kg. Pyrene was detected also in DA-S2 at 0.0092 mg/kg; the result was below the EAL, 44 mg/kg. A summary of soil SVOC results is provided in Table 6.

Table 6. Summary of Soil/SVOC Analytical Results

Analytes \ Sample ID	Analytical Results for Surface Soil Samples (Unit: mg/kg)							Tier 1 EALs (mg/kg)
	1707-S1	1707-S2	1707-S3	1707-S4	1707-S5	1707-S6	1707-S7	
N-Nitrosodimethylamine	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
Phenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.16
bis(2-Chloroethyl)ether	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.000064
2-Chlorophenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.0092
1,3-Dichlorobenzene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.057
1,4-Dichlorobenzene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.0047
Benzyl alcohol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
1,2-Dicholorobenzene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.75
2-Methylphenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
bis(2-Chloroisopropyl)ether	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.0035
4 - Methylphenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
N-Nitroso-di-n-propylamine	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
Hexachloroethane	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.27
Nitrobenzene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.0046
Isophorone	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.77
2-Nitrophenol	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	---
2,4-Dimethylphenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	9.9
Benzoic acid	ND (1.7)	ND (1.7)	ND (1.7)	ND (1.7)	ND (1.7)	ND (1.7)	ND (1.7)	---
bis(2-Chloroethoxy) methane	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
2,4-Dichlorophenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.025
1,2,4-Trichlorobenzene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.098
Naphthalene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	4.4
4-Chloroaniline	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
Hexachlorobutadiene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.18
4-Chloro-3-methylphenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
2-Methylnapthalene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	4.1
Hexachlorocylopentadiene	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	---
2,4,6-Trichlorophenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	1.8
2,4,5-Trichlorophenol	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	29
2-Chloronaphthalene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
2-Nitroaniline	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	---
Dimethylphthalate	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	22
Acenaphthylene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	100
2,6-Dinitrotoluene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	3.6

Sample ID / Analytes	Analytical Results for Surface Soil Samples (Unit: mg/kg)							Tier 1 EALs (mg/kg)
	1707-S1	1707-S2	1707-S3	1707-S4	1707-S5	1707-S6	1707-S7	
3-Nitroaniline	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	---
Acenaphthene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	120
2,4-Dinitrophenol	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	5.6
4-Nitrophenol	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	---
Dibenzofuran	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
2,4-Dinitrotoluene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.021
Diethylphthalate	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	16
Fluorene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	100
4-Chlorophenyl-phenylether	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
4-Nitroaniline	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	---
4,6-Dinitro-2-methylphenol	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	---
N-Nitrosodiphenylamine	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
Azobenzene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
4-Bromophenyl-phenylether	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
Hexachlorobenzene	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	0.3
Pentachlorophenol	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	0.82
Phenanthrene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	440
Anthracene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	4.3
Di-n-butylphthalate	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
Fluoranthene	ND (0.067)	0.0084	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	460
Pyrene	ND (0.067)	0.0092	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	44
Butylbenzylphthalate	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
3,3'-Dichlorobenzidine	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.67)	ND (0.66)	0.079
Benzo(a)anthracene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	1.5
Chrysene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	30
bis(2-Etyhlhexyl)phthalate	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	35
Di-n-octylphthalate	ND (0.34)	ND (0.33)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.33)	---
Benzo(b)fluoranthene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	1.5
Benzo(k)fluoranthene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	15
Benzo(a)pyrene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	0.15
Indeno(1,2,3-cd)pyrene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	1.5
Dibenzo(a,h)anthracene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	0.15
Benzo(g,h,i)perylene	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.066)	35

Criteria: Hawaii Department of Health, Tier 1 Soil EAL with unrestricted land use above a drinking water resource and greater than 150 meters from surface water (Fall 2011)
Acronyms and Abbreviations:
EAL: Environmental Action Levels
mg/kg: milligrams per kilogram
ND: Not Detected
SVOC: Semi Volatile Organic Compounds
---: No criteria available
(00): Reporting Limit

4.0 DATA QUALITY REVIEW

MNA conducted an analytical data quality review to determine the usability of the data generated by performing a data check for sample preservation methods, technical sample holding times, method blanks, laboratory control sample/laboratory control sample duplicate (LCS/LCSD), matrix spike/matrix spike duplicate (MS/MSD), and surrogate recoveries. All technical holding times were met. The LCS/LCSD, MS/MSD, and surrogate recoveries were within the laboratory acceptable ranges. Based on the analytical data review, MNA concluded that the analytical results are considered valid and useable.

5.0 SUMMARY

During December 4-5, 2013, MNA conducted a surface soil screening survey for ICSD, Pahole Radio Facility located at Mokuleia, Island of Oahu, Hawaii. The purpose of the surface screening survey was to identify the presence of potentially hazardous soil contaminants and associated risks that would be encountered during the earthwork for construction. The soil screening was limited to the areas anticipated to be disturbed by the demolition of the former generator building; construction of new ICSD building and telecom facility; relocation of the three existing water tanks; and erosion control area.

MNA defined seven DA based on the planned earthwork activities, as follows:

- DA-S1: Northeast side of former Generator Building to be demolished (Sample ID: 1707-S1)
- DA-S2: Northwest side of former Generator Building to be demolished (Sample ID: 1707-S2)
- DA-S3: Southwest side of former Generator Building to be demolished (Sample ID: 1707-S3)
- DA-S4: Erosion control area (Sample ID: 1707-S4)
- DA-S5: Proposed new Telecom Facility (Sample ID: 1707-S5)
- DA-S6: Proposed area for water tank relocation (Sample ID: 1707-S6)
- DA-S7: Proposed new ICSD Facility (Sample ID: 1707-S7)

Composite sampling technique was employed for soil samples. The soil samples were collected from the surface at 2 to 8 inch bgs. Each composite sample was prepared by collecting 10 sub-samples from each DA using a hand auger, and combining the sub-samples into a single

laboratory sample. The composite samples were analyzed for RCRA 8 metals, PCB, TPH-GRO/DRO/RRO, VOC, and SVOC.

The analytical results were compared to the HDOH Tier 1 EAL for unrestricted (residential) land use above a drinking water resource and greater than 150 meters from surface water (Fall 2011).

Reportable levels of arsenic, cadmium, barium, chromium, lead, mercury, selenium, and silver were detected. All results were below the EALs for unrestricted land use except lead. The sample collected from DA-S6 detected lead at 270 milligrams per kilogram (mg/kg), which exceeded the Tier 1 EAL for unrestricted land use, 200 mg/kg. However, the concentration was well below the EAL for restricted land use (industrial/commercial land uses) and direct exposure action level for construction/trench worker, 800 mg/kg.

PCB including Aroclor-1254 and Aroclor-1260 were detected in the range of 0.024 to 0.55 mg/kg and 0.15 to 0.17 mg/kg, respectively. The total sum of PCB concentrations, however, was below the EAL, 1.1 mg/kg.

Reportable levels of TPH-GRO, TPH-DRO, and TPH-RRO were detected, and the results were below the EALs.

None of VOC were detected except acetone and para-isopropyl toluene. Acetone was detected in the range of 0.028 mg/kg to 0.75 mg/kg, below the EAL, 1.0 mg/kg; detection of acetone is likely from the laboratory instruments. Para-isopropyl toluene was detected in the range of 0.0065 mg/kg to 1.7 mg/kg; no EAL was established by HDOH.

SVOC including fluoranthene and pyrene were detected, well below the EALs.

During the soil sampling, no signs of soil contamination such as discoloration or chemical odors were observed, except for paint debris in the tower area ground surface, containing high level of lead. The paint debris was collected and analyzed, and the report is provided under a separate cover.

6.0 RECOMMENDATIONS

Based on the results of the screening survey, MNA recommends the following:

- The surface soil of the areas to be disturbed contains reportable levels of metals, PCB, TPH, VOC, and SVOC. All concentrations of detected analytes, except lead, are well below the EALs of unrestricted land use. Lead concentration exceeded the EAL of unrestricted land use, but it was below the restricted land use and direct exposure action level for construction/trench worker. Earthwork, however, may cause a potential exposure to the workers and the facility users via fugitive dust. The routes of exposure of impacted soil as fugitive dust are by inhalation, ingestion, and dermal contact. The Contractor shall use engineering controls such as water misting and wind barriers to control fugitive dust.
- No off-site disposal of the site soils is warranted. However, excess soil that will be transported off-site for re-use or disposal shall be tested to ensure compliance with the recipient guidelines and requirements.
- Use of Best Management Practices (BMP), such as dust control and erosion control, must be implemented to prevent surface runoff.

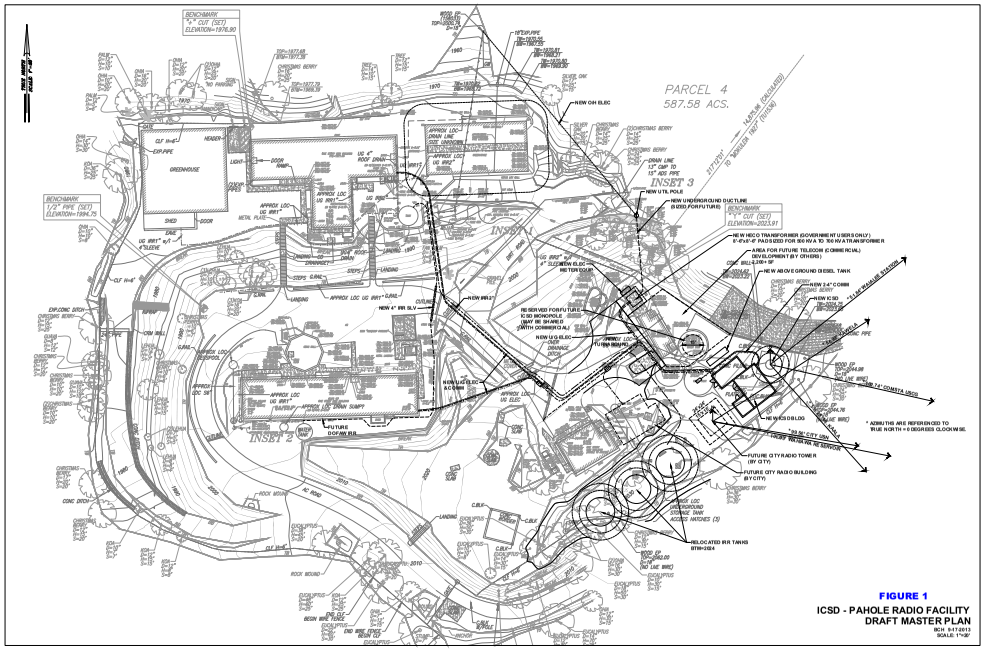
7.0 REFERENCES

State of Hawaii, Department of Health. (2011; rev Jan 2012). *Tier 1 Environmental Action Levels Surfer*. Hawaii Department of Health.

U.S. EPA. (2013, August 19). *Aroclor and Other PCB Mixtures*. Retrieved December 18, 2013, from U.S. EPA: http://www.epa.gov/osw/hazard/tsd/pcbs/pubs/aroclor.htm

APPENDIX A. FIGURES

Figure 1. Location Map
Figure 2. Sampling Locations



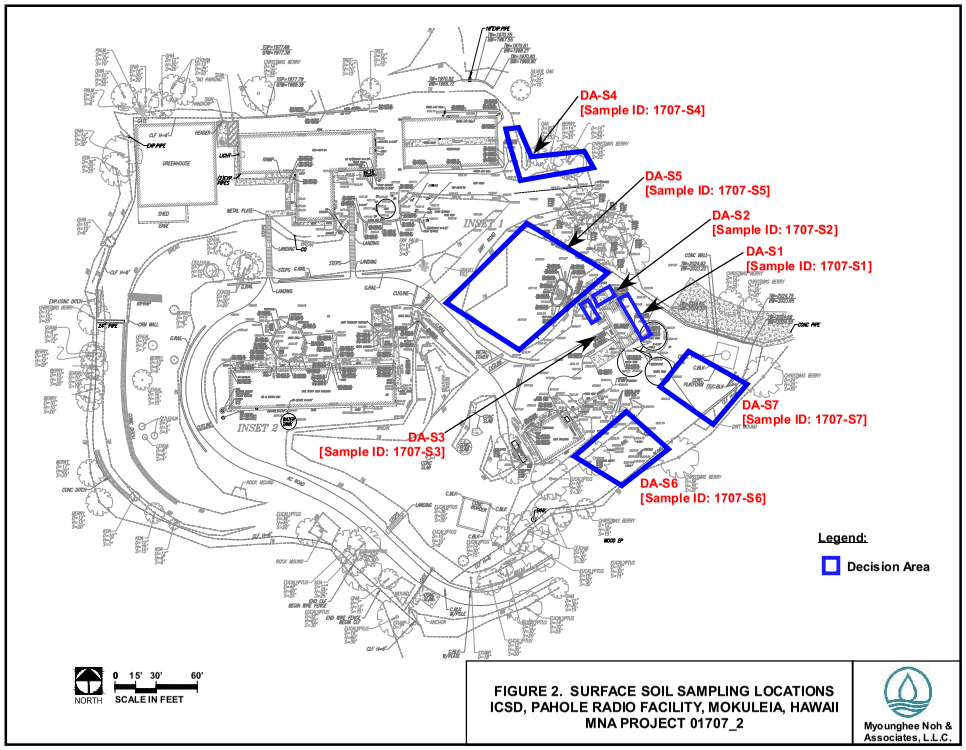
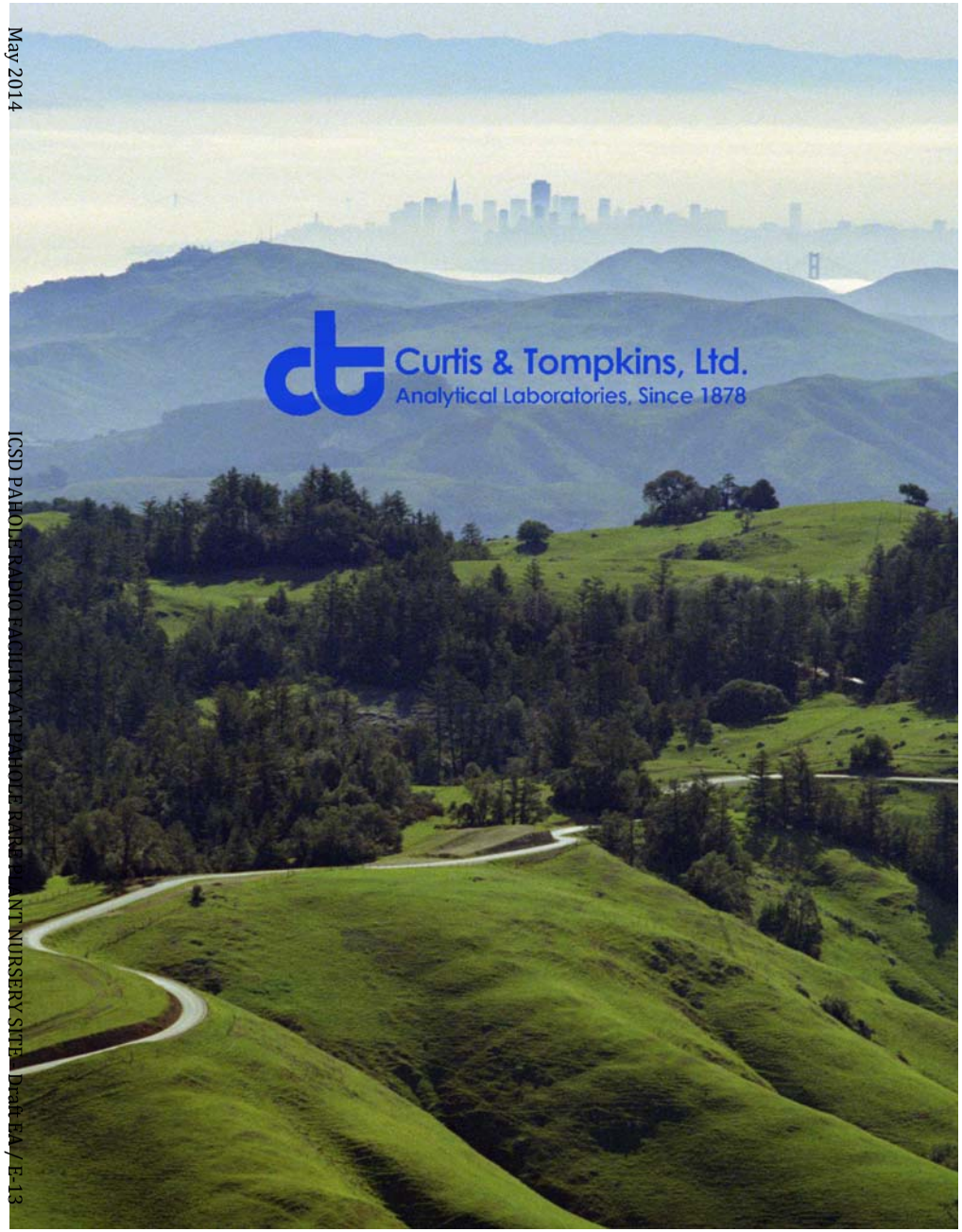


FIGURE 2. SURFACE SOIL SAMPLING LOCATIONS
ICSD, PAHOLE RADIO FACILITY, MOKULEIA, HAWAII
MNA PROJECT 01707_2

APPENDIX B LABORATORY ANALYTICAL REPORT



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 251489
ANALYTICAL REPORT

Myounghee Noh & Associates	Project	: 21707
99-1046 Iwaena Street	Location	: DAGS Pahole Radio Facility
Aiea, HI 96701	Level	: II

Sample ID	Lab ID
1707-S1	251489-001
1707-S2	251489-002
1707-S3	251489-003
1707-S4	251489-004
1707-S5	251489-005
1707-S6	251489-006
1707-S7	251489-007
PAHOLE TB	251489-008

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Isabelle Choy Date: 12/16/2013

Isabelle Choy
Project Manager
isabelle.choy@ctberk.com

NELAP # 01107CA

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	251489
Client:	Myounghee Noh & Associates
Project:	21707
Location:	DAGS Pahole Radio Facility
Request Date:	12/10/13
Samples Received:	12/10/13

This data package contains sample and QC results for seven soil samples and one water sample, requested for the above referenced project on 12/10/13. The samples were received cold and intact.

TPH-Purgeables and/or BTXE by GC (EPA 8015B) Water:
No analytical problems were encountered.

TPH-Purgeables and/or BTXE by GC (EPA 8015B) Soil:
High surrogate recovery was observed for bromofluorobenzene (FID) in 1707-S4 (lab # 251489-004). No other analytical problems were encountered.

TPH-Extractables by GC (EPA 8015B):
1707-S7 (lab # 251489-007) was diluted due to the dark and viscous nature of the sample extract. No other analytical problems were encountered.

Volatile Organics by GC/MS (EPA 8260B):
Matrix spikes were not performed for this analysis in batch 206045 due to insufficient sample amount. 1707-S7 (lab # 251489-007) was not diluted; the low sample weight is due to 5035 packaging. 1707-S1 (lab # 251489-001) was diluted due to high non-target analytes. No other analytical problems were encountered.

Semivolatile Organics by GC/MS (EPA 8270C):
Low recovery was observed for phenol in the MS for batch 205938, due to matrix interference; the parent sample was not a project sample, the low recovery was confirmed by re-analysis, and the LCS was within limits. High RPD was also observed for phenol in the MS/MSD for batch 205938, due to matrix interference; the high RPD was confirmed by re-analysis, and this analyte was not detected at or above the RL in the associated samples. No other analytical problems were encountered.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. No analytical problems were encountered.

Metals (EPA 6010B and EPA 7471A):
No analytical problems were encountered.

CHAIN OF CUSTODY

Page 1 of 1

Chain of Custody # _____

Curtis & Tompkins Laboratories
ENVIRONMENTAL ANALYTICAL TESTING LABORATORY
In Business Since 1878

2323 Fifth Street
Berkeley, CA 94710
Phone (510) 486-0900
Fax (510) 486-0532

C&T LOGIN # 251489

Project No: 21707
Sampler:
Project Name: DAGS Pahole radio facility
Report To: Bryan Chinaka + Eunjin Kathkerte
Project P.O. No:
Company: Myounghee Noh + Associates
EDD Format: PDF Report Level ☒ II ☐ III ☐ IV
Telephone: 404-551-2396
Turnaround Time: ☒ RUSH 3 day TAT ☐ Standard
Email: bryan@noh-associates.com + eunjin@noh-associates.com

ANALYTICAL REQUEST

Lab No.	Sample ID.	SAMPLING: Date Collected	SAMPLING: Time Collected	MATRIX: Water	MATRIX: Solid	MATRIX: Soil	# of Containers	CHEMICAL PRESERVATIVE: HCl	~~H2SO4~~	~~MeOH~~	~~HNO3~~	NaOH	None	TPH-GRO	TPH-DRO/TRO	SVOCs	PCB	RCRA 8 metals	VOCs
1	1707-S1	12-4-13	12 40			X	7		2	4			1	X	X	X	X	X	X
2	1707-S2	12-4-13	13 20			X	7		2	4			1	X	X	X	X	X	X
3	1707-S3	12-5-13	10 40			X	7		2	4			1	X	X	X	X	X	X
4	1707-S4	12-5-13	11 30			X	7		2	4			1	X	X	X	X	X	X
5	1707-S5	12-5-13	13 10			X	7		2	4			1	X	X	X	X	X	X
6	1707-S6	12-4-13	14 40			X	7		2	4			1	X	X	X	X	X	X
7	1707-S7	12-4-13	14 45			X	7		2	4			1	X	X	X	X	X	X
8	Pahole TB	N/A	N/A	X			3							X	X				

Notes:
- All samples are composite samples. Homogenize before analysis
- Sieving samples to exclude aggregate particles.

SAMPLE RECEIPT: ☐ Intact ☐ Cold ☐ On Ice ☐ Ambient

RELINQUISHED BY:
Bryan Chinaka — DATE: 12/ — TIME: 13:00
DATE: — TIME:
DATE: — TIME:

RECEIVED BY:
Eunjin Kathkerte — DATE: 12/10/13 — TIME: 1000
DATE: — TIME:
DATE: — TIME:

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 251489 Date Received 12/10/13 Number of coolers 1
Client MN & A Project DAGS PAHOLE RADIO FACILITY (21707)

Date Opened 12/10/13 By (print) TR (sign) Tina Rankou
Date Logged in ↓ By (print) ↓ (sign) ↓

1. Did cooler come with a shipping slip (airbill, etc) FEDEX (YES) NO
   Shipping info 8742 3877 4450
2A. Were custody seals present? .... ☒ YES (circle) on cooler on samples ☐ NO
   How many — Name — Date —
2B. Were custody seals intact upon arrival? (YES) NO N/A
3. Were custody papers dry and intact when received? (YES) NO
4. Were custody papers filled out properly (ink, signed, etc)? (YES) NO
5. Is the project identifiable from custody papers? (If so fill out top of form) (YES) NO
6. Indicate the packing in cooler: (if other, describe)
   ☒ Bubble Wrap ☐ Foam blocks ☒ Bags ☐ None
   ☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels
7. Temperature documentation: * Notify PM if temperature exceeds 6°C
   Type of ice used: ☐ Wet ☒ Blue/Gel ☐ None Temp(°C) 6.4
   ☒ Samples Received on ice & cold without a temperature blank; temp. taken with IR gun
   ☐ Samples received on ice directly from the field. Cooling process had begun
8. Were Method 5035 sampling containers present? (YES) NO
   If YES, what time were they transferred to freezer? 1145
9. Did all bottles arrive unbroken/unopened? (YES) NO
10. Are there any missing / extra samples? YES (NO)
11. Are samples in the appropriate containers for indicated tests? (YES) NO
12. Are sample labels present, in good condition and complete? (YES) NO
13. Do the sample labels agree with custody papers? (YES) NO
14. Was sufficient amount of sample sent for tests requested? (YES) NO
15. Are the samples appropriately preserved? YES NO (N/A)
16. Did you check preservatives for all bottles for each sample? YES NO (N/A)
17. Did you document your preservative check? YES NO (N/A)
18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO (N/A)
19. Did you change the hold time in LIMS for preserved terracores? (YES) NO N/A
20. Are bubbles > 6mm absent in VOA samples? YES NO (N/A)
21. Was the client contacted concerning this sample delivery? YES (NO)
   If YES, Who was called? By Date:

COMMENTS

Rev 10, 11/11

Curtis & Tompkins, Ltd.

Total Volatile Hydrocarbons

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5030B
Project#:	21707	Analysis:	EPA 8015B
Field ID:	PAHOLE TB	Batch#:	206060
Matrix:	Water	Sampled:	12/04/13
Units:	ug/L	Received:	12/10/13
Diln Fac:	1.000	Analyzed:	12/12/13

Type: SAMPLE Lab ID: 251489-008

Analyte	Result	RL
Gasoline C7-C12	ND	50

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	98	77-128

Type: BLANK Lab ID: QC720107

Analyte	Result	RL
Gasoline C7-C12	ND	50

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	83	77-128

ND= Not Detected
RL= Reporting Limit

Page 1 of 1 22.1

Curtis & Tompkins, Ltd.

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5030B
Project#:	21707	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC720106	Batch#:	206060
Matrix:	Water	Analyzed:	12/12/13
Units:	ug/L		

Analyte	Spiked	Result	%REC	Limits
Gasoline C7-C12	1,000	913.0	91	80-120

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	81	77-128

Curtis & Tompkins, Ltd.

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5030B
Project#:	21707	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Batch#:	206060
MSS Lab ID:	251541-001	Sampled:	12/11/13
Matrix:	Water	Received:	12/11/13
Units:	ug/L	Analyzed:	12/12/13
Diln Fac:	1.000		

Type: MS Lab ID: QC720108

Analyte	MSS Result	Spiked	Result	%REC	Limits
Gasoline C7-C12	19.02	2,000	1,947	96	74-120

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	95	77-128

Type: MSD Lab ID: QC720109

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Gasoline C7-C12	2,000	1,960	97	74-120	1	27

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	105	77-128

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Gasoline by GC/FID (5035 Prep)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8015B
Matrix:	Soil	Batch#:	206057
Units:	mg/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Field ID: 1707-S1 Lab ID: 251489-001
Type: SAMPLE Sampled: 12/04/13

Analyte	Result	RL
Gasoline C7-C12	0.73 Y	0.28

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	102	67-137

Field ID: 1707-S2 Lab ID: 251489-002
Type: SAMPLE Sampled: 12/04/13

Analyte	Result	RL
Gasoline C7-C12	0.77 Y	0.26

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	124	67-137

Field ID: 1707-S3 Lab ID: 251489-003
Type: SAMPLE Sampled: 12/05/13

Analyte	Result	RL
Gasoline C7-C12	ND	0.16

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	123	67-137

Field ID: 1707-S4 Lab ID: 251489-004
Type: SAMPLE Sampled: 12/05/13

Analyte	Result	RL
Gasoline C7-C12	4.1 Y	0.25

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	160 *	67-137

Field ID: 1707-S5 Lab ID: 251489-005
Type: SAMPLE Sampled: 12/05/13

Analyte	Result	RL
Gasoline C7-C12	0.64 Y	0.18

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	121	67-137

*= Value outside of QC limits; see narrative
Y= Sample exhibits chromatographic pattern which does not resemble standard
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Gasoline by GC/FID (5035 Prep)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8015B
Matrix:	Soil	Batch#:	206057
Units:	mg/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Field ID: 1707-S6 Lab ID: 251489-006
Type: SAMPLE Sampled: 12/04/13

Analyte	Result	RL
Gasoline C7-C12	1.1 Y	0.25

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	130	67-137

Field ID: 1707-S7 Lab ID: 251489-007
Type: SAMPLE Sampled: 12/04/13

Analyte	Result	RL
Gasoline C7-C12	ND	0.20

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	109	67-137

Type: BLANK Lab ID: QC720096

Analyte	Result	RL
Gasoline C7-C12	ND	0.20

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	92	67-137

*= Value outside of QC limits; see narrative
Y= Sample exhibits chromatographic pattern which does not resemble standard
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Gasoline by GC/FID (5035 Prep)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC720095	Batch#:	206057
Matrix:	Soil	Analyzed:	12/12/13
Units:	mg/Kg		

Analyte	Spiked	Result	%REC	Limits
Gasoline C7-C12	1.000	1.040	104	80-120

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	107	67-137

Curtis & Tompkins, Ltd.

Batch QC Report

Gasoline by GC/FID (5035 Prep)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5030B
Project#:	21707	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Diln Fac:	1.000
MSS Lab ID:	251466-005	Batch#:	206057
Matrix:	Soil	Sampled:	12/09/13
Units:	mg/Kg	Received:	12/09/13
Basis:	as received	Analyzed:	12/12/13

Type: MS Lab ID: QC720136

Analyte	MSS Result	Spiked	Result	%REC	Limits
Gasoline C7-C12	<0.07733	10.20	6.751	66	42-120

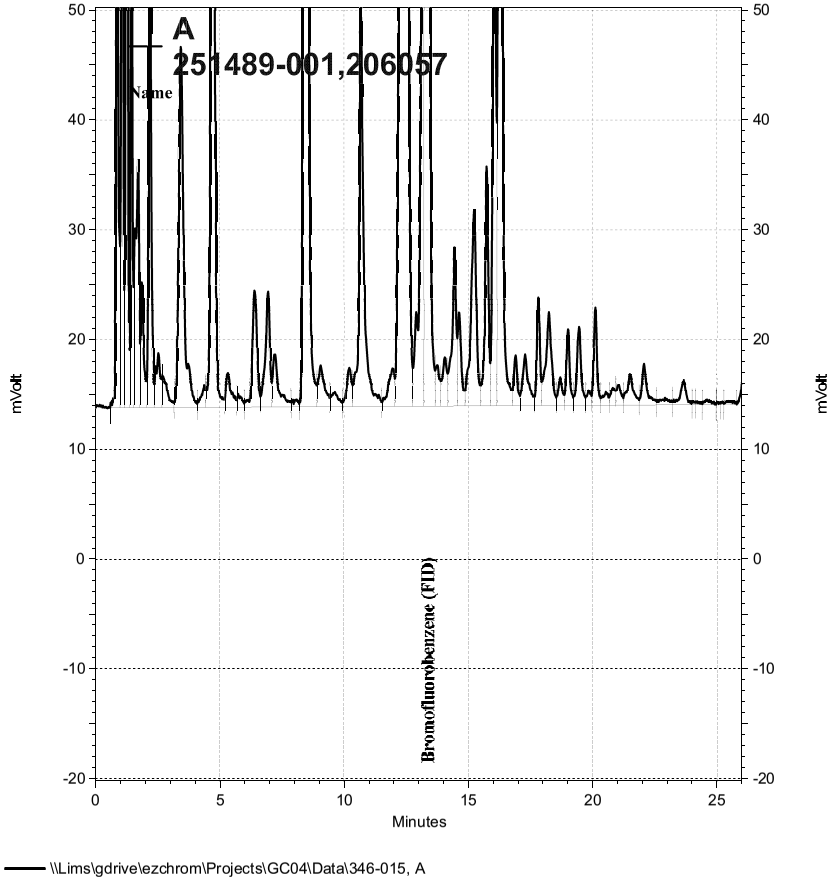
Surrogate	%REC	Limits
Bromofluorobenzene (FID)	110	67-137

Type: MSD Lab ID: QC720137

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Gasoline C7-C12	9.709	6.387	66	42-120	1	44

Surrogate	%REC	Limits
Bromofluorobenzene (FID)	108	67-137

RPD= Relative Percent Difference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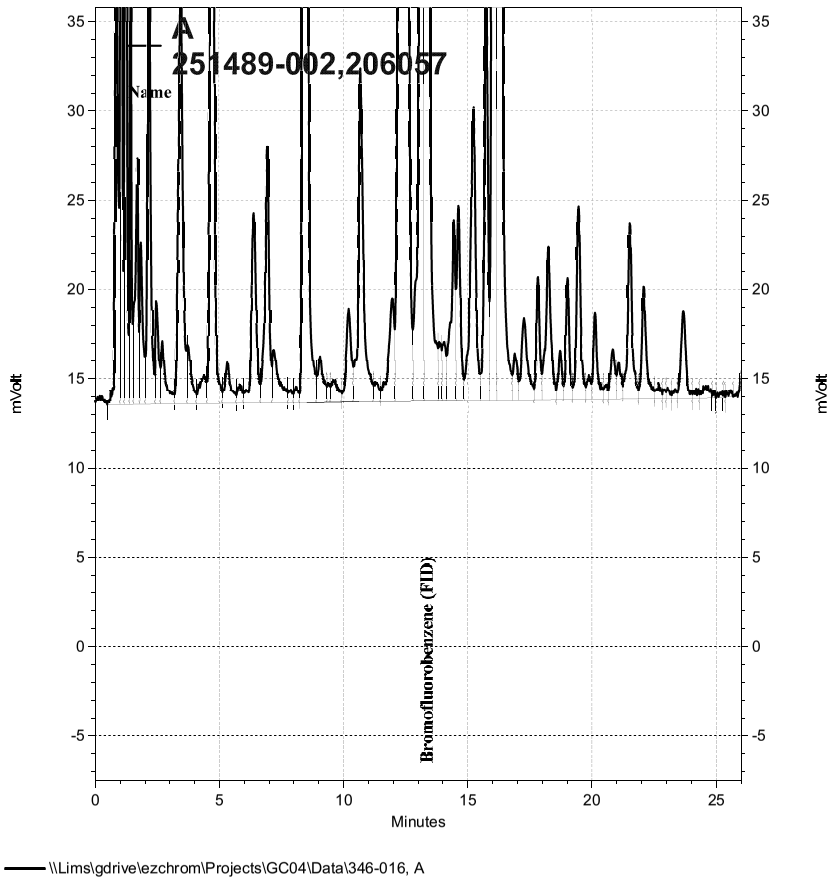
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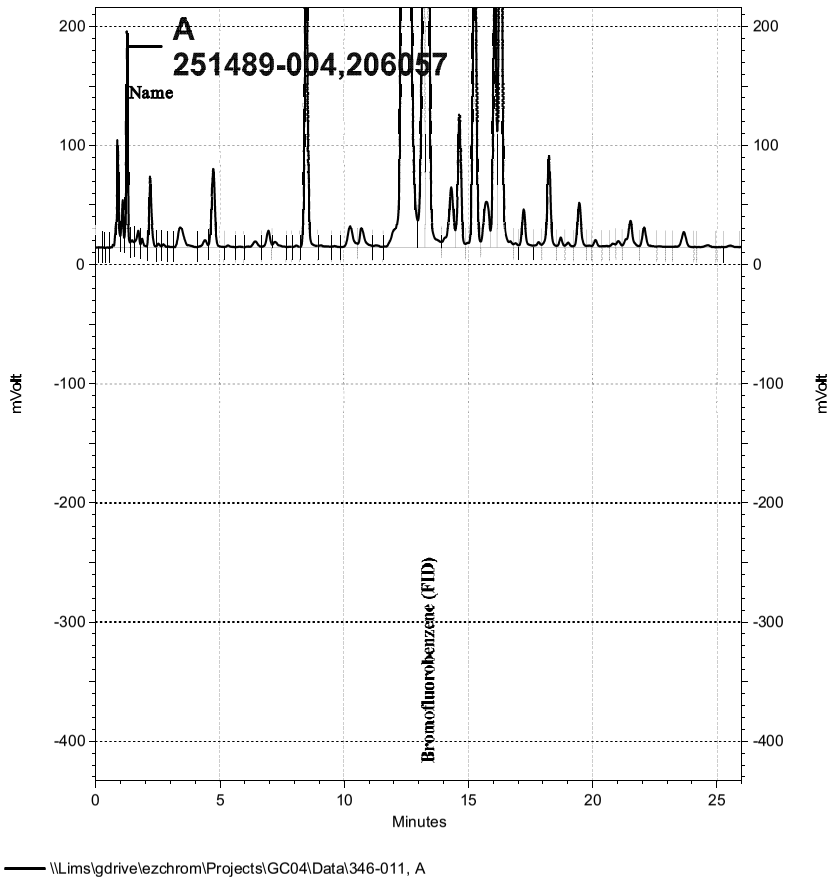
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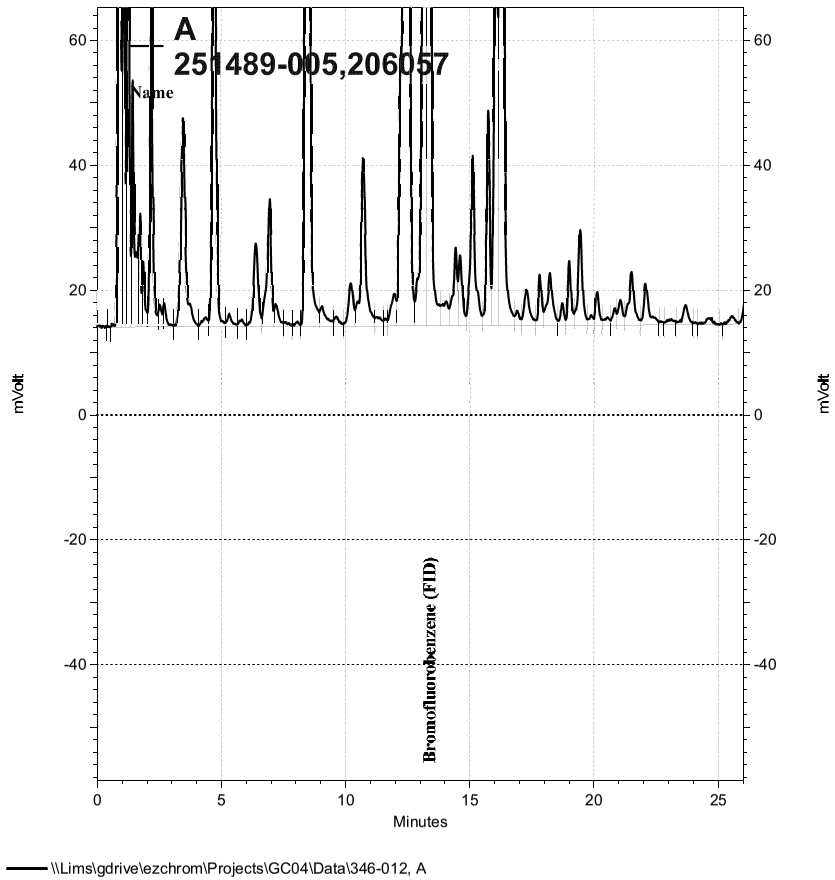
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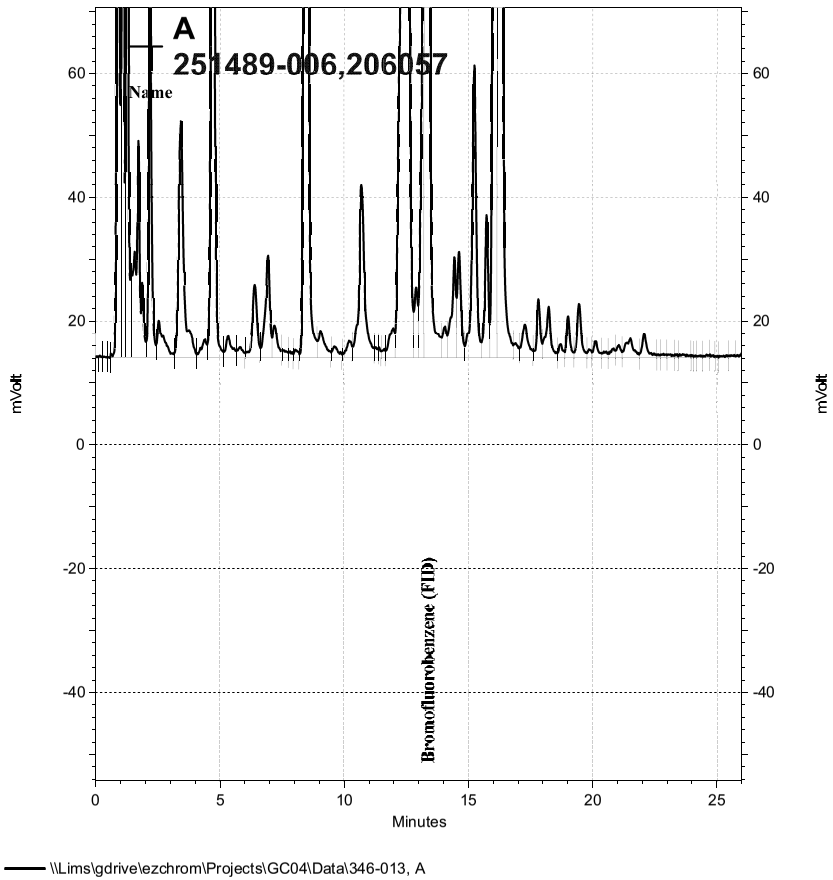
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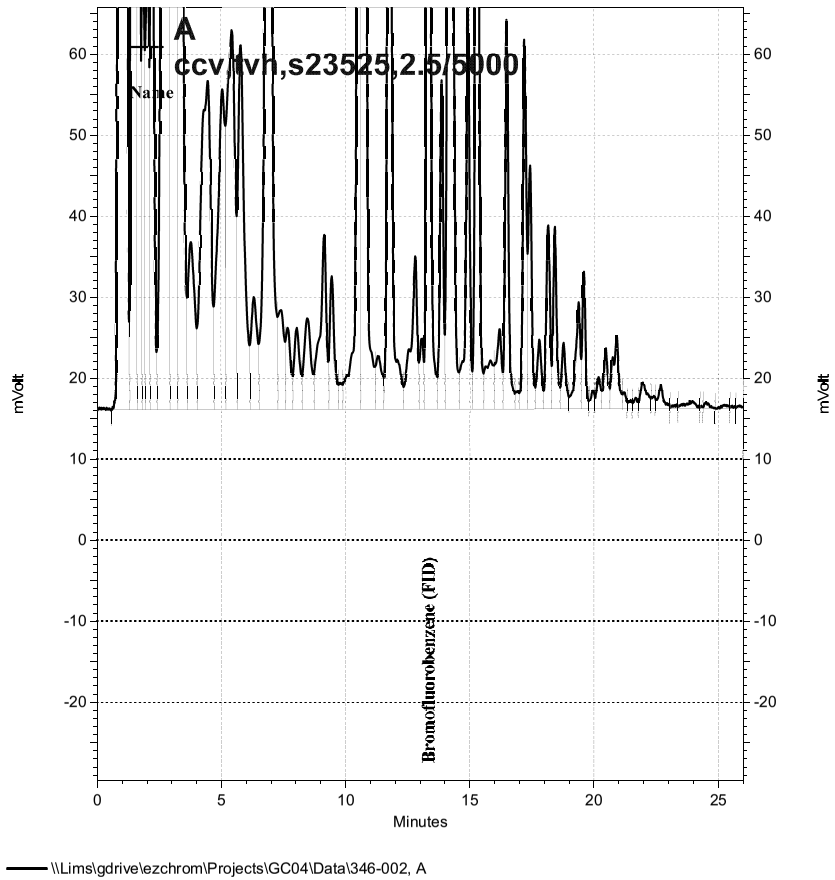
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mVolt
Minutes
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Curtis & Tompkins, Ltd.

Total Extractable Hydrocarbons

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8015B
Matrix:	Soil	Batch#:	206022
Units:	mg/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/11/13

Field ID:	1707-S1	Diln Fac:	1.000
Type:	SAMPLE	Sampled:	12/04/13
Lab ID:	251489-001	Analyzed:	12/12/13

Analyte	Result	RL
Diesel C10-C24	52 Y	1.0
Motor Oil C24-C36	99	5.0

Surrogate	%REC	Limits
o-Terphenyl	95	64-136

Field ID:	1707-S2	Diln Fac:	1.000
Type:	SAMPLE	Sampled:	12/04/13
Lab ID:	251489-002	Analyzed:	12/12/13

Analyte	Result	RL
Diesel C10-C24	44 Y	0.99
Motor Oil C24-C36	84	5.0

Surrogate	%REC	Limits
o-Terphenyl	90	64-136

Field ID:	1707-S3	Diln Fac:	1.000
Type:	SAMPLE	Sampled:	12/05/13
Lab ID:	251489-003	Analyzed:	12/12/13

Analyte	Result	RL
Diesel C10-C24	4.2 Y	1.0
Motor Oil C24-C36	13	5.0

Surrogate	%REC	Limits
o-Terphenyl	99	64-136

Field ID:	1707-S4	Diln Fac:	1.000
Type:	SAMPLE	Sampled:	12/05/13
Lab ID:	251489-004	Analyzed:	12/12/13

Analyte	Result	RL
Diesel C10-C24	19 Y	0.99
Motor Oil C24-C36	100	5.0

Surrogate	%REC	Limits
o-Terphenyl	71	64-136

Y= Sample exhibits chromatographic pattern which does not resemble standard
DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Total Extractable Hydrocarbons

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8015B
Matrix:	Soil	Batch#:	206022
Units:	mg/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/11/13

Field ID:	1707-S5	Diln Fac:	1.000
Type:	SAMPLE	Sampled:	12/05/13
Lab ID:	251489-005	Analyzed:	12/12/13

Analyte	Result	RL
Diesel C10-C24	33 Y	0.99
Motor Oil C24-C36	59	5.0

Surrogate	%REC	Limits
o-Terphenyl	78	64-136

Field ID:	1707-S6	Diln Fac:	1.000
Type:	SAMPLE	Sampled:	12/04/13
Lab ID:	251489-006	Analyzed:	12/13/13

Analyte	Result	RL
Diesel C10-C24	30 Y	1.0
Motor Oil C24-C36	55	5.0

Surrogate	%REC	Limits
o-Terphenyl	102	64-136

Field ID:	1707-S7	Diln Fac:	10.00
Type:	SAMPLE	Sampled:	12/04/13
Lab ID:	251489-007	Analyzed:	12/13/13

Analyte	Result	RL
Diesel C10-C24	12 Y	9.9
Motor Oil C24-C36	56	50

Surrogate	%REC	Limits
o-Terphenyl	DO	64-136

Type:	BLANK	Analyzed:	12/12/13
Lab ID:	QC719960	Cleanup Method:	EPA 3630C
Diln Fac:	1.000		

Analyte	Result	RL
Diesel C10-C24	ND	1.0
Motor Oil C24-C36	ND	5.0

Surrogate	%REC	Limits
o-Terphenyl	95	64-136

Y= Sample exhibits chromatographic pattern which does not resemble standard
DO= Diluted Out
ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Total Extractable Hydrocarbons

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC719961	Batch#:	206022
Matrix:	Soil	Prepared:	12/11/13
Units:	mg/Kg	Analyzed:	12/12/13

Cleanup Method: EPA 3630C

Analyte	Spiked	Result	%REC	Limits
Diesel C10-C24	49.80	32.82	66	61-132

Surrogate	%REC	Limits
o-Terphenyl	91	64-136

Curtis & Tompkins, Ltd.

Batch QC Report

Total Extractable Hydrocarbons

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Batch#:	206022
MSS Lab ID:	251356-001	Sampled:	12/05/13
Matrix:	Soil	Received:	12/05/13
Units:	mg/Kg	Prepared:	12/11/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	5.000		

Type: MS Cleanup Method: EPA 3630C
Lab ID: QC719962

Analyte	MSS Result	Spiked	Result	%REC	Limits
Diesel C10-C24	532.1	49.68	431.6	-202 NM	40-146

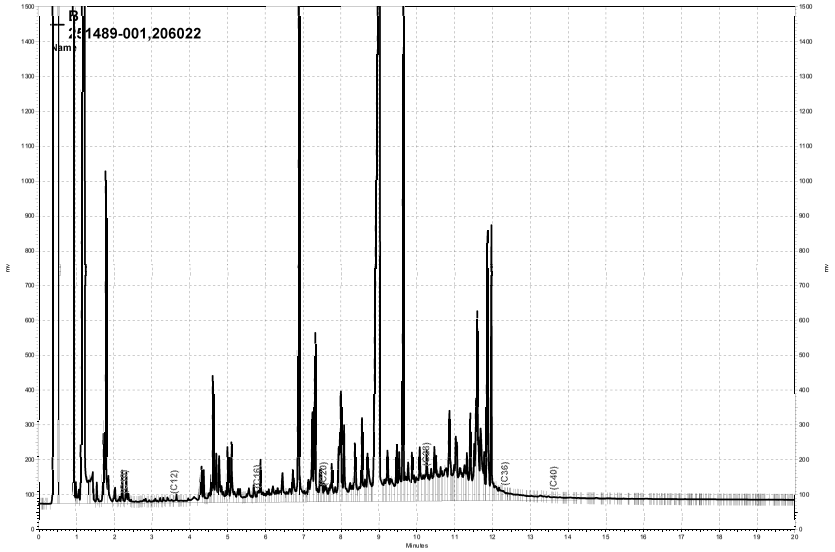
Surrogate	%REC	Limits
o-Terphenyl	88	64-136

Type: MSD Cleanup Method: EPA 3630C
Lab ID: QC719963

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Diesel C10-C24	49.85	454.9	-155 NM	40-146	5	56

Surrogate	%REC	Limits
o-Terphenyl	100	64-136

NM= Not Meaningful: Sample concentration > 4X spike concentration
RPD= Relative Percent Difference



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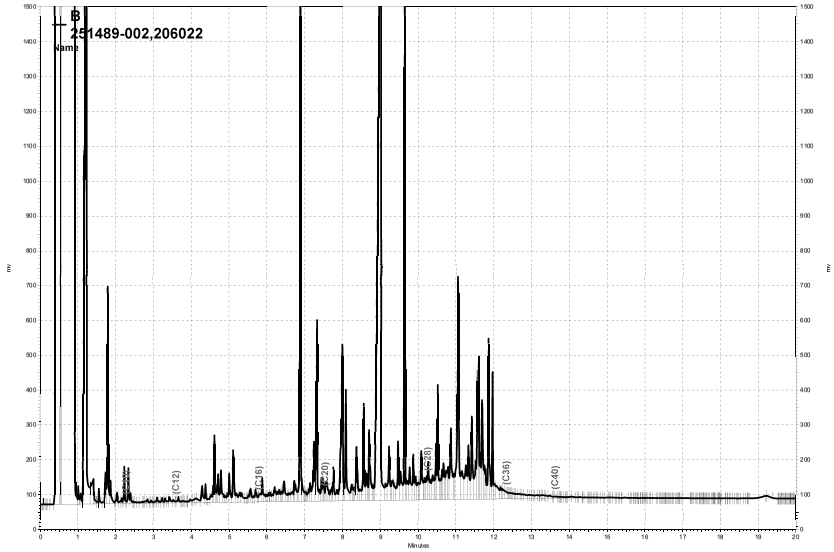

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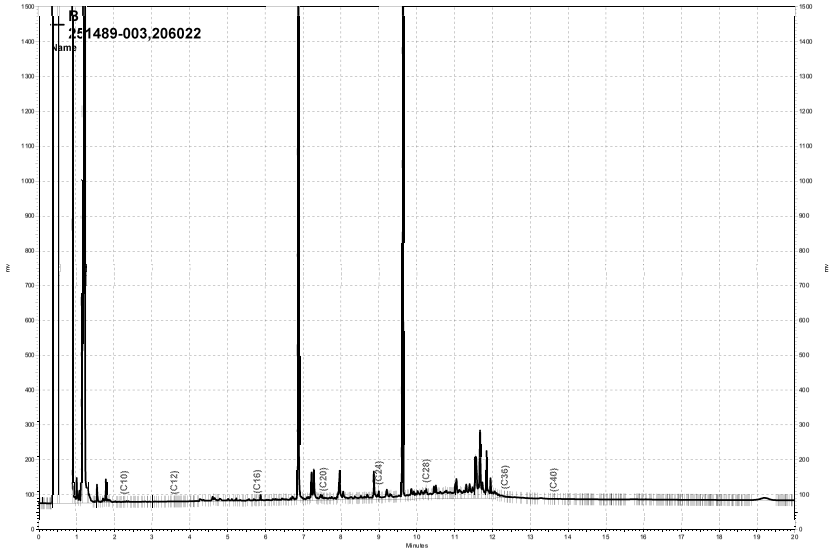

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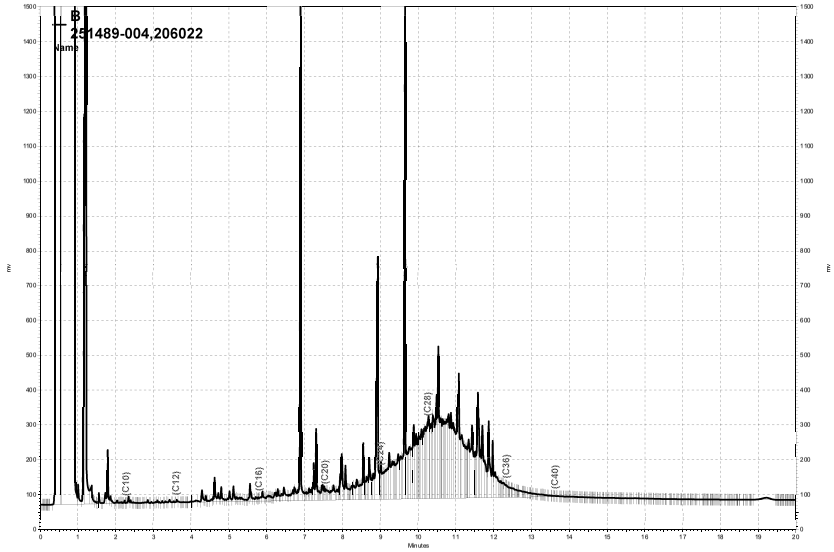

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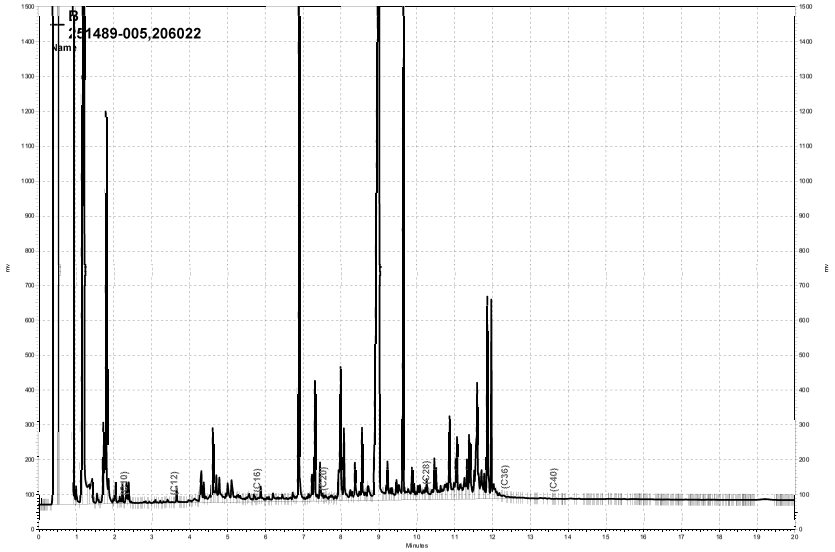

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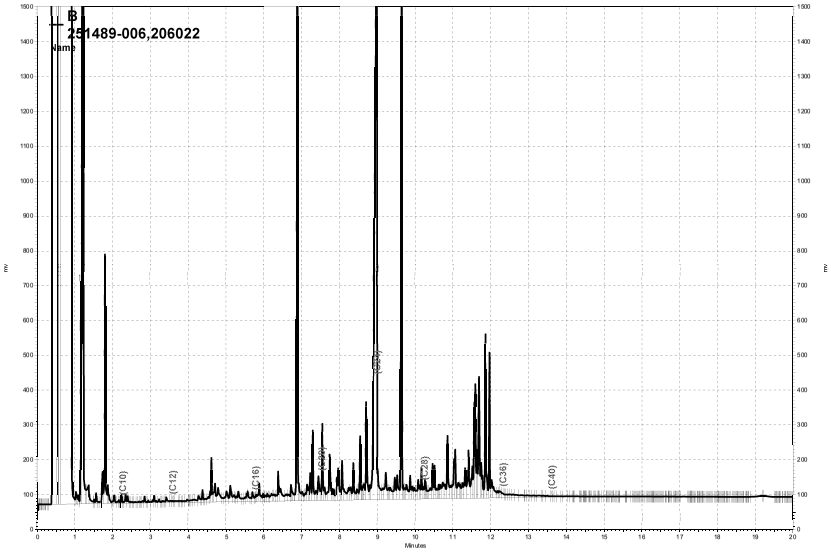

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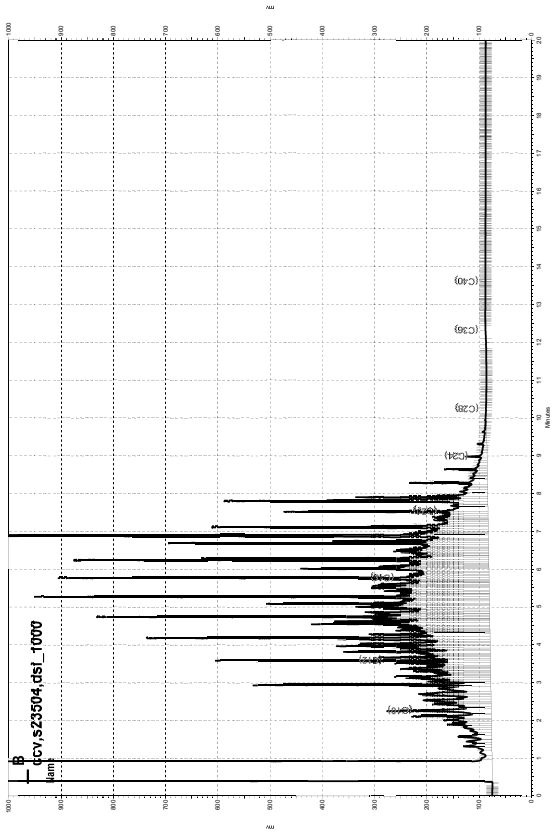
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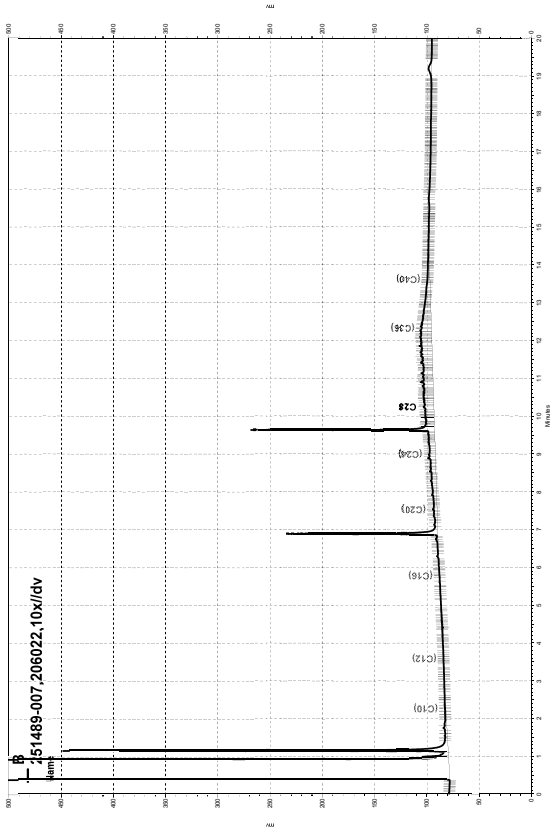
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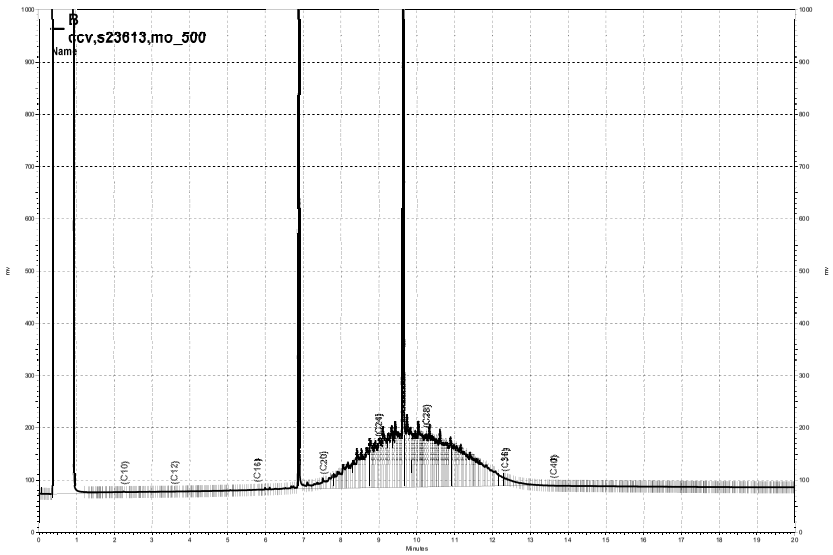

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S1	Diln Fac:	66.50
Lab ID:	251489-001	Batch#:	206045
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Freon 12	ND	670
Chloromethane	ND	670
Vinyl Chloride	ND	670
Bromomethane	ND	670
Chloroethane	ND	670
Trichlorofluoromethane	ND	330
Acetone	ND	1,300
Freon 113	ND	330
1,1-Dichloroethene	ND	330
Methylene Chloride	ND	1,300
Carbon Disulfide	ND	330
MTBE	ND	330
trans-1,2-Dichloroethene	ND	330
Vinyl Acetate	ND	3,300
1,1-Dichloroethane	ND	330
2-Butanone	ND	670
cis-1,2-Dichloroethene	ND	330
2,2-Dichloropropane	ND	330
Chloroform	ND	330
Bromochloromethane	ND	330
1,1,1-Trichloroethane	ND	330
1,1-Dichloropropene	ND	330
Carbon Tetrachloride	ND	330
1,2-Dichloroethane	ND	330
Benzene	ND	330
Trichloroethene	ND	330
1,2-Dichloropropane	ND	330
Bromodichloromethane	ND	330
Dibromomethane	ND	330
4-Methyl-2-Pentanone	ND	670
cis-1,3-Dichloropropene	ND	330
Toluene	ND	330
trans-1,3-Dichloropropene	ND	330
1,1,2-Trichloroethane	ND	330
2-Hexanone	ND	670
1,3-Dichloropropane	ND	330
Tetrachloroethene	ND	330

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S1	Diln Fac:	66.50
Lab ID:	251489-001	Batch#:	206045
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Dibromochloromethane	ND	330
1,2-Dibromoethane	ND	330
Chlorobenzene	ND	330
1,1,1,2-Tetrachloroethane	ND	330
Ethylbenzene	ND	330
m,p-Xylenes	ND	330
o-Xylene	ND	330
Styrene	ND	330
Bromoform	ND	330
Isopropylbenzene	ND	330
1,1,2,2-Tetrachloroethane	ND	330
1,2,3-Trichloropropane	ND	330
Propylbenzene	ND	330
Bromobenzene	ND	330
1,3,5-Trimethylbenzene	ND	330
2-Chlorotoluene	ND	330
4-Chlorotoluene	ND	330
tert-Butylbenzene	ND	330
1,2,4-Trimethylbenzene	ND	330
sec-Butylbenzene	ND	330
para-Isopropyl Toluene	1,700	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
n-Butylbenzene	ND	330
1,2-Dichlorobenzene	ND	330
1,2-Dibromo-3-Chloropropane	ND	330
1,2,4-Trichlorobenzene	ND	330
Hexachlorobutadiene	ND	330
Naphthalene	ND	330
1,2,3-Trichlorobenzene	ND	330

Surrogate	%REC	Limits
Dibromofluoromethane	97	76-128
1,2-Dichloroethane-d4	102	80-137
Toluene-d8	98	80-120
Bromofluorobenzene	107	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S2	Diln Fac:	1.171
Lab ID:	251489-002	Batch#:	206049
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Freon 12	ND	12
Chloromethane	ND	12
Vinyl Chloride	ND	12
Bromomethane	ND	12
Chloroethane	ND	12
Trichlorofluoromethane	ND	5.9
Acetone	75	23
Freon 113	ND	5.9
1,1-Dichloroethene	ND	5.9
Methylene Chloride	ND	23
Carbon Disulfide	ND	5.9
MTBE	ND	5.9
trans-1,2-Dichloroethene	ND	5.9
Vinyl Acetate	ND	59
1,1-Dichloroethane	ND	5.9
2-Butanone	ND	12
cis-1,2-Dichloroethene	ND	5.9
2,2-Dichloropropane	ND	5.9
Chloroform	ND	5.9
Bromochloromethane	ND	5.9
1,1,1-Trichloroethane	ND	5.9
1,1-Dichloropropene	ND	5.9
Carbon Tetrachloride	ND	5.9
1,2-Dichloroethane	ND	5.9
Benzene	ND	5.9
Trichloroethene	ND	5.9
1,2-Dichloropropane	ND	5.9
Bromodichloromethane	ND	5.9
Dibromomethane	ND	5.9
4-Methyl-2-Pentanone	ND	12
cis-1,3-Dichloropropene	ND	5.9
Toluene	ND	5.9
trans-1,3-Dichloropropene	ND	5.9
1,1,2-Trichloroethane	ND	5.9
2-Hexanone	ND	12
1,3-Dichloropropane	ND	5.9
Tetrachloroethene	ND	5.9

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S2	Diln Fac:	1.171
Lab ID:	251489-002	Batch#:	206049
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Dibromochloromethane	ND	5.9
1,2-Dibromoethane	ND	5.9
Chlorobenzene	ND	5.9
1,1,1,2-Tetrachloroethane	ND	5.9
Ethylbenzene	ND	5.9
m,p-Xylenes	ND	5.9
o-Xylene	ND	5.9
Styrene	ND	5.9
Bromoform	ND	5.9
Isopropylbenzene	ND	5.9
1,1,2,2-Tetrachloroethane	ND	5.9
1,2,3-Trichloropropane	ND	5.9
Propylbenzene	ND	5.9
Bromobenzene	ND	5.9
1,3,5-Trimethylbenzene	ND	5.9
2-Chlorotoluene	ND	5.9
4-Chlorotoluene	ND	5.9
tert-Butylbenzene	ND	5.9
1,2,4-Trimethylbenzene	ND	5.9
sec-Butylbenzene	ND	5.9
para-Isopropyl Toluene	120	5.9
1,3-Dichlorobenzene	ND	5.9
1,4-Dichlorobenzene	ND	5.9
n-Butylbenzene	ND	5.9
1,2-Dichlorobenzene	ND	5.9
1,2-Dibromo-3-Chloropropane	ND	5.9
1,2,4-Trichlorobenzene	ND	5.9
Hexachlorobutadiene	ND	5.9
Naphthalene	ND	5.9
1,2,3-Trichlorobenzene	ND	5.9

Surrogate	%REC	Limits
Dibromofluoromethane	103	76-128
1,2-Dichloroethane-d4	131	80-137
Toluene-d8	92	80-120
Bromofluorobenzene	102	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S3	Diln Fac:	1.126
Lab ID:	251489-003	Batch#:	206049
Matrix:	Soil	Sampled:	12/05/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Freon 12	ND	11
Chloromethane	ND	11
Vinyl Chloride	ND	11
Bromomethane	ND	11
Chloroethane	ND	11
Trichlorofluoromethane	ND	5.6
Acetone	40	23
Freon 113	ND	5.6
1,1-Dichloroethene	ND	5.6
Methylene Chloride	ND	23
Carbon Disulfide	ND	5.6
MTBE	ND	5.6
trans-1,2-Dichloroethene	ND	5.6
Vinyl Acetate	ND	56
1,1-Dichloroethane	ND	5.6
2-Butanone	ND	11
cis-1,2-Dichloroethene	ND	5.6
2,2-Dichloropropane	ND	5.6
Chloroform	ND	5.6
Bromochloromethane	ND	5.6
1,1,1-Trichloroethane	ND	5.6
1,1-Dichloropropene	ND	5.6
Carbon Tetrachloride	ND	5.6
1,2-Dichloroethane	ND	5.6
Benzene	ND	5.6
Trichloroethene	ND	5.6
1,2-Dichloropropane	ND	5.6
Bromodichloromethane	ND	5.6
Dibromomethane	ND	5.6
4-Methyl-2-Pentanone	ND	11
cis-1,3-Dichloropropene	ND	5.6
Toluene	ND	5.6
trans-1,3-Dichloropropene	ND	5.6
1,1,2-Trichloroethane	ND	5.6
2-Hexanone	ND	11
1,3-Dichloropropane	ND	5.6
Tetrachloroethene	ND	5.6

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S3	Diln Fac:	1.126
Lab ID:	251489-003	Batch#:	206049
Matrix:	Soil	Sampled:	12/05/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Dibromochloromethane	ND	5.6
1,2-Dibromoethane	ND	5.6
Chlorobenzene	ND	5.6
1,1,1,2-Tetrachloroethane	ND	5.6
Ethylbenzene	ND	5.6
m,p-Xylenes	ND	5.6
o-Xylene	ND	5.6
Styrene	ND	5.6
Bromoform	ND	5.6
Isopropylbenzene	ND	5.6
1,1,2,2-Tetrachloroethane	ND	5.6
1,2,3-Trichloropropane	ND	5.6
Propylbenzene	ND	5.6
Bromobenzene	ND	5.6
1,3,5-Trimethylbenzene	ND	5.6
2-Chlorotoluene	ND	5.6
4-Chlorotoluene	ND	5.6
tert-Butylbenzene	ND	5.6
1,2,4-Trimethylbenzene	ND	5.6
sec-Butylbenzene	ND	5.6
para-Isopropyl Toluene	6.5	5.6
1,3-Dichlorobenzene	ND	5.6
1,4-Dichlorobenzene	ND	5.6
n-Butylbenzene	ND	5.6
1,2-Dichlorobenzene	ND	5.6
1,2-Dibromo-3-Chloropropane	ND	5.6
1,2,4-Trichlorobenzene	ND	5.6
Hexachlorobutadiene	ND	5.6
Naphthalene	ND	5.6
1,2,3-Trichlorobenzene	ND	5.6

Surrogate	%REC	Limits
Dibromofluoromethane	106	76-128
1,2-Dichloroethane-d4	118	80-137
Toluene-d8	99	80-120
Bromofluorobenzene	96	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S4	Diln Fac:	0.9346
Lab ID:	251489-004	Batch#:	206049
Matrix:	Soil	Sampled:	12/05/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Freon 12	ND	9.3
Chloromethane	ND	9.3
Vinyl Chloride	ND	9.3
Bromomethane	ND	9.3
Chloroethane	ND	9.3
Trichlorofluoromethane	ND	4.7
Acetone	92	19
Freon 113	ND	4.7
1,1-Dichloroethene	ND	4.7
Methylene Chloride	ND	19
Carbon Disulfide	ND	4.7
MTBE	ND	4.7
trans-1,2-Dichloroethene	ND	4.7
Vinyl Acetate	ND	47
1,1-Dichloroethane	ND	4.7
2-Butanone	ND	9.3
cis-1,2-Dichloroethene	ND	4.7
2,2-Dichloropropane	ND	4.7
Chloroform	ND	4.7
Bromochloromethane	ND	4.7
1,1,1-Trichloroethane	ND	4.7
1,1-Dichloropropene	ND	4.7
Carbon Tetrachloride	ND	4.7
1,2-Dichloroethane	ND	4.7
Benzene	ND	4.7
Trichloroethene	ND	4.7
1,2-Dichloropropane	ND	4.7
Bromodichloromethane	ND	4.7
Dibromomethane	ND	4.7
4-Methyl-2-Pentanone	ND	9.3
cis-1,3-Dichloropropene	ND	4.7
Toluene	ND	4.7
trans-1,3-Dichloropropene	ND	4.7
1,1,2-Trichloroethane	ND	4.7
2-Hexanone	ND	9.3
1,3-Dichloropropane	ND	4.7
Tetrachloroethene	ND	4.7

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S4	Diln Fac:	0.9346
Lab ID:	251489-004	Batch#:	206049
Matrix:	Soil	Sampled:	12/05/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Dibromochloromethane	ND	4.7
1,2-Dibromoethane	ND	4.7
Chlorobenzene	ND	4.7
1,1,1,2-Tetrachloroethane	ND	4.7
Ethylbenzene	ND	4.7
m,p-Xylenes	ND	4.7
o-Xylene	ND	4.7
Styrene	ND	4.7
Bromoform	ND	4.7
Isopropylbenzene	ND	4.7
1,1,2,2-Tetrachloroethane	ND	4.7
1,2,3-Trichloropropane	ND	4.7
Propylbenzene	ND	4.7
Bromobenzene	ND	4.7
1,3,5-Trimethylbenzene	ND	4.7
2-Chlorotoluene	ND	4.7
4-Chlorotoluene	ND	4.7
tert-Butylbenzene	ND	4.7
1,2,4-Trimethylbenzene	ND	4.7
sec-Butylbenzene	ND	4.7
para-Isopropyl Toluene	16	4.7
1,3-Dichlorobenzene	ND	4.7
1,4-Dichlorobenzene	ND	4.7
n-Butylbenzene	ND	4.7
1,2-Dichlorobenzene	ND	4.7
1,2-Dibromo-3-Chloropropane	ND	4.7
1,2,4-Trichlorobenzene	ND	4.7
Hexachlorobutadiene	ND	4.7
Naphthalene	ND	4.7
1,2,3-Trichlorobenzene	ND	4.7

Surrogate	%REC	Limits
Dibromofluoromethane	104	76-128
1,2-Dichloroethane-d4	125	80-137
Toluene-d8	99	80-120
Bromofluorobenzene	99	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S5	Diln Fac:	0.9259
Lab ID:	251489-005	Batch#:	206049
Matrix:	Soil	Sampled:	12/05/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Freon 12	ND	9.3
Chloromethane	ND	9.3
Vinyl Chloride	ND	9.3
Bromomethane	ND	9.3
Chloroethane	ND	9.3
Trichlorofluoromethane	ND	4.6
Acetone	110	19
Freon 113	ND	4.6
1,1-Dichloroethene	ND	4.6
Methylene Chloride	ND	19
Carbon Disulfide	ND	4.6
MTBE	ND	4.6
trans-1,2-Dichloroethene	ND	4.6
Vinyl Acetate	ND	46
1,1-Dichloroethane	ND	4.6
2-Butanone	ND	9.3
cis-1,2-Dichloroethene	ND	4.6
2,2-Dichloropropane	ND	4.6
Chloroform	ND	4.6
Bromochloromethane	ND	4.6
1,1,1-Trichloroethane	ND	4.6
1,1-Dichloropropene	ND	4.6
Carbon Tetrachloride	ND	4.6
1,2-Dichloroethane	ND	4.6
Benzene	ND	4.6
Trichloroethene	ND	4.6
1,2-Dichloropropane	ND	4.6
Bromodichloromethane	ND	4.6
Dibromomethane	ND	4.6
4-Methyl-2-Pentanone	ND	9.3
cis-1,3-Dichloropropene	ND	4.6
Toluene	ND	4.6
trans-1,3-Dichloropropene	ND	4.6
1,1,2-Trichloroethane	ND	4.6
2-Hexanone	ND	9.3
1,3-Dichloropropane	ND	4.6
Tetrachloroethene	ND	4.6

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S5	Diln Fac:	0.9259
Lab ID:	251489-005	Batch#:	206049
Matrix:	Soil	Sampled:	12/05/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Dibromochloromethane	ND	4.6
1,2-Dibromoethane	ND	4.6
Chlorobenzene	ND	4.6
1,1,1,2-Tetrachloroethane	ND	4.6
Ethylbenzene	ND	4.6
m,p-Xylenes	ND	4.6
o-Xylene	ND	4.6
Styrene	ND	4.6
Bromoform	ND	4.6
Isopropylbenzene	ND	4.6
1,1,2,2-Tetrachloroethane	ND	4.6
1,2,3-Trichloropropane	ND	4.6
Propylbenzene	ND	4.6
Bromobenzene	ND	4.6
1,3,5-Trimethylbenzene	ND	4.6
2-Chlorotoluene	ND	4.6
4-Chlorotoluene	ND	4.6
tert-Butylbenzene	ND	4.6
1,2,4-Trimethylbenzene	ND	4.6
sec-Butylbenzene	ND	4.6
para-Isopropyl Toluene	16	4.6
1,3-Dichlorobenzene	ND	4.6
1,4-Dichlorobenzene	ND	4.6
n-Butylbenzene	ND	4.6
1,2-Dichlorobenzene	ND	4.6
1,2-Dibromo-3-Chloropropane	ND	4.6
1,2,4-Trichlorobenzene	ND	4.6
Hexachlorobutadiene	ND	4.6
Naphthalene	ND	4.6
1,2,3-Trichlorobenzene	ND	4.6

Surrogate	%REC	Limits
Dibromofluoromethane	104	76-128
1,2-Dichloroethane-d4	126	80-137
Toluene-d8	98	80-120
Bromofluorobenzene	96	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S6	Diln Fac:	1.188
Lab ID:	251489-006	Batch#:	206049
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Freon 12	ND	12
Chloromethane	ND	12
Vinyl Chloride	ND	12
Bromomethane	ND	12
Chloroethane	ND	12
Trichlorofluoromethane	ND	5.9
Acetone	160	24
Freon 113	ND	5.9
1,1-Dichloroethene	ND	5.9
Methylene Chloride	ND	24
Carbon Disulfide	ND	5.9
MTBE	ND	5.9
trans-1,2-Dichloroethene	ND	5.9
Vinyl Acetate	ND	59
1,1-Dichloroethane	ND	5.9
2-Butanone	ND	12
cis-1,2-Dichloroethene	ND	5.9
2,2-Dichloropropane	ND	5.9
Chloroform	ND	5.9
Bromochloromethane	ND	5.9
1,1,1-Trichloroethane	ND	5.9
1,1-Dichloropropene	ND	5.9
Carbon Tetrachloride	ND	5.9
1,2-Dichloroethane	ND	5.9
Benzene	ND	5.9
Trichloroethene	ND	5.9
1,2-Dichloropropane	ND	5.9
Bromodichloromethane	ND	5.9
Dibromomethane	ND	5.9
4-Methyl-2-Pentanone	ND	12
cis-1,3-Dichloropropene	ND	5.9
Toluene	ND	5.9
trans-1,3-Dichloropropene	ND	5.9
1,1,2-Trichloroethane	ND	5.9
2-Hexanone	ND	12
1,3-Dichloropropane	ND	5.9
Tetrachloroethene	ND	5.9

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S6	Diln Fac:	1.188
Lab ID:	251489-006	Batch#:	206049
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Dibromochloromethane	ND	5.9
1,2-Dibromoethane	ND	5.9
Chlorobenzene	ND	5.9
1,1,1,2-Tetrachloroethane	ND	5.9
Ethylbenzene	ND	5.9
m,p-Xylenes	ND	5.9
o-Xylene	ND	5.9
Styrene	ND	5.9
Bromoform	ND	5.9
Isopropylbenzene	ND	5.9
1,1,2,2-Tetrachloroethane	ND	5.9
1,2,3-Trichloropropane	ND	5.9
Propylbenzene	ND	5.9
Bromobenzene	ND	5.9
1,3,5-Trimethylbenzene	ND	5.9
2-Chlorotoluene	ND	5.9
4-Chlorotoluene	ND	5.9
tert-Butylbenzene	ND	5.9
1,2,4-Trimethylbenzene	ND	5.9
sec-Butylbenzene	ND	5.9
para-Isopropyl Toluene	15	5.9
1,3-Dichlorobenzene	ND	5.9
1,4-Dichlorobenzene	ND	5.9
n-Butylbenzene	ND	5.9
1,2-Dichlorobenzene	ND	5.9
1,2-Dibromo-3-Chloropropane	ND	5.9
1,2,4-Trichlorobenzene	ND	5.9
Hexachlorobutadiene	ND	5.9
Naphthalene	ND	5.9
1,2,3-Trichlorobenzene	ND	5.9

Surrogate	%REC	Limits
Dibromofluoromethane	108	76-128
1,2-Dichloroethane-d4	125	80-137
Toluene-d8	94	80-120
Bromofluorobenzene	99	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S7	Diln Fac:	1.220
Lab ID:	251489-007	Batch#:	206049
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Freon 12	ND	12
Chloromethane	ND	12
Vinyl Chloride	ND	12
Bromomethane	ND	12
Chloroethane	ND	12
Trichlorofluoromethane	ND	6.1
Acetone	28	24
Freon 113	ND	6.1
1,1-Dichloroethene	ND	6.1
Methylene Chloride	ND	24
Carbon Disulfide	ND	6.1
MTBE	ND	6.1
trans-1,2-Dichloroethene	ND	6.1
Vinyl Acetate	ND	61
1,1-Dichloroethane	ND	6.1
2-Butanone	ND	12
cis-1,2-Dichloroethene	ND	6.1
2,2-Dichloropropane	ND	6.1
Chloroform	ND	6.1
Bromochloromethane	ND	6.1
1,1,1-Trichloroethane	ND	6.1
1,1-Dichloropropene	ND	6.1
Carbon Tetrachloride	ND	6.1
1,2-Dichloroethane	ND	6.1
Benzene	ND	6.1
Trichloroethene	ND	6.1
1,2-Dichloropropane	ND	6.1
Bromodichloromethane	ND	6.1
Dibromomethane	ND	6.1
4-Methyl-2-Pentanone	ND	12
cis-1,3-Dichloropropene	ND	6.1
Toluene	ND	6.1
trans-1,3-Dichloropropene	ND	6.1
1,1,2-Trichloroethane	ND	6.1
2-Hexanone	ND	12
1,3-Dichloropropane	ND	6.1
Tetrachloroethene	ND	6.1

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Field ID:	1707-S7	Diln Fac:	1.220
Lab ID:	251489-007	Batch#:	206049
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Analyzed:	12/12/13

Analyte	Result	RL
Dibromochloromethane	ND	6.1
1,2-Dibromoethane	ND	6.1
Chlorobenzene	ND	6.1
1,1,1,2-Tetrachloroethane	ND	6.1
Ethylbenzene	ND	6.1
m,p-Xylenes	ND	6.1
o-Xylene	ND	6.1
Styrene	ND	6.1
Bromoform	ND	6.1
Isopropylbenzene	ND	6.1
1,1,2,2-Tetrachloroethane	ND	6.1
1,2,3-Trichloropropane	ND	6.1
Propylbenzene	ND	6.1
Bromobenzene	ND	6.1
1,3,5-Trimethylbenzene	ND	6.1
2-Chlorotoluene	ND	6.1
4-Chlorotoluene	ND	6.1
tert-Butylbenzene	ND	6.1
1,2,4-Trimethylbenzene	ND	6.1
sec-Butylbenzene	ND	6.1
para-Isopropyl Toluene	ND	6.1
1,3-Dichlorobenzene	ND	6.1
1,4-Dichlorobenzene	ND	6.1
n-Butylbenzene	ND	6.1
1,2-Dichlorobenzene	ND	6.1
1,2-Dibromo-3-Chloropropane	ND	6.1
1,2,4-Trichlorobenzene	ND	6.1
Hexachlorobutadiene	ND	6.1
Naphthalene	ND	6.1
1,2,3-Trichlorobenzene	ND	6.1

Surrogate	%REC	Limits
Dibromofluoromethane	104	76-128
1,2-Dichloroethane-d4	118	80-137
Toluene-d8	95	80-120
Bromofluorobenzene	93	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Matrix:	Soil	Batch#:	206045
Units:	ug/Kg	Analyzed:	12/12/13
Diln Fac:	1.000		

Type: BS Lab ID: QC720052

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	25.00	28.28	113	68-135
Benzene	25.00	27.76	111	80-127
Trichloroethene	25.00	29.18	117	77-129
Toluene	25.00	28.49	114	79-125
Chlorobenzene	25.00	29.11	116	78-120

Surrogate	%REC	Limits
Dibromofluoromethane	100	76-128
1,2-Dichloroethane-d4	105	80-137
Toluene-d8	100	80-120
Bromofluorobenzene	104	79-128

Type: BSD Lab ID: QC720053

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	25.00	28.27	113	68-135	0	35
Benzene	25.00	28.26	113	80-127	2	20
Trichloroethene	25.00	29.83	119	77-129	2	20
Toluene	25.00	29.01	116	79-125	2	23
Chlorobenzene	25.00	29.85	119	78-120	3	20

Surrogate	%REC	Limits
Dibromofluoromethane	100	76-128
1,2-Dichloroethane-d4	101	80-137
Toluene-d8	101	80-120
Bromofluorobenzene	104	79-128

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Matrix:	Soil	Batch#:	206049
Units:	ug/Kg	Analyzed:	12/12/13
Diln Fac:	1.000		

Type: BS Lab ID: QC720066

Analyte	Spiked	Result	%REC	Limits
1,1-Dichloroethene	18.75	22.80	122	68-135
Benzene	18.75	21.10	113	80-127
Trichloroethene	18.75	20.36	109	77-129
Toluene	18.75	21.27	113	79-125
Chlorobenzene	18.75	22.38	119	78-120

Surrogate	%REC	Limits
Dibromofluoromethane	103	76-128
1,2-Dichloroethane-d4	109	80-137
Toluene-d8	99	80-120
Bromofluorobenzene	92	79-128

Type: BSD Lab ID: QC720067

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	18.75	22.89	122	68-135	0	35
Benzene	18.75	20.82	111	80-127	1	20
Trichloroethene	18.75	20.97	112	77-129	3	20
Toluene	18.75	20.93	112	79-125	2	23
Chlorobenzene	18.75	21.75	116	78-120	3	20

Surrogate	%REC	Limits
Dibromofluoromethane	102	76-128
1,2-Dichloroethane-d4	101	80-137
Toluene-d8	94	80-120
Bromofluorobenzene	94	79-128

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC720068	Batch#:	206049
Matrix:	Soil	Analyzed:	12/12/13
Units:	ug/Kg		

Analyte	Result	RL
Freon 12	ND	10
Chloromethane	ND	10
Vinyl Chloride	ND	10
Bromomethane	ND	10
Chloroethane	ND	10
Trichlorofluoromethane	ND	5.0
Acetone	ND	20
Freon 113	ND	5.0
1,1-Dichloroethene	ND	5.0
Methylene Chloride	ND	20
Carbon Disulfide	ND	5.0
MTBE	ND	5.0
trans-1,2-Dichloroethene	ND	5.0
Vinyl Acetate	ND	50
1,1-Dichloroethane	ND	5.0
2-Butanone	ND	10
cis-1,2-Dichloroethene	ND	5.0
2,2-Dichloropropane	ND	5.0
Chloroform	ND	5.0
Bromochloromethane	ND	5.0
1,1,1-Trichloroethane	ND	5.0
1,1-Dichloropropene	ND	5.0
Carbon Tetrachloride	ND	5.0
1,2-Dichloroethane	ND	5.0
Benzene	ND	5.0
Trichloroethene	ND	5.0
1,2-Dichloropropane	ND	5.0
Bromodichloromethane	ND	5.0
Dibromomethane	ND	5.0
4-Methyl-2-Pentanone	ND	10
cis-1,3-Dichloropropene	ND	5.0
Toluene	ND	5.0
trans-1,3-Dichloropropene	ND	5.0
1,1,2-Trichloroethane	ND	5.0
2-Hexanone	ND	10
1,3-Dichloropropane	ND	5.0
Tetrachloroethene	ND	5.0

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC720068	Batch#:	206049
Matrix:	Soil	Analyzed:	12/12/13
Units:	ug/Kg		

Analyte	Result	RL
Dibromochloromethane	ND	5.0
1,2-Dibromoethane	ND	5.0
Chlorobenzene	ND	5.0
1,1,1,2-Tetrachloroethane	ND	5.0
Ethylbenzene	ND	5.0
m,p-Xylenes	ND	5.0
o-Xylene	ND	5.0
Styrene	ND	5.0
Bromoform	ND	5.0
Isopropylbenzene	ND	5.0
1,1,2,2-Tetrachloroethane	ND	5.0
1,2,3-Trichloropropane	ND	5.0
Propylbenzene	ND	5.0
Bromobenzene	ND	5.0
1,3,5-Trimethylbenzene	ND	5.0
2-Chlorotoluene	ND	5.0
4-Chlorotoluene	ND	5.0
tert-Butylbenzene	ND	5.0
1,2,4-Trimethylbenzene	ND	5.0
sec-Butylbenzene	ND	5.0
para-Isopropyl Toluene	ND	5.0
1,3-Dichlorobenzene	ND	5.0
1,4-Dichlorobenzene	ND	5.0
n-Butylbenzene	ND	5.0
1,2-Dichlorobenzene	ND	5.0
1,2-Dibromo-3-Chloropropane	ND	5.0
1,2,4-Trichlorobenzene	ND	5.0
Hexachlorobutadiene	ND	5.0
Naphthalene	ND	5.0
1,2,3-Trichlorobenzene	ND	5.0

Surrogate	%REC	Limits
Dibromofluoromethane	104	76-128
1,2-Dichloroethane-d4	112	80-137
Toluene-d8	91	80-120
Bromofluorobenzene	90	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC720152	Batch#:	206045
Matrix:	Soil	Analyzed:	12/12/13
Units:	ug/Kg		

Analyte	Result	RL
Freon 12	ND	10
Chloromethane	ND	10
Vinyl Chloride	ND	10
Bromomethane	ND	10
Chloroethane	ND	10
Trichlorofluoromethane	ND	5.0
Acetone	ND	20
Freon 113	ND	5.0
1,1-Dichloroethene	ND	5.0
Methylene Chloride	ND	20
Carbon Disulfide	ND	5.0
MTBE	ND	5.0
trans-1,2-Dichloroethene	ND	5.0
Vinyl Acetate	ND	50
1,1-Dichloroethane	ND	5.0
2-Butanone	ND	10
cis-1,2-Dichloroethene	ND	5.0
2,2-Dichloropropane	ND	5.0
Chloroform	ND	5.0
Bromochloromethane	ND	5.0
1,1,1-Trichloroethane	ND	5.0
1,1-Dichloropropene	ND	5.0
Carbon Tetrachloride	ND	5.0
1,2-Dichloroethane	ND	5.0
Benzene	ND	5.0
Trichloroethene	ND	5.0
1,2-Dichloropropane	ND	5.0
Bromodichloromethane	ND	5.0
Dibromomethane	ND	5.0
4-Methyl-2-Pentanone	ND	10
cis-1,3-Dichloropropene	ND	5.0
Toluene	ND	5.0
trans-1,3-Dichloropropene	ND	5.0
1,1,2-Trichloroethane	ND	5.0
2-Hexanone	ND	10
1,3-Dichloropropane	ND	5.0
Tetrachloroethene	ND	5.0

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5035
Project#:	21707	Analysis:	EPA 8260B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC720152	Batch#:	206045
Matrix:	Soil	Analyzed:	12/12/13
Units:	ug/Kg		

Analyte	Result	RL
Dibromochloromethane	ND	5.0
1,2-Dibromoethane	ND	5.0
Chlorobenzene	ND	5.0
1,1,1,2-Tetrachloroethane	ND	5.0
Ethylbenzene	ND	5.0
m,p-Xylenes	ND	5.0
o-Xylene	ND	5.0
Styrene	ND	5.0
Bromoform	ND	5.0
Isopropylbenzene	ND	5.0
1,1,2,2-Tetrachloroethane	ND	5.0
1,2,3-Trichloropropane	ND	5.0
Propylbenzene	ND	5.0
Bromobenzene	ND	5.0
1,3,5-Trimethylbenzene	ND	5.0
2-Chlorotoluene	ND	5.0
4-Chlorotoluene	ND	5.0
tert-Butylbenzene	ND	5.0
1,2,4-Trimethylbenzene	ND	5.0
sec-Butylbenzene	ND	5.0
para-Isopropyl Toluene	ND	5.0
1,3-Dichlorobenzene	ND	5.0
1,4-Dichlorobenzene	ND	5.0
n-Butylbenzene	ND	5.0
1,2-Dichlorobenzene	ND	5.0
1,2-Dibromo-3-Chloropropane	ND	5.0
1,2,4-Trichlorobenzene	ND	5.0
Hexachlorobutadiene	ND	5.0
Naphthalene	ND	5.0
1,2,3-Trichlorobenzene	ND	5.0

Surrogate	%REC	Limits
Dibromofluoromethane	100	76-128
1,2-Dichloroethane-d4	102	80-137
Toluene-d8	100	80-120
Bromofluorobenzene	104	79-128

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Purgeable Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 5030B
Project#:	21707	Analysis:	EPA 8260B
Field ID:	ZZZZZZZZZZ	Batch#:	206049
MSS Lab ID:	251546-001	Sampled:	12/11/13
Matrix:	Soil	Received:	12/11/13
Units:	ug/Kg	Analyzed:	12/12/13
Basis:	as received		

Type: MS Diln Fac: 2.439
Lab ID: QC720178

Analyte	MSS Result	Spiked	Result	%REC	Limits
1,1-Dichloroethene	<3.168	122.0	127.5	105	46-138
Benzene	<1.718	122.0	133.0	109	51-125
Trichloroethene	<1.855	122.0	130.0	107	41-146
Toluene	<1.156	122.0	112.9	93	45-123
Chlorobenzene	<0.8738	122.0	112.4	92	39-120

Surrogate	%REC	Limits
Dibromofluoromethane	96	76-128
1,2-Dichloroethane-d4	94	80-137
Toluene-d8	98	80-120
Bromofluorobenzene	108	79-128

Type: MSD Diln Fac: 2.463
Lab ID: QC720179

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
1,1-Dichloroethene	123.2	125.5	102	46-138	3	51
Benzene	123.2	119.2	97	51-125	12	46
Trichloroethene	123.2	122.1	99	41-146	7	55
Toluene	123.2	96.49	78	45-123	17	59
Chlorobenzene	123.2	98.49	80	39-120	14	54

Surrogate	%REC	Limits
Dibromofluoromethane	97	76-128
1,2-Dichloroethane-d4	92	80-137
Toluene-d8	96	80-120
Bromofluorobenzene	104	79-128

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S1	Batch#:	205938
Lab ID:	251489-001	Sampled:	12/04/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
N-Nitrosodimethylamine	ND	340
Phenol	ND	340
bis(2-Chloroethyl)ether	ND	340
2-Chlorophenol	ND	340
1,3-Dichlorobenzene	ND	340
1,4-Dichlorobenzene	ND	340
Benzyl alcohol	ND	340
1,2-Dichlorobenzene	ND	340
2-Methylphenol	ND	340
bis(2-Chloroisopropyl) ether	ND	340
4-Methylphenol	ND	340
N-Nitroso-di-n-propylamine	ND	340
Hexachloroethane	ND	340
Nitrobenzene	ND	340
Isophorone	ND	340
2-Nitrophenol	ND	670
2,4-Dimethylphenol	ND	340
Benzoic acid	ND	1,700
bis(2-Chloroethoxy)methane	ND	340
2,4-Dichlorophenol	ND	340
1,2,4-Trichlorobenzene	ND	340
Naphthalene	ND	67
4-Chloroaniline	ND	340
Hexachlorobutadiene	ND	340
4-Chloro-3-methylphenol	ND	340
2-Methylnaphthalene	ND	67
Hexachlorocyclopentadiene	ND	670
2,4,6-Trichlorophenol	ND	340
2,4,5-Trichlorophenol	ND	340
2-Chloronaphthalene	ND	340
2-Nitroaniline	ND	670
Dimethylphthalate	ND	340
Acenaphthylene	ND	67
2,6-Dinitrotoluene	ND	340
3-Nitroaniline	ND	670
Acenaphthene	ND	67
2,4-Dinitrophenol	ND	670
4-Nitrophenol	ND	670
Dibenzofuran	ND	340
2,4-Dinitrotoluene	ND	340
Diethylphthalate	ND	340
Fluorene	ND	67
4-Chlorophenyl-phenylether	ND	340
4-Nitroaniline	ND	670
4,6-Dinitro-2-methylphenol	ND	670
N-Nitrosodiphenylamine	ND	340
Azobenzene	ND	340
4-Bromophenyl-phenylether	ND	340
Hexachlorobenzene	ND	340
Pentachlorophenol	ND	670
Phenanthrene	ND	67
Anthracene	ND	67
Di-n-butylphthalate	ND	340

ND= Not Detected
RL= Reporting Limit

28.0

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S1	Batch#:	205938
Lab ID:	251489-001	Sampled:	12/04/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
Fluoranthene	ND	67
Pyrene	ND	67
Butylbenzylphthalate	ND	340
3,3'-Dichlorobenzidine	ND	670
Benzo(a)anthracene	ND	67
Chrysene	ND	67
bis(2-Ethylhexyl)phthalate	ND	340
Di-n-octylphthalate	ND	340
Benzo(b)fluoranthene	ND	67
Benzo(k)fluoranthene	ND	67
Benzo(a)pyrene	ND	67
Indeno(1,2,3-cd)pyrene	ND	67
Dibenz(a,h)anthracene	ND	67
Benzo(g,h,i)perylene	ND	67

Surrogate	%REC	Limits
2-Fluorophenol	82	33-120
Phenol-d5	90	39-120
2,4,6-Tribromophenol	81	33-120
Nitrobenzene-d5	90	46-120
2-Fluorobiphenyl	90	51-120
Terphenyl-d14	113	50-120

ND= Not Detected
RL= Reporting Limit

28.0

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S2	Batch#:	205938
Lab ID:	251489-002	Sampled:	12/04/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
N-Nitrosodimethylamine	ND	330
Phenol	ND	330
bis(2-Chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	330
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
bis(2-Chloroisopropyl) ether	ND	330
4-Methylphenol	ND	330
N-Nitroso-di-n-propylamine	ND	330
Hexachloroethane	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	670
2,4-Dimethylphenol	ND	330
Benzoic acid	ND	1,700
bis(2-Chloroethoxy)methane	ND	330
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	67
4-Chloroaniline	ND	330
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	67
Hexachlorocyclopentadiene	ND	670
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	670
Dimethylphthalate	ND	330
Acenaphthylene	ND	67
2,6-Dinitrotoluene	ND	330
3-Nitroaniline	ND	670
Acenaphthene	ND	67
2,4-Dinitrophenol	ND	670
4-Nitrophenol	ND	670
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
Diethylphthalate	ND	330
Fluorene	ND	67
4-Chlorophenyl-phenylether	ND	330
4-Nitroaniline	ND	670
4,6-Dinitro-2-methylphenol	ND	670
N-Nitrosodiphenylamine	ND	330
Azobenzene	ND	330
4-Bromophenyl-phenylether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	670
Phenanthrene	ND	67
Anthracene	ND	67
Di-n-butylphthalate	ND	330

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S2	Batch#:	205938
Lab ID:	251489-002	Sampled:	12/04/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
Fluoranthene	84	67
Pyrene	92	67
Butylbenzylphthalate	ND	330
3,3'-Dichlorobenzidine	ND	670
Benzo(a)anthracene	ND	67
Chrysene	ND	67
bis(2-Ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	67
Benzo(k)fluoranthene	ND	67
Benzo(a)pyrene	ND	67
Indeno(1,2,3-cd)pyrene	ND	67
Dibenz(a,h)anthracene	ND	67
Benzo(g,h,i)perylene	ND	67

Surrogate	%REC	Limits
2-Fluorophenol	81	33-120
Phenol-d5	90	39-120
2,4,6-Tribromophenol	89	33-120
Nitrobenzene-d5	89	46-120
2-Fluorobiphenyl	86	51-120
Terphenyl-d14	103	50-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S3	Batch#:	205938
Lab ID:	251489-003	Sampled:	12/05/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
N-Nitrosodimethylamine	ND	340
Phenol	ND	340
bis(2-Chloroethyl)ether	ND	340
2-Chlorophenol	ND	340
1,3-Dichlorobenzene	ND	340
1,4-Dichlorobenzene	ND	340
Benzyl alcohol	ND	340
1,2-Dichlorobenzene	ND	340
2-Methylphenol	ND	340
bis(2-Chloroisopropyl) ether	ND	340
4-Methylphenol	ND	340
N-Nitroso-di-n-propylamine	ND	340
Hexachloroethane	ND	340
Nitrobenzene	ND	340
Isophorone	ND	340
2-Nitrophenol	ND	670
2,4-Dimethylphenol	ND	340
Benzoic acid	ND	1,700
bis(2-Chloroethoxy)methane	ND	340
2,4-Dichlorophenol	ND	340
1,2,4-Trichlorobenzene	ND	340
Naphthalene	ND	67
4-Chloroaniline	ND	340
Hexachlorobutadiene	ND	340
4-Chloro-3-methylphenol	ND	340
2-Methylnaphthalene	ND	67
Hexachlorocyclopentadiene	ND	670
2,4,6-Trichlorophenol	ND	340
2,4,5-Trichlorophenol	ND	340
2-Chloronaphthalene	ND	340
2-Nitroaniline	ND	670
Dimethylphthalate	ND	340
Acenaphthylene	ND	67
2,6-Dinitrotoluene	ND	340
3-Nitroaniline	ND	670
Acenaphthene	ND	67
2,4-Dinitrophenol	ND	670
4-Nitrophenol	ND	670
Dibenzofuran	ND	340
2,4-Dinitrotoluene	ND	340
Diethylphthalate	ND	340
Fluorene	ND	67
4-Chlorophenyl-phenylether	ND	340
4-Nitroaniline	ND	670
4,6-Dinitro-2-methylphenol	ND	670
N-Nitrosodiphenylamine	ND	340
Azobenzene	ND	340
4-Bromophenyl-phenylether	ND	340
Hexachlorobenzene	ND	340
Pentachlorophenol	ND	670
Phenanthrene	ND	67
Anthracene	ND	67
Di-n-butylphthalate	ND	340

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S3	Batch#:	205938
Lab ID:	251489-003	Sampled:	12/05/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
Fluoranthene	ND	67
Pyrene	ND	67
Butylbenzylphthalate	ND	340
3,3'-Dichlorobenzidine	ND	670
Benzo(a)anthracene	ND	67
Chrysene	ND	67
bis(2-Ethylhexyl)phthalate	ND	340
Di-n-octylphthalate	ND	340
Benzo(b)fluoranthene	ND	67
Benzo(k)fluoranthene	ND	67
Benzo(a)pyrene	ND	67
Indeno(1,2,3-cd)pyrene	ND	67
Dibenz(a,h)anthracene	ND	67
Benzo(g,h,i)perylene	ND	67

Surrogate	%REC	Limits
2-Fluorophenol	72	33-120
Phenol-d5	82	39-120
2,4,6-Tribromophenol	64	33-120
Nitrobenzene-d5	84	46-120
2-Fluorobiphenyl	73	51-120
Terphenyl-d14	86	50-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S4	Batch#:	205938
Lab ID:	251489-004	Sampled:	12/05/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/13/13
Diln Fac:	1.000		

Analyte	Result	RL
N-Nitrosodimethylamine	ND	340
Phenol	ND	340
bis(2-Chloroethyl)ether	ND	340
2-Chlorophenol	ND	340
1,3-Dichlorobenzene	ND	340
1,4-Dichlorobenzene	ND	340
Benzyl alcohol	ND	340
1,2-Dichlorobenzene	ND	340
2-Methylphenol	ND	340
bis(2-Chloroisopropyl) ether	ND	340
4-Methylphenol	ND	340
N-Nitroso-di-n-propylamine	ND	340
Hexachloroethane	ND	340
Nitrobenzene	ND	340
Isophorone	ND	340
2-Nitrophenol	ND	670
2,4-Dimethylphenol	ND	340
Benzoic acid	ND	1,700
bis(2-Chloroethoxy)methane	ND	340
2,4-Dichlorophenol	ND	340
1,2,4-Trichlorobenzene	ND	340
Naphthalene	ND	67
4-Chloroaniline	ND	340
Hexachlorobutadiene	ND	340
4-Chloro-3-methylphenol	ND	340
2-Methylnaphthalene	ND	67
Hexachlorocyclopentadiene	ND	670
2,4,6-Trichlorophenol	ND	340
2,4,5-Trichlorophenol	ND	340
2-Chloronaphthalene	ND	340
2-Nitroaniline	ND	670
Dimethylphthalate	ND	340
Acenaphthylene	ND	67
2,6-Dinitrotoluene	ND	340
3-Nitroaniline	ND	670
Acenaphthene	ND	67
2,4-Dinitrophenol	ND	670
4-Nitrophenol	ND	670
Dibenzofuran	ND	340
2,4-Dinitrotoluene	ND	340
Diethylphthalate	ND	340
Fluorene	ND	67
4-Chlorophenyl-phenylether	ND	340
4-Nitroaniline	ND	670
4,6-Dinitro-2-methylphenol	ND	670
N-Nitrosodiphenylamine	ND	340
Azobenzene	ND	340
4-Bromophenyl-phenylether	ND	340
Hexachlorobenzene	ND	340
Pentachlorophenol	ND	670
Phenanthrene	ND	67
Anthracene	ND	67
Di-n-butylphthalate	ND	340

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S4	Batch#:	205938
Lab ID:	251489-004	Sampled:	12/05/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/13/13
Diln Fac:	1.000		

Analyte	Result	RL
Fluoranthene	ND	67
Pyrene	ND	67
Butylbenzylphthalate	ND	340
3,3'-Dichlorobenzidine	ND	670
Benzo(a)anthracene	ND	67
Chrysene	ND	67
bis(2-Ethylhexyl)phthalate	ND	340
Di-n-octylphthalate	ND	340
Benzo(b)fluoranthene	ND	67
Benzo(k)fluoranthene	ND	67
Benzo(a)pyrene	ND	67
Indeno(1,2,3-cd)pyrene	ND	67
Dibenz(a,h)anthracene	ND	67
Benzo(g,h,i)perylene	ND	67

Surrogate	%REC	Limits
2-Fluorophenol	66	33-120
Phenol-d5	76	39-120
2,4,6-Tribromophenol	49	33-120
Nitrobenzene-d5	81	46-120
2-Fluorobiphenyl	81	51-120
Terphenyl-d14	90	50-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S5	Batch#:	205938
Lab ID:	251489-005	Sampled:	12/05/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
N-Nitrosodimethylamine	ND	340
Phenol	ND	340
bis(2-Chloroethyl)ether	ND	340
2-Chlorophenol	ND	340
1,3-Dichlorobenzene	ND	340
1,4-Dichlorobenzene	ND	340
Benzyl alcohol	ND	340
1,2-Dichlorobenzene	ND	340
2-Methylphenol	ND	340
bis(2-Chloroisopropyl) ether	ND	340
4-Methylphenol	ND	340
N-Nitroso-di-n-propylamine	ND	340
Hexachloroethane	ND	340
Nitrobenzene	ND	340
Isophorone	ND	340
2-Nitrophenol	ND	670
2,4-Dimethylphenol	ND	340
Benzoic acid	ND	1,700
bis(2-Chloroethoxy)methane	ND	340
2,4-Dichlorophenol	ND	340
1,2,4-Trichlorobenzene	ND	340
Naphthalene	ND	67
4-Chloroaniline	ND	340
Hexachlorobutadiene	ND	340
4-Chloro-3-methylphenol	ND	340
2-Methylnaphthalene	ND	67
Hexachlorocyclopentadiene	ND	670
2,4,6-Trichlorophenol	ND	340
2,4,5-Trichlorophenol	ND	340
2-Chloronaphthalene	ND	340
2-Nitroaniline	ND	670
Dimethylphthalate	ND	340
Acenaphthylene	ND	67
2,6-Dinitrotoluene	ND	340
3-Nitroaniline	ND	670
Acenaphthene	ND	67
2,4-Dinitrophenol	ND	670
4-Nitrophenol	ND	670
Dibenzofuran	ND	340
2,4-Dinitrotoluene	ND	340
Diethylphthalate	ND	340
Fluorene	ND	67
4-Chlorophenyl-phenylether	ND	340
4-Nitroaniline	ND	670
4,6-Dinitro-2-methylphenol	ND	670
N-Nitrosodiphenylamine	ND	340
Azobenzene	ND	340
4-Bromophenyl-phenylether	ND	340
Hexachlorobenzene	ND	340
Pentachlorophenol	ND	670
Phenanthrene	ND	67
Anthracene	ND	67
Di-n-butylphthalate	ND	340

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S5	Batch#:	205938
Lab ID:	251489-005	Sampled:	12/05/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
Fluoranthene	ND	67
Pyrene	ND	67
Butylbenzylphthalate	ND	340
3,3'-Dichlorobenzidine	ND	670
Benzo(a)anthracene	ND	67
Chrysene	ND	67
bis(2-Ethylhexyl)phthalate	ND	340
Di-n-octylphthalate	ND	340
Benzo(b)fluoranthene	ND	67
Benzo(k)fluoranthene	ND	67
Benzo(a)pyrene	ND	67
Indeno(1,2,3-cd)pyrene	ND	67
Dibenz(a,h)anthracene	ND	67
Benzo(g,h,i)perylene	ND	67

Surrogate	%REC	Limits
2-Fluorophenol	68	33-120
Phenol-d5	76	39-120
2,4,6-Tribromophenol	74	33-120
Nitrobenzene-d5	79	46-120
2-Fluorobiphenyl	75	51-120
Terphenyl-d14	87	50-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S6	Batch#:	205938
Lab ID:	251489-006	Sampled:	12/04/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
N-Nitrosodimethylamine	ND	340
Phenol	ND	340
bis(2-Chloroethyl)ether	ND	340
2-Chlorophenol	ND	340
1,3-Dichlorobenzene	ND	340
1,4-Dichlorobenzene	ND	340
Benzyl alcohol	ND	340
1,2-Dichlorobenzene	ND	340
2-Methylphenol	ND	340
bis(2-Chloroisopropyl) ether	ND	340
4-Methylphenol	ND	340
N-Nitroso-di-n-propylamine	ND	340
Hexachloroethane	ND	340
Nitrobenzene	ND	340
Isophorone	ND	340
2-Nitrophenol	ND	670
2,4-Dimethylphenol	ND	340
Benzoic acid	ND	1,700
bis(2-Chloroethoxy)methane	ND	340
2,4-Dichlorophenol	ND	340
1,2,4-Trichlorobenzene	ND	340
Naphthalene	ND	67
4-Chloroaniline	ND	340
Hexachlorobutadiene	ND	340
4-Chloro-3-methylphenol	ND	340
2-Methylnaphthalene	ND	67
Hexachlorocyclopentadiene	ND	670
2,4,6-Trichlorophenol	ND	340
2,4,5-Trichlorophenol	ND	340
2-Chloronaphthalene	ND	340
2-Nitroaniline	ND	670
Dimethylphthalate	ND	340
Acenaphthylene	ND	67
2,6-Dinitrotoluene	ND	340
3-Nitroaniline	ND	670
Acenaphthene	ND	67
2,4-Dinitrophenol	ND	670
4-Nitrophenol	ND	670
Dibenzofuran	ND	340
2,4-Dinitrotoluene	ND	340
Diethylphthalate	ND	340
Fluorene	ND	67
4-Chlorophenyl-phenylether	ND	340
4-Nitroaniline	ND	670
4,6-Dinitro-2-methylphenol	ND	670
N-Nitrosodiphenylamine	ND	340
Azobenzene	ND	340
4-Bromophenyl-phenylether	ND	340
Hexachlorobenzene	ND	340
Pentachlorophenol	ND	670
Phenanthrene	ND	67
Anthracene	ND	67
Di-n-butylphthalate	ND	340

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S6	Batch#:	205938
Lab ID:	251489-006	Sampled:	12/04/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	1.000		

Analyte	Result	RL
Fluoranthene	ND	67
Pyrene	ND	67
Butylbenzylphthalate	ND	340
3,3'-Dichlorobenzidine	ND	670
Benzo(a)anthracene	ND	67
Chrysene	ND	67
bis(2-Ethylhexyl)phthalate	ND	340
Di-n-octylphthalate	ND	340
Benzo(b)fluoranthene	ND	67
Benzo(k)fluoranthene	ND	67
Benzo(a)pyrene	ND	67
Indeno(1,2,3-cd)pyrene	ND	67
Dibenz(a,h)anthracene	ND	67
Benzo(g,h,i)perylene	ND	67

Surrogate	%REC	Limits
2-Fluorophenol	74	33-120
Phenol-d5	82	39-120
2,4,6-Tribromophenol	77	33-120
Nitrobenzene-d5	87	46-120
2-Fluorobiphenyl	78	51-120
Terphenyl-d14	97	50-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S7	Diln Fac:	1.000
Lab ID:	251489-007	Batch#:	205938
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/10/13

Analyte	Result	RL	Analyzed
N-Nitrosodimethylamine	ND	330	12/13/13
Phenol	ND	330	12/13/13
bis(2-Chloroethyl)ether	ND	330	12/13/13
2-Chlorophenol	ND	330	12/13/13
1,3-Dichlorobenzene	ND	330	12/13/13
1,4-Dichlorobenzene	ND	330	12/13/13
Benzyl alcohol	ND	330	12/13/13
1,2-Dichlorobenzene	ND	330	12/13/13
2-Methylphenol	ND	330	12/13/13
bis(2-Chloroisopropyl) ether	ND	330	12/13/13
4-Methylphenol	ND	330	12/13/13
N-Nitroso-di-n-propylamine	ND	330	12/13/13
Hexachloroethane	ND	330	12/13/13
Nitrobenzene	ND	330	12/13/13
Isophorone	ND	330	12/13/13
2-Nitrophenol	ND	660	12/13/13
2,4-Dimethylphenol	ND	330	12/13/13
Benzoic acid	ND	1,700	12/13/13
bis(2-Chloroethoxy)methane	ND	330	12/13/13
2,4-Dichlorophenol	ND	330	12/13/13
1,2,4-Trichlorobenzene	ND	330	12/13/13
Naphthalene	ND	66	12/13/13
4-Chloroaniline	ND	330	12/13/13
Hexachlorobutadiene	ND	330	12/13/13
4-Chloro-3-methylphenol	ND	330	12/13/13
2-Methylnaphthalene	ND	66	12/13/13
Hexachlorocyclopentadiene	ND	660	12/13/13
2,4,6-Trichlorophenol	ND	330	12/13/13
2,4,5-Trichlorophenol	ND	330	12/13/13
2-Chloronaphthalene	ND	330	12/13/13
2-Nitroaniline	ND	660	12/13/13
Dimethylphthalate	ND	330	12/13/13
Acenaphthylene	ND	66	12/13/13
2,6-Dinitrotoluene	ND	330	12/13/13
3-Nitroaniline	ND	660	12/13/13
Acenaphthene	ND	66	12/13/13
2,4-Dinitrophenol	ND	660	12/13/13
4-Nitrophenol	ND	660	12/13/13
Dibenzofuran	ND	330	12/13/13
2,4-Dinitrotoluene	ND	330	12/13/13
Diethylphthalate	ND	330	12/13/13
Fluorene	ND	66	12/13/13
4-Chlorophenyl-phenylether	ND	330	12/13/13
4-Nitroaniline	ND	660	12/13/13
4,6-Dinitro-2-methylphenol	ND	660	12/13/13
N-Nitrosodiphenylamine	ND	330	12/13/13
Azobenzene	ND	330	12/13/13
4-Bromophenyl-phenylether	ND	330	12/13/13
Hexachlorobenzene	ND	330	12/13/13
Pentachlorophenol	ND	660	12/13/13
Phenanthrene	ND	66	12/13/13
Anthracene	ND	66	12/13/13
Di-n-butylphthalate	ND	330	12/13/13
Fluoranthene	ND	66	12/13/13

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	1707-S7	Diln Fac:	1.000
Lab ID:	251489-007	Batch#:	205938
Matrix:	Soil	Sampled:	12/04/13
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/10/13

Analyte	Result	RL	Analyzed
Pyrene	ND	66	12/13/13
Butylbenzylphthalate	ND	330	12/13/13
3,3'-Dichlorobenzidine	ND	660	12/13/13
Benzo(a)anthracene	ND	66	12/13/13
Chrysene	ND	66	12/13/13
bis(2-Ethylhexyl)phthalate	ND	330	12/13/13
Di-n-octylphthalate	ND	330	12/12/13
Benzo(b)fluoranthene	ND	66	12/12/13
Benzo(k)fluoranthene	ND	66	12/12/13
Benzo(a)pyrene	ND	66	12/12/13
Indeno(1,2,3-cd)pyrene	ND	66	12/12/13
Dibenz(a,h)anthracene	ND	66	12/12/13
Benzo(g,h,i)perylene	ND	66	12/12/13

Surrogate	%REC	Limits	Analyzed
2-Fluorophenol	57	33-120	12/13/13
Phenol-d5	66	39-120	12/13/13
2,4,6-Tribromophenol	43	33-120	12/13/13
Nitrobenzene-d5	74	46-120	12/13/13
2-Fluorobiphenyl	72	51-120	12/13/13
Terphenyl-d14	88	50-120	12/13/13

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC719610	Batch#:	205938
Matrix:	Soil	Prepared:	12/10/13
Units:	ug/Kg	Analyzed:	12/11/13

Analyte	Result	RL
N-Nitrosodimethylamine	ND	330
Phenol	ND	330
bis(2-Chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	330
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
bis(2-Chloroisopropyl) ether	ND	330
4-Methylphenol	ND	330
N-Nitroso-di-n-propylamine	ND	330
Hexachloroethane	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	660
2,4-Dimethylphenol	ND	330
Benzoic acid	ND	1,600
bis(2-Chloroethoxy)methane	ND	330
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	66
4-Chloroaniline	ND	330
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	66
Hexachlorocyclopentadiene	ND	660
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	660
Dimethylphthalate	ND	330
Acenaphthylene	ND	66
2,6-Dinitrotoluene	ND	330
3-Nitroaniline	ND	660
Acenaphthene	ND	66
2,4-Dinitrophenol	ND	660
4-Nitrophenol	ND	660
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
Diethylphthalate	ND	330
Fluorene	ND	66
4-Chlorophenyl-phenylether	ND	330
4-Nitroaniline	ND	660
4,6-Dinitro-2-methylphenol	ND	660
N-Nitrosodiphenylamine	ND	330
Azobenzene	ND	330
4-Bromophenyl-phenylether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	660
Phenanthrene	ND	66
Anthracene	ND	66
Di-n-butylphthalate	ND	330
Fluoranthene	ND	66

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC719610	Batch#:	205938
Matrix:	Soil	Prepared:	12/10/13
Units:	ug/Kg	Analyzed:	12/11/13

Analyte	Result	RL
Pyrene	ND	66
Butylbenzylphthalate	ND	330
3,3'-Dichlorobenzidine	ND	660
Benzo(a)anthracene	ND	66
Chrysene	ND	66
bis(2-Ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	66
Benzo(k)fluoranthene	ND	66
Benzo(a)pyrene	ND	66
Indeno(1,2,3-cd)pyrene	ND	66
Dibenz(a,h)anthracene	ND	66
Benzo(g,h,i)perylene	ND	66

Surrogate	%REC	Limits
2-Fluorophenol	62	33-120
Phenol-d5	70	39-120
2,4,6-Tribromophenol	60	33-120
Nitrobenzene-d5	74	46-120
2-Fluorobiphenyl	68	51-120
Terphenyl-d14	85	50-120

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC719611	Batch#:	205938
Matrix:	Soil	Prepared:	12/10/13
Units:	ug/Kg	Analyzed:	12/11/13

Analyte	Spiked	Result	%REC	Limits
Phenol	2,667	2,366	89	43-120
2-Chlorophenol	2,667	1,951	73	50-120
1,4-Dichlorobenzene	2,667	1,781	67	52-120
N-Nitroso-di-n-propylamine	2,667	2,555	96	30-121
1,2,4-Trichlorobenzene	2,667	1,895	71	53-120
4-Chloro-3-methylphenol	2,667	2,471	93	58-120
Acenaphthene	1,000	834.8	83	53-120
4-Nitrophenol	2,667	2,303	86	46-120
2,4-Dinitrotoluene	2,667	2,134	80	57-120
Pentachlorophenol	2,667	2,013	75	31-120
Pyrene	1,000	1,018	102	55-120

Surrogate	%REC	Limits
2-Fluorophenol	70	33-120
Phenol-d5	81	39-120
2,4,6-Tribromophenol	85	33-120
Nitrobenzene-d5	85	46-120
2-Fluorobiphenyl	77	51-120
Terphenyl-d14	87	50-120

Curtis & Tompkins, Ltd.

Batch QC Report

Semivolatile Organics by GC/MS

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8270C
Field ID:	ZZZZZZZZZZ	Batch#:	205938
MSS Lab ID:	251465-005	Sampled:	12/09/13
Matrix:	Soil	Received:	12/09/13
Units:	ug/Kg	Prepared:	12/10/13
Basis:	as received	Analyzed:	12/12/13
Diln Fac:	2.000		

Type: MS Lab ID: QC719612

Analyte	MSS Result	Spiked	Result	%REC	Limits
Phenol	1,857	2,682	2,508	24 *	50-120
2-Chlorophenol	<28.22	2,682	1,826	68	50-120
1,4-Dichlorobenzene	<14.82	2,682	1,627	61	55-120
N-Nitroso-di-n-propylamine	<30.74	2,682	2,286	85	43-120
1,2,4-Trichlorobenzene	<17.17	2,682	1,915	71	58-120
4-Chloro-3-methylphenol	<17.54	2,682	2,293	85	60-120
Acenaphthene	<13.55	1,006	783.2	78	59-120
4-Nitrophenol	<14.34	2,682	1,897	71	45-120
2,4-Dinitrotoluene	<16.87	2,682	1,967	73	59-120
Pentachlorophenol	<207.7	2,682	1,479	55	17-120
Pyrene	154.9	1,006	1,043	88	53-124

Surrogate	%REC	Limits
2-Fluorophenol	61	33-120
Phenol-d5	72	39-120
2,4,6-Tribromophenol	78	33-120
Nitrobenzene-d5	77	46-120
2-Fluorobiphenyl	76	51-120
Terphenyl-d14	84	50-120

Type: MSD Lab ID: QC719613

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Phenol	2,660	4,003	81	50-120	46 *	35
2-Chlorophenol	2,660	2,400	90	50-120	28	38
1,4-Dichlorobenzene	2,660	2,346	88	55-120	37	39
N-Nitroso-di-n-propylamine	2,660	3,047	115	43-120	29	38
1,2,4-Trichlorobenzene	2,660	2,468	93	58-120	26	34
4-Chloro-3-methylphenol	2,660	2,685	101	60-120	17	32
Acenaphthene	997.3	966.2	97	59-120	22	37
4-Nitrophenol	2,660	2,265	85	45-120	19	40
2,4-Dinitrotoluene	2,660	2,175	82	59-120	11	29
Pentachlorophenol	2,660	1,776	67	17-120	19	51
Pyrene	997.3	1,309	116	53-124	23	49

Surrogate	%REC	Limits
2-Fluorophenol	83	33-120
Phenol-d5	94	39-120
2,4,6-Tribromophenol	89	33-120
Nitrobenzene-d5	104	46-120
2-Fluorobiphenyl	94	51-120
Terphenyl-d14	100	50-120

*= Value outside of QC limits; see narrative
RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8082
Matrix:	Soil	Batch#:	206081
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/12/13
Diln Fac:	1.000		

Field ID: 1707-S1 Sampled: 12/04/13
Type: SAMPLE Analyzed: 12/13/13
Lab ID: 251489-001

Analyte	Result	RL
Aroclor-1016	ND	12
Aroclor-1221	ND	24
Aroclor-1232	ND	12
Aroclor-1242	ND	12
Aroclor-1248	ND	12
Aroclor-1254	ND	12
Aroclor-1260	ND	12

Surrogate	%REC	Limits
TCMX	82	60-140
Decachlorobiphenyl	90	36-133

Field ID: 1707-S2 Sampled: 12/04/13
Type: SAMPLE Analyzed: 12/13/13
Lab ID: 251489-002

Analyte	Result	RL
Aroclor-1016	ND	12
Aroclor-1221	ND	24
Aroclor-1232	ND	12
Aroclor-1242	ND	12
Aroclor-1248	ND	12
Aroclor-1254	ND	12
Aroclor-1260	ND	12

Surrogate	%REC	Limits
TCMX	110	60-140
Decachlorobiphenyl	94	36-133

Field ID: 1707-S3 Sampled: 12/05/13
Type: SAMPLE Analyzed: 12/13/13
Lab ID: 251489-003

Analyte	Result	RL
Aroclor-1016	ND	12
Aroclor-1221	ND	24
Aroclor-1232	ND	12
Aroclor-1242	ND	12
Aroclor-1248	ND	12
Aroclor-1254	ND	12
Aroclor-1260	ND	12

Surrogate	%REC	Limits
TCMX	100	60-140
Decachlorobiphenyl	82	36-133

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8082
Matrix:	Soil	Batch#:	206081
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/12/13
Diln Fac:	1.000		

Field ID: 1707-S4 Lab ID: 251489-004
Type: SAMPLE Sampled: 12/05/13

Analyte	Result	RL	Analyzed
Aroclor-1016	ND	12	12/14/13
Aroclor-1221	ND	24	12/14/13
Aroclor-1232	ND	12	12/14/13
Aroclor-1242	ND	12	12/14/13
Aroclor-1248	ND	12	12/14/13
Aroclor-1254	380	12	12/13/13
Aroclor-1260	170	12	12/14/13

Surrogate	%REC	Limits	Analyzed
TCMX	96	60-140	12/14/13
Decachlorobiphenyl	91	36-133	12/14/13

Field ID: 1707-S5 Sampled: 12/05/13
Type: SAMPLE Analyzed: 12/13/13
Lab ID: 251489-005

Analyte	Result	RL
Aroclor-1016	ND	12
Aroclor-1221	ND	24
Aroclor-1232	ND	12
Aroclor-1242	ND	12
Aroclor-1248	ND	12
Aroclor-1254	ND	12
Aroclor-1260	ND	12

Surrogate	%REC	Limits
TCMX	104	60-140
Decachlorobiphenyl	100	36-133

Field ID: 1707-S6 Lab ID: 251489-006
Type: SAMPLE Sampled: 12/04/13

Analyte	Result	RL	Analyzed
Aroclor-1016	ND	12	12/14/13
Aroclor-1221	ND	24	12/14/13
Aroclor-1232	ND	12	12/14/13
Aroclor-1242	ND	12	12/14/13
Aroclor-1248	ND	12	12/14/13
Aroclor-1254	550	12	12/13/13
Aroclor-1260	150	12	12/14/13

Surrogate	%REC	Limits	Analyzed
TCMX	95	60-140	12/14/13
Decachlorobiphenyl	100	36-133	12/14/13

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8082
Matrix:	Soil	Batch#:	206081
Units:	ug/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/12/13
Diln Fac:	1.000		

Field ID:	1707-S7	Sampled:	12/04/13
Type:	SAMPLE	Analyzed:	12/13/13
Lab ID:	251489-007		

Analyte	Result	RL
Aroclor-1016	ND	12
Aroclor-1221	ND	24
Aroclor-1232	ND	12
Aroclor-1242	ND	12
Aroclor-1248	ND	12
Aroclor-1254	24	12
Aroclor-1260	ND	12

Surrogate	%REC	Limits
TCMX	98	60-140
Decachlorobiphenyl	91	36-133

Type:	BLANK	Analyzed:	12/13/13
Lab ID:	QC720219		

Analyte	Result	RL
Aroclor-1016	ND	12
Aroclor-1221	ND	24
Aroclor-1232	ND	12
Aroclor-1242	ND	12
Aroclor-1248	ND	12
Aroclor-1254	ND	12
Aroclor-1260	ND	12

Surrogate	%REC	Limits
TCMX	98	60-140
Decachlorobiphenyl	106	36-133

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8082
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC720220	Batch#:	206081
Matrix:	Soil	Prepared:	12/12/13
Units:	ug/Kg	Analyzed:	12/13/13

Analyte	Spiked	Result	%REC	Limits
Aroclor-1016	165.6	161.5	98	58-144
Aroclor-1260	165.6	176.6	107	55-146

Surrogate	%REC	Limits
TCMX	97	60-140
Decachlorobiphenyl	116	36-133

Curtis & Tompkins, Ltd.

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3550B
Project#:	21707	Analysis:	EPA 8082
Field ID:	1707-S1	Batch#:	206081
MSS Lab ID:	251489-001	Sampled:	12/04/13
Matrix:	Soil	Received:	12/10/13
Units:	ug/Kg	Prepared:	12/12/13
Basis:	as received	Analyzed:	12/13/13
Diln Fac:	1.000		

Type: MS Lab ID: QC720221

Analyte	MSS Result	Spiked	Result	%REC	Limits
Aroclor-1016	<2.949	166.2	162.8	98	51-155
Aroclor-1260	<1.928	166.2	202.1	122	38-155

Surrogate	%REC	Limits
TCMX	95	60-140
Decachlorobiphenyl	90	36-133

Type: MSD Lab ID: QC720222

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	166.4	162.3	98	51-155	0	38
Aroclor-1260	166.4	210.2	126	38-155	4	55

Surrogate	%REC	Limits
TCMX	100	60-140
Decachlorobiphenyl	102	36-133

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	251489	Project#:	21707
Client:	Myounghee Noh & Associates	Location:	DAGS Pahole Radio Facility
Field ID:	1707-S1	Basis:	as received
Lab ID:	251489-001	Diln Fac:	1.000
Matrix:	Soil	Sampled:	12/04/13
Units:	mg/Kg	Received:	12/10/13

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Arsenic	ND	0.27	206012	12/11/13	12/12/13	EPA 3050B	EPA 6010B
Barium	48	0.27	206012	12/11/13	12/12/13	EPA 3050B	EPA 6010B
Cadmium	1.5	0.27	206012	12/11/13	12/12/13	EPA 3050B	EPA 6010B
Chromium	230	0.27	206012	12/11/13	12/12/13	EPA 3050B	EPA 6010B
Lead	39	0.27	206012	12/11/13	12/12/13	EPA 3050B	EPA 6010B
Mercury	0.19	0.016	206052	12/12/13	12/12/13	METHOD	EPA 7471A
Selenium	15	0.53	206012	12/11/13	12/13/13	EPA 3050B	EPA 6010B
Silver	0.84	0.27	206012	12/11/13	12/12/13	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	251489	Project#:	21707
Client:	Myounghee Noh & Associates	Location:	DAGS Pahole Radio Facility
Field ID:	1707-S2	Basis:	as received
Lab ID:	251489-002	Diln Fac:	1.000
Matrix:	Soil	Sampled:	12/04/13
Units:	mg/Kg	Received:	12/10/13

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Arsenic	16	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Barium	39	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Cadmium	1.7	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Chromium	230	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Lead	35	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Mercury	0.22	0.018	206052	12/12/13	12/12/13	METHOD	EPA 7471A
Selenium	11	0.51	206012	12/11/13	12/13/13	EPA 3050B	EPA 6010B
Silver	0.93	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B

RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	251489	Project#:	21707
Client:	Myounghee Noh & Associates	Location:	DAGS Pahole Radio Facility
Field ID:	1707-S3	Basis:	as received
Lab ID:	251489-003	Diln Fac:	1.000
Matrix:	Soil	Sampled:	12/05/13
Units:	mg/Kg	Received:	12/10/13

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Arsenic	ND	0.26	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Barium	37	0.26	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Cadmium	0.98	0.26	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Chromium	190	0.26	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Lead	7.3	0.26	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Mercury	0.25	0.015	206052	12/12/13	12/12/13	METHOD	EPA 7471A
Selenium	8.7	0.52	206012	12/11/13	12/13/13	EPA 3050B	EPA 6010B
Silver	0.84	0.26	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	251489	Project#:	21707
Client:	Myounghee Noh & Associates	Location:	DAGS Pahole Radio Facility
Field ID:	1707-S4	Basis:	as received
Lab ID:	251489-004	Diln Fac:	1.000
Matrix:	Soil	Sampled:	12/05/13
Units:	mg/Kg	Received:	12/10/13

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Arsenic	ND	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Barium	48	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Cadmium	1.4	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Chromium	250	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Lead	130	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Mercury	0.51	0.018	206052	12/12/13	12/12/13	METHOD	EPA 7471A
Selenium	14	0.45	206012	12/11/13	12/13/13	EPA 3050B	EPA 6010B
Silver	1.1	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	251489	Project#:	21707
Client:	Myounghee Noh & Associates	Location:	DAGS Pahole Radio Facility
Field ID:	1707-S5	Basis:	as received
Lab ID:	251489-005	Diln Fac:	1.000
Matrix:	Soil	Sampled:	12/05/13
Units:	mg/Kg	Received:	12/10/13

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Arsenic	ND	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Barium	31	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Cadmium	1.2	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Chromium	220	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Lead	18	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Mercury	0.73	0.015	206052	12/12/13	12/12/13	METHOD	EPA 7471A
Selenium	18	0.50	206012	12/11/13	12/13/13	EPA 3050B	EPA 6010B
Silver	1.3	0.25	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	251489	Project#:	21707
Client:	Myounghee Noh & Associates	Location:	DAGS Pahole Radio Facility
Field ID:	1707-S6	Basis:	as received
Lab ID:	251489-006	Diln Fac:	1.000
Matrix:	Soil	Sampled:	12/04/13
Units:	mg/Kg	Received:	12/10/13

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Arsenic	ND	0.24	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Barium	34	0.24	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Cadmium	1.3	0.24	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Chromium	250	0.24	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Lead	270	0.24	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Mercury	0.067	0.018	206052	12/12/13	12/12/13	METHOD	EPA 7471A
Selenium	ND	0.49	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Silver	0.82	0.24	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

RCRA Metals

Lab #:	251489	Project#:	21707
Client:	Myounghee Noh & Associates	Location:	DAGS Pahole Radio Facility
Field ID:	1707-S7	Basis:	as received
Lab ID:	251489-007	Diln Fac:	1.000
Matrix:	Soil	Sampled:	12/04/13
Units:	mg/Kg	Received:	12/10/13

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Arsenic	ND	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Barium	32	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Cadmium	0.90	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Chromium	220	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Lead	7.6	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B
Mercury	0.029	0.018	206052	12/12/13	12/12/13	METHOD	EPA 7471A
Selenium	5.7	0.47	206012	12/11/13	12/13/13	EPA 3050B	EPA 6010B
Silver	0.71	0.23	206012	12/11/13	12/11/13	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	21707	Analysis:	EPA 6010B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC719914	Batch#:	206012
Matrix:	Soil	Prepared:	12/11/13
Units:	mg/Kg		

Analyte	Result	RL	Analyzed
Arsenic	ND	0.25	12/11/13
Barium	ND	0.25	12/11/13
Cadmium	ND	0.25	12/11/13
Chromium	ND	0.25	12/11/13
Lead	ND	0.25	12/12/13
Selenium	ND	0.50	12/11/13
Silver	ND	0.25	12/11/13

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	21707	Analysis:	EPA 6010B
Matrix:	Soil	Batch#:	206012
Units:	mg/Kg	Prepared:	12/11/13
Diln Fac:	1.000	Analyzed:	12/11/13

Type: BS Lab ID: QC719915

Analyte	Spiked	Result	%REC	Limits
Arsenic	50.00	50.10	100	80-120
Barium	100.0	98.04	98	80-120
Cadmium	10.00	10.01	100	80-120
Chromium	100.0	97.38	97	80-120
Lead	100.0	95.02	95	80-120
Selenium	50.00	48.59	97	80-120
Silver	10.00	9.335	93	80-120

Type: BSD Lab ID: QC719916

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Arsenic	50.00	49.85	100	80-120	0	20
Barium	100.0	98.81	99	80-120	1	20
Cadmium	10.00	9.983	100	80-120	0	20
Chromium	100.0	98.07	98	80-120	1	20
Lead	100.0	94.55	95	80-120	0	20
Selenium	50.00	49.28	99	80-120	1	20
Silver	10.00	9.338	93	80-120	0	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	EPA 3050B
Project#:	21707	Analysis:	EPA 6010B
Field ID:	1707-S1	Diln Fac:	1.000
MSS Lab ID:	251489-001	Batch#:	206012
Matrix:	Soil	Sampled:	12/04/13
Units:	mg/Kg	Received:	12/10/13
Basis:	as received	Prepared:	12/11/13

Type: MS Lab ID: QC719917

Analyte	MSS Result	Spiked	Result	%REC	Limits	Analyzed
Arsenic	<0.07728	50.00	37.02	74	72-120	12/12/13
Barium	48.19	100.0	135.0	87	50-133	12/12/13
Cadmium	1.468	10.00	9.930	85	72-120	12/12/13
Chromium	228.6	100.0	307.3	79	61-120	12/12/13
Lead	39.46	100.0	113.3	74	52-122	12/12/13
Selenium	15.16	50.00	61.38	92	70-120	12/13/13
Silver	0.8361	10.00	10.59	98	67-120	12/12/13

Type: MSD Lab ID: QC719918

Analyte	Spiked	Result	%REC	Limits	RPD	Lim	Analyzed
Arsenic	50.51	40.41	80	72-120	8	30	12/12/13
Barium	101.0	134.6	86	50-133	1	43	12/12/13
Cadmium	10.10	10.09	85	72-120	1	22	12/12/13
Chromium	101.0	307.2	78	61-120	0	31	12/12/13
Lead	101.0	115.2	75	52-122	1	49	12/12/13
Selenium	50.51	62.27	93	70-120	1	26	12/13/13
Silver	10.10	10.58	96	67-120	1	25	12/12/13

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	METHOD
Project#:	21707	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Type:	BLANK	Batch#:	206052
Lab ID:	QC720080	Prepared:	12/12/13
Matrix:	Soil	Analyzed:	12/12/13
Units:	mg/Kg		

Result	RL
ND	0.017

ND= Not Detected
RL= Reporting Limit

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	METHOD
Project#:	21707	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	206052
Matrix:	Soil	Prepared:	12/12/13
Units:	mg/Kg	Analyzed:	12/12/13
Diln Fac:	1.000		

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC720081	0.2083	0.2033	98	80-120		
BSD	QC720082	0.2083	0.2000	96	80-120	2	20

RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

RCRA Metals

Lab #:	251489	Location:	DAGS Pahole Radio Facility
Client:	Myounghee Noh & Associates	Prep:	METHOD
Project#:	21707	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	206052
MSS Lab ID:	251425-001	Sampled:	12/06/13
Matrix:	Soil	Received:	12/06/13
Units:	mg/Kg	Prepared:	12/12/13
Basis:	as received	Analyzed:	12/12/13

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC720083	0.04673	0.2232	0.2679	99	69-136		
MSD	QC720084		0.2155	0.2560	97	69-136	2	35

RPD= Relative Percent Difference

APPENDIX F

Targeted Hazardous Material Survey Report

TARGETED HAZARDOUS MATERIAL SURVEY REPORT
FOR
INFORMATION AND COMMUNICATION SERVICES DIVISION
PAHOLE RADIO FACILITY
RENOVATIONS AND OTHER IMPROVEMENTS
MOKULEIA, HAWAII

DAGS JOB NO. 12-10-0733
MNA PROJECT 01707_2

DECEMBER 19, 2013

Myounghee Noh & Associates

Environmental Studies and Consulting Services

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This survey report is prepared for:

Richard Matsunaga & Associates Architects, Inc.
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Honolulu, Hawaii 96814

TARGETED HAZARDOUS MATERIAL SURVEY REPORT
FOR
INFORMATION AND COMMUNICATION SERVICES DIVISION
PAHOLE RADIO FACILITY
RENOVATIONS AND OTHER IMPROVEMENTS PROJECT
MOKULEIA, HAWAII

DAGS Job No. 12-10-0733
MNA Project 01707_2

December 19, 2013

Danny Falanug
Building Inspector (HIASB-3526, exp. Date 5/25/2014)

Myounghee Noh
Principal

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Draft/Illustrator	Kristin Cabanila
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Editor/QC	Phillip Cabanila

EXECUTIVE SUMMARY

In October 2013, Myounghee Noh & Associates, L.L.C. (MNA), was retained by Richard Matsunaga & Associates Architects, Inc. (RMAIA), to conduct a targeted hazardous materials survey of the Information and Communication Services Division (ICSD) Pahole Radio Site, located in Mokuleia, Island of Oahu, Hawaii. MNA's survey was conducted in support of the planned renovation and improvement project. Targeted areas in this survey were the Former Generator Building, Water Tanks 1-3, the Lower Building, and the Tower Area.

The purpose of the survey was to identify the existence (if any), extent, and condition of asbestos-containing materials (ACM), lead-containing paint (LCP) , and arsenic-containing material present in areas anticipated to be disturbed by the planned renovation project.

MNA conducted the survey during December 4-5, 2013, and identified 33 suspect building materials. Based on the survey and analysis of 36 asbestos samples, 46 lead samples, and two arsenic samples, MNA provides the following summary:

	Asbestos-Containing Material	Lead-Containing Paint	Lead-Based Paint	Arsenic-Containing Material
Former Generator Building	■	■	■	■
Lower Building		■	■	
Water Tank 1				
Water Tank 2				
Water Tank 3				
Tower Area (ground surface)			■	

Based on the sampling and analysis of suspect paints and bulk materials, special hazard control measures are warranted for work involving ACM, LCP, lead-based paint (LBP), and arsenic-containing materials. These control measures are briefly described in Section 8 Recommendations for Renovation and Construction Work. General dust and runoff controls are also warranted.

The contractor shall verify the location and volumes of hazardous materials and determine the appropriate dust and hazard control measures based on the area and material to be disturbed. Any ACM disturbance exceeding three square feet or three linear feet of friable ACM or generating 0.5 cubic feet of ACM debris is considered a regulated activity.

Quantities of hazardous materials provided in this report for contractor's information are based on visual estimates at the time of the survey. Contractors are required to perform in accordance with 29 CFR 1926.1101(k)(3)(i) to identify the presence, location, and quantity of ACM and/or Presumed-ACM before any work is begun.

1.0 INTRODUCTION

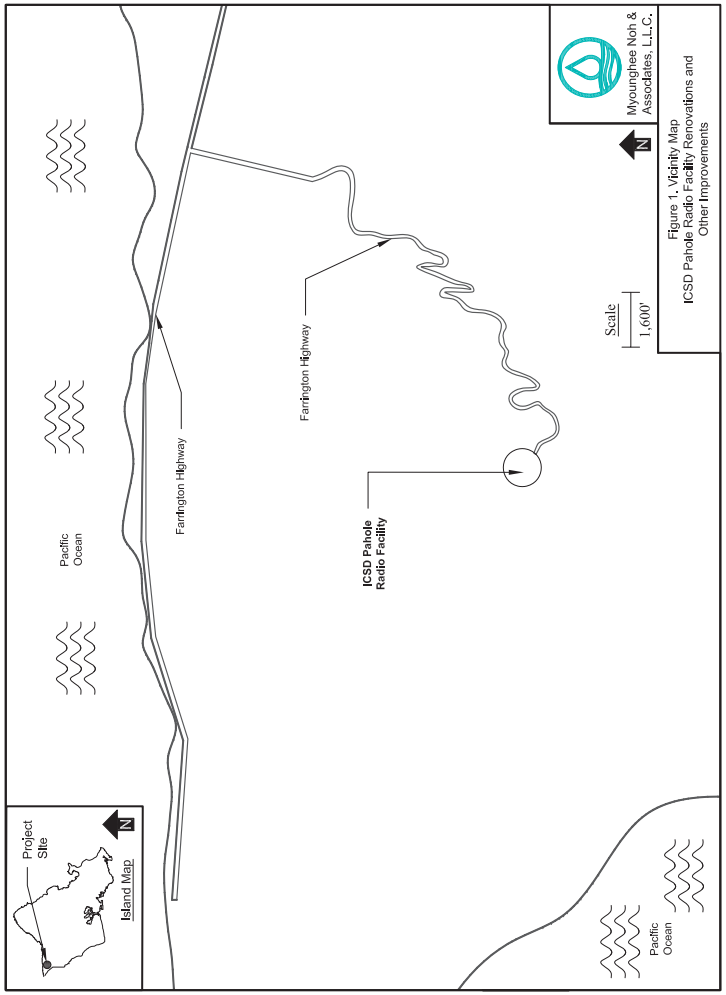
Myounghee Noh & Associates, L.L.C. (MNA), under contract with Richard Matsunaga & Associates Architects, Inc. (RMAIA), conducted a targeted hazardous materials survey at the Information and Communication Services Division (ICSD) Pahole Radio Site, located in Mokuleia, Island of Oahu, Hawaii. Figure 1 presents a general vicinity map of the Pahole Radio Site.

MNA's survey was conducted in support of planned renovations of the Former Generator Building, Water Tanks 1-3, the Lower Building, and the Tower Area (ground surface). The survey targeted asbestos, lead, and arsenic in the project site.

Pahole Radio Site
December, 2013

2.0 SAMPLING AND SURVEY METHODS

During December 4-5, 2013, State of Hawaii-certified building inspector, Danny Falanug, conducted the targeted hazardous material building survey. The inspector performed a visual inspection of all interior and exterior areas expected to be disturbed by the planned renovation project to identify materials suspected of containing asbestos, lead, or arsenic and collected samples of these materials. Inspector certifications are presented in Appendix A.



2.1 Identifying Homogeneous Materials

The survey identified building materials with the same appearance, color, and substrate as homogeneous materials. Interior homogeneous materials are considered unique per building and building floor, while exterior building materials are considered unique per building. Building materials with the same characteristics (appearance, color, and substrate) as an identified homogeneous material should be considered to possess the same hazardous characteristics unless specifically identified as a different material in the report. As an example, if tan paint on metal is identified as lead-based paint (LBP), then all similar tan paint on metal should be treated as LBP. Table 1 provides an overview of sampling and a summary of hazardous materials identified.

Table 1. Summary of Sampling and Results

Materials Sampled	Samples Submitted/ Inspected	Identified Material Locations	Identified Hazardous Materials
Asbestos in bulk material and paint	36	Ceilings, door frames, walls	3 ACM (2-10% asbestos)
Lead in paint	46	Conduit, debris, door frames, electrical box, eaves, floor, support beams, trim, vents, walls, window bars, window frames	17 LCP (280 mg/kg – 72,000 mg/kg) including 12 LBP (5,100 mg/kg – 72,000 mg/kg)
Arsenic in bulk material	2	Ceilings	1 Arsenic-Containing Material (2,200 – 2,700 mg/kg)

ACM – Asbestos-Containing Material
LBP – Lead-Based Paint
LCP – Lead-Containing Paint
mg/kg – milligrams per kilogram (equivalent to parts per million)

2.2 Building Material Sampling

Bulk and paint samples were collected using a decontaminated chisel, razor, and hammer in a manner that minimized airborne dust. The inspector collected triplicate samples for asbestos and duplicate samples for lead and arsenic. Samples were placed in sealable plastic bags, labeled with a unique identification number, and recorded on a chain-of-custody. For each sample, the date, sample appearance, analyte, and sample location were recorded on a field data form. All samples were transported under chain-of-custody by FedEx to LA Testing in South Pasadena,

California. LA Testing used their EMSL Laboratory in San Leandro, California, for asbestos analysis. LA Testing used their Garden Grove, California, facility for arsenic analysis.

3.0 LABORATORY INFORMATION

LA Testing analyzed the samples as follows:

- Asbestos samples by polarized light microscopy using the Environmental Protection Agency (EPA) Method 600/R-93/116.
- Lead samples by flame atomic absorption spectroscopy using the EPA Method 7420.
- Arsenic samples by inductively coupled plasma-atomic emission spectrometry using the EPA Method 3050/1610B.

LA Testing, South Pasadena, is certified by:

- National Voluntary Laboratory Accreditation Program (NVLAP), certification 200232-0.
- State of Hawaii Department of Health (HDOH), certification L-01-034.
- American Industrial Hygienist Association (AIHA) Environmental Lead Laboratory Accreditation Program (ELLAP), certification 102814.

EMSL Analytical, Inc., San Leandro, is certified by:

- NVLAP, certification 101048-3.
- HDOH, certification L-01-035.
- American Association for Laboratory Accreditation (A2LA) Environmental Laboratory, certification 2845.09.

LA Testing, Garden Grove, is certified by:

- NVLAP, certification 101384-0.
- HDOH, certification L-07-001.
- AIHA ELLAP, certification 101650.

4.0 ASBESTOS RESULTS

Materials determined to contain greater than, or equal to, 1% asbestos fibers are considered regulated ACM under the National Emission Standards for Hazardous Air Pollutants (NESHAP) as specified

in 40 Code of Federal Regulations (CFR) Part 61 Subpart M. The U.S. Occupational Safety and Health Administration (OSHA) Asbestos General Industry and Construction Standards also define asbestos-containing materials (ACM) as 1% or more by volume under 29 CFR 1910.1001 and 29 CFR 1926.1101, respectively. However, OSHA considers any measurable levels of asbestos fibers as health concern.

Twelve suspect ACM were identified onsite, generating 36 samples for the analysis of asbestos. Three of the suspect ACM were confirmed to be ACM through sampling and analysis. The confirmed ACM were present in the Former Generator Building, light gray and black caulking on exterior door frames and walls and white drywall ceiling panel. No ACM were identified in the targeted areas of the Lower Building, Water Tanks 1-3, or the Tower Area.

The ACM findings are summarized in Table 2. The suspect ACM descriptions and identifiers are provided in Appendix B. Sample location drawings are provided in Appendix C. Photographs of the suspect materials are presented in Appendix D. Laboratory analytical reports, chain-of-custody, and field data forms are provided in Appendix E.

5.0 LEAD RESULTS

The U.S. Department of Housing and Urban Development (HUD) and the EPA define paint containing 5,000 milligrams per kilogram (mg/kg), or 0.5% by weight, or more of lead to be LBP. OSHA considers paint containing any measurable concentration of lead to be lead-containing paint (LCP). When lead is detected in a multi-layer sample, it is assumed that all layers represented by the sample contain lead at the same concentration.

Twenty-three paints suspected of containing lead were identified and sampled, generating 46 paint samples. Seventeen LCP were identified in the survey area, with results ranging from 280 mg/kg to 72,000 mg/kg. Twelve of those LCP were identified as LBP, exceeding 5,000 mg/kg, the threshold for LBP.

Twelve LCP, including eight LBP, were identified in the Former Generator Building. Four LCP, including three LBP, were identified in the Lower Building. One LBP debris was identified adjacent to the Tower Area on the ground surface. No LCP were identified on the exterior or within the interior of Water Tanks 1-3.

The lead findings are summarized in Table 3. Suspect LCP descriptions and identifiers are provided in Appendix B. Lead sample and hazardous material location drawings are provided in Appendix C. Photographs of suspect materials are presented in Appendix D. Laboratory analytical reports, chain-of-custody, and field data forms are provided in Appendix E.

6.0 ARSENIC RESULTS

The disturbance of arsenic-containing materials is regulated by the OSHA Inorganic Arsenic General Industry Standard under 29 CFR 1910.1018. One fiberboard material in the Former Generator Building suspected to contain arsenic was identified and sampled, generating two samples for the analysis of arsenic content. The samples contained measurable amounts of arsenic, 2,200 mg/kg and 2,700 mg/kg. The identified arsenic-containing material was white 12" x 12" acoustical ceiling tiles with holes in fair condition on the interior drywall ceiling, totaling approximately 200 square feet.

The suspect arsenic-containing material description and identifier is provided in Appendix B. A sample location drawing is provided in Appendix C. A photograph of the confirmed arsenic-containing material is presented in Appendix D. Laboratory analytical reports, chain-of-custody, and field data forms are provided in Appendix E.

Table 2. Asbestos-Containing Material Determination Table

Building	Rooms	Locations	HM ID	Material Color	Material	Substrate	Result	Condition	Estimated Quantity
Former Generator Building	Interior	Walls	1	Lt. blue	Skim coat	Concrete block	ND	Fair	1,000 sq. ft.
Former Generator Building	Interior	Floor	4	Yellow	Skim coat	Concrete	ND	Poor	50 sq. ft.
Former Generator Building	Interior	Ceilings	6	White	12" x 12" Acoustical tiles with holes Mastic	Drywall	ND	Fair	200 sq. ft.
Former Generator Building	**Interior**	**Ceiling**	**7**	**White**	**Drywall board**	**None**	**ACM 2% Amosite**	**Fair**	**200 sq. ft.**
Former Generator Building	Exterior	Roof	15	Black	Tar Felt	Metal	ND	Fair	200 sq. ft.
Former Generator Building	Exterior	Door frames	16	Tan	Rubber	Concrete block	ND	Poor	40 ln. ft.
Former Generator Building	**Exterior**	**Wall**	**17**	**Black**	**Caulking**	**Concrete block**	**ACM 10% Chrysotile**	**Fair**	**5 ln. ft.**
Former Generator Building	**Exterior**	**Door frames**	**18**	**Lt. gray**	**Caulking**	**Wood**	**ACM 3% Chrysotile**	**Poor**	**40 ln. ft.**
Water Tank 1	Interior	Wall	21	Black	Tank liner	Metal	ND	Good	1,300 sq. ft.
Water Tank 2	Interior	Wall	24	Black	Tank liner	Metal	ND	Good	630 sq. ft.
Water Tank 3	Interior	Wall	27	Black	Tank liner	Metal	ND	Good	630 sq. ft.
Lower Building	Storage 2	Ceiling	31	White	Drywall	None	ND	Poor	20 sq. ft.

Bold values indicate results above the detection limit.
Good – Material is in an "as installed" condition. It is usable as is, may show cosmetic wear and tear or fading.
Fair – Building material is functional for its installed purpose but shows initial signs of deterioration beyond the cosmetic.
Poor – Material shows significant deterioration and may not be functional for its installed purpose. Paint is bubbling or peeling over 20% or more of surface area and no longer protects the substrate.

Acronyms and Abbreviations:
ACM – Asbestos-Containing Material
HM ID – Homogeneous Material Identifier
ln. ft. – linear feet
ND – None Detected
sq. ft. – square feet

Table 3. Lead-Containing Paint Determination

Building	Rooms	Locations	HM ID	Material Color	Material	Substrate	Result (mg/kg)	Condition	Estimated Quantity
Former Generator Building	**Interior**	**Walls**	**1**	**Lt. blue**	Skim coat **Paint**	**Concrete block**	**LCP 2,600 - 3,300**	**Fair**	**1,000 sq. ft.**
Former Generator Building	**Interior**	**Door frames, window frames, trim**	**2**	**Lt. blue**	**Paint**	**Wood**	**LBP 6,100 - 6,600**	**Poor**	**100 ln. ft.**
Former Generator Building	**Interior**	**Walls**	**3**	**Black**	**Paint**	**Concrete block**	**LBP 5,300 - 6,400**	**Fair**	**50 ln. ft.**
Former Generator Building	**Interior**	**Floor**	**4**	**Yellow**	Skim coat **Paint**	**Concrete**	**LBP 200,000 - 270,000**	**Poor**	**50 sq. ft.**
Former Generator Building	**Interior**	**Conduit, electrical box**	**5**	**Blue**	**Paint**	**Metal**	**LBP 4,800 - 5,100**	**Poor**	**30 ln. ft.**
Former Generator Building	**Interior**	**Support beam**	**8**	**Lt. blue**	**Paint**	**Metal**	**LBP 22,000 - 26,000**	**Poor**	**10 ln. ft.**
Former Generator Building	**Interior**	**Conduit, vents**	**9**	**Black**	**Paint**	**Metal**	**LCP 280 - 4,400**	**Fair**	**10 ln. ft.**
Former Generator Building	**Interior**	**Door frames**	**10**	**Black**	**Paint**	**Wood**	**LBP 18,000 - 20,000**	**Poor**	**4 ln. ft.**
Former Generator Building	**Exterior**	**Walls**	**11**	**Tan**	**Paint**	**Concrete block**	**LCP 880 - 950**	**Fair**	**1,500 sq. ft.**
Former Generator Building	**Exterior**	**Eaves, window bars**	**12**	**Tan**	**Paint**	**Metal**	**LBP 69,000 - 72,000**	**Poor**	**100 sq. ft.**
Former Generator Building	**Exterior**	**Door frames, window frame**	**13**	**Tan**	**Paint**	**Wood**	**LBP 15,000 - 46,000**	**Poor**	**50 ln. ft.**
Former Generator Building	**Exterior**	**Wall**	**14**	**Green**	**Paint**	**Concrete block**	**LCP 370 - 700**	**Good**	**20 sq. ft.**
Water Tank 1	Exterior	Wall	19	White	Paint	Metal	<100	Good	1,300 sq. ft.
Water Tank 1	Exterior	Roof	20	Olive green	Paint	Metal	<110 - <340	Good	320 sq. ft.
Water Tank 2	Exterior	Wall	22	White	Paint	Metal	<100	Good	630 sq. ft.
Water Tank 2	Exterior	Roof	23	Olive green	Paint	Metal	<110 - <930	Good	320 sq. ft.
Water Tank 3	Exterior	Wall	25	Lt. green	Paint	Metal	<100	Good	630 sq. ft.
Water Tank 3	Exterior	Roof	26	Olive green	Paint	Metal	<250 - <850	Good	320 sq. ft.
Lower Building	**Kitchen**	**Wall**	**28**	**White**	**Paint**	**Concrete block**	**LBP 7,000 - 7,900**	**Good**	**50 sq. ft.**
Lower Building	**Kitchen**	**Electrical box**	**29**	**Blue**	**Paint**	**Metal**	**LBP 8,300 - 12,000**	**Fair**	**30 sq. ft.**
Lower Building	**Kitchen**	**Wall**	**30**	**Beige**	**Paint**	**Concrete block**	**LBP 18,000**	**Good**	**20 sq. ft.**

Building	Rooms	Locations	HM ID	Material Color	Material	Substrate	Result (mg/kg)	Condition	Estimated Quantity
Lower Building	Storage 2	Walls	32	Lt. green	Paint	Concrete block	LCP 1,900 - 2,000	Good	160 sq. ft.
Tower Area	Exterior	Debris	33	Orange	Paint	Metal	LBP 3,900 - 8,400	NA	200 sq. ft.

Bold values indicate results above the detection limit.

Good – Material is in an "as installed" condition. It is usable as is, may show cosmetic wear and tear or fading.

Fair – Building material is functional for its installed purpose but shows initial signs of deterioration beyond the cosmetic.

Poor – Material shows significant deterioration and may not be functional for its installed purpose. Paint is bubbling or peeling over 20% or more of surface area and no longer protects the substrate.

Acronyms and Abbreviations:
HM ID – Hazardous Material Identifier
LBP – Lead-Based Paint ≥5,000
LCP – Lead-Containing Material <5,000 mg/kg
ln. ft. – Linear Feet
mg/kg – milligrams per kilogram, equivalent to parts per million
NA – Not Applicable
sq. ft. – Square Feet

7.0 SUMMARY OF SURVEY RESULTS

In October 2013, MNA was retained by RMAIA, to conduct a hazardous materials survey of the ICSD Pahole Radio Site, located at Mokuleia, on the Island of Oahu, Hawaii. MNA's survey was conducted in support of planned renovations of the Former Generator Building, Water Tanks 1-3, the Lower Building, and the Tower Area.

The purpose of the survey was to identify the existence (if any), extent, and condition of ACM, LCP, and arsenic-containing materials present in areas anticipated to be disturbed by the planned renovation project.

MNA conducted the survey during December 4-5, 2013, and identified 33 suspect building materials. Based on the survey and analysis of 36 asbestos samples, 46 lead samples, and two arsenic samples, MNA provides the following summary:

- Three ACM were identified in the Former Generator Building. No ACM were identified in the targeted areas of the Lower Building, Water Tanks 1-3, or the Tower Area. The ACM found were:
  - **White drywall-board ceiling** in fair condition in the interior, **2% amosite**, totaling approximately 200 square feet.
  - **Black caulking** in fair condition on **exterior concrete block walls**, **10% chrysotile**, totaling approximately five linear feet.

  - **Light gray caulking** in poor condition **on exterior wood door frames**, **3% chrysotile**, totaling approximately 40 linear feet.

- Seventeen LCP were identified in the targeted areas. The LCP included:

  Former Generator Building
  - **Light blue paint** in fair condition **on concrete block walls in the interior**, **2,600 mg/kg** and **3,300 mg/kg**, totaling approximately 1,000 square feet.
  - **Black paint** in fair condition **on metal conduit and vents in the interior**, **280 mg/kg** and **4,400 mg/kg**, totaling approximately 10 linear feet.
  - **Tan paint** in fair condition **on exterior concrete block walls**, **880 mg/kg** and **950 mg/kg**, totaling approximately 1,500 square feet.
  - **Green paint** in good condition **on exterior concrete block walls**, **370 mg/kg** and **700 mg/kg**, totaling approximately 20 square feet.

  Lower Building
  - **Light green paint** in good condition **on concrete block walls in Storage 2**, **1,900 mg/kg** and **2,000 mg/kg**, totaling approximately 160 square feet.

- Twelve of the 17 LCP were LBP, exceeding 5,000 mg/kg. The LBP included:

  Former Generator Building
  - **Light blue paint** in poor condition **on wood door frames, window frames, and trim in the interior**, **6,100 mg/kg** and **6,600 mg/kg**, totaling approximately 100 linear feet.
  - **Black paint** in fair condition **on concrete block in the interior, 5,300 mg/kg** and **6,400 mg/kg**, totaling approximately 50 linear feet.
  - **Blue paint** in poor condition **on metal conduit and electrical box in the interior**, **4,800 mg/kg** and **5,100 mg/kg**, totaling approximately 30 linear feet.
  - **Light blue paint** in poor condition **on metal support beam in the interior**, **22,000 mg/kg** and **26,000 mg/kg**, totaling approximately 10 linear feet.
  - **Black paint** in poor condition **on wood door frames in the interior**, **18,000 mg/kg** and **20,000 mg/kg**, totaling approximately 5 linear feet.
  - **Tan paint** in poor condition **on exterior metal eaves and window bars**, **69,000 mg/kg** and **72,000 mg/kg**, totaling approximately 100 square feet.
  - **Tan paint** in poor condition **on exterior wood door and window frames**, **15,000 mg/kg** and **46,000 mg/kg**, totaling approximately 50 linear feet.

Lower Building

- **White paint** in good condition **on concrete block walls in the Kitchen**, **7,000 mg/kg** and **7,900 mg/kg**, totaling approximately 50 square feet.
- **Blue paint** in fair condition **on metal electrical box in the Kitchen, 8,300 mg/kg** and **12,000 mg/kg**, totaling approximately 30 square feet.
- **Beige paint** in good condition **on concrete block walls in the Kitchen**, **18,000 mg/kg**, totaling approximately 20 square feet.

Tower Area

- **Orange paint on metal debris on the ground surface**, 3,900 mg/kg and **8,400 mg/kg,** totaling approximately 200 square feet.

- One arsenic-containing material, **white 12" x 12" acoustical ceiling tiles with holes** in fair condition **in the Former Generator Building**, **2,200 mg/kg** and **2,700 mg/kg**, totaling approximately 200 square feet.

8.0 RECOMMENDATIONS FOR RENOVATION AND CONSTRUCTION WORK

OSHA requires that only properly trained employees perform construction work and demolition that disturbs hazardous materials. The following recommendations address OSHA and other applicable federal requirements. These recommendations provide guidance for the management of hazardous building materials and control of occupational and environmental hazards associated with operations, maintenance, renovation, and demolition. These recommendations are based on information gathered during the hazardous materials survey. These recommendations are not intended to constitute a formal work plan but are intended to provide a starting point for the development of a work plan.

8.1 Asbestos-Containing Materials

Employees involved in renovation or demolition activities that disturb ACM must conduct work in accordance with 29 CFR 1926.1101, the OSHA Asbestos Construction Standard. Work practices that would trigger these requirements include, but are not limited to, repair, maintenance, or renovation of structures containing asbestos, as well as removal or encapsulation of materials containing asbestos. For each project, the contractor shall determine the appropriate safety measures based on the area to be disturbed, the type, volume, and condition of ACM.

Applicable work practice guidelines involving the disturbance of ACM are summarized, but are not limited to:

- Employees must utilize appropriate engineering controls and personal protective equipment (PPE). This PPE includes disposable coveralls, gloves, eye protection, steel-toed boots, a hard hat, and a National Institute for Occupational Safety and Health (NIOSH)-approved appropriate respirator.
- Employers shall provide and require the use of appropriate PPE for any employee exposed to airborne concentrations of asbestos that exceed OSHA regulatory limits, or for which a required negative exposure assessment is not produced (29 CFR 1926.1101[i][1]).
- Employees must utilize respiratory protection until the initial exposure monitoring assessment documents safe working levels of airborne asbestos (29 CFR 1926.1101[f] and [h]). Additional periodic exposure monitoring may be required.
- An initial exposure monitoring assessment should be carried out when workers are disturbing ACM to ensure that they are not exposed to airborne asbestos concentrations greater than the Permissible Exposure Limit (PEL) of 0.1 fibers per cubic centimeter (f/cc) of air as an 8-hour time-weighted average (TWA), and the Excursion Limit of 1.0 f/cc as averaged over a 30 minute sampling period.
- The work site must be maintained as a controlled regulated area and supervised by a competent person.
- Employees must implement stringent dust control procedures to minimize asbestos in any airborne dust.
- Employees must clean the work area thoroughly using wet methods and a high-efficiency particulate air (HEPA) vacuum. Dry sweeping or air blowing of ACM debris and dust must be avoided.
- Wastes and dust containing ACM must be collected separately from other construction debris. Employees should conduct prompt clean up and disposal of asbestos wastes and debris in leak-tight containers.
- Asbestos-containing waste must be packaged, labeled, stored, and disposed of in accordance with applicable regulations.

- Visually inspect the work area to ensure that all ACM debris and dust has been properly removed.
- Conduct clearance in accordance with contract specifications.

8.2 Lead-Containing Paints

Employees involved in renovation or construction activities that disturb LCP or LBP must conduct work in accordance with 29 CFR 1926.62, the OSHA Lead Construction Standard. Work practices that would trigger these requirements include, but are not limited to, sanding, blasting, welding, cutting, or scraping. For each project, the contractor shall determine the appropriate safety measures based on the area to be disturbed, the lead concentration, and the paint condition. Applicable work practice guidelines involving the disturbance of LCP or LBP are summarized, but are not limited to:

- Employees must utilize appropriate engineering controls and PPE. The PPE includes disposable coveralls, gloves, eye protection, steel-toed boots, a hard hat, and a NIOSH-approved appropriate respirator.
- Employees must utilize respiratory protection until the initial air monitoring assessment documents safe working levels of airborne lead (29 CFR 1926.62[d][1] and [2][i][A]).
- An exposure assessment should be carried out when employees are disturbing LCP or LBP to ensure that they are not exposed to airborne lead concentrations greater than the PEL of 50 micrograms per cubic meter ($\mu g/m^3$) averaged over an 8-hour period. Additional periodic exposure monitoring may be required if the lead OSHA Action Level of 30 $\mu g/m^3$ averaged over an 8-hour period is exceeded.
- Employees must implement stringent dust control procedures to minimize airborne lead concentrations.
- Employees must clean the work area thoroughly using wet methods and a HEPA vacuum. Dry sweeping or air blowing of lead debris and dust must be avoided.
- Lead-containing debris should be segregated from other wastes, collected, and containerized. Wastes should be fully characterized, including a determination of the waste as hazardous or non-hazardous. Lead-containing wastes should be disposed of in accordance with applicable requirements.

- Visually inspect the work area to ensure all lead-containing debris and dust has been properly removed.
- Conduct clearance in accordance with contract specifications.

8.3 Arsenic-Containing Materials

Employees involved in renovation or construction activities that disturb arsenic-containing materials must conduct work in accordance with 29 CFR 1926.1118, the OSHA Inorganic Arsenic Construction Standard. The requirements applicable to construction work under this standard are identical to those set forth in 29 CFR 1910.1018, the OSHA Inorganic Arsenic General Industry Standard. Work practices that would trigger these requirements include, but are not limited to, repair, maintenance, renovation, or demolition of structures containing arsenic, as well as removal or encapsulation of materials containing arsenic. For each project, the contractor should determine the appropriate safety measures based on the area to be disturbed, arsenic concentration, and the volume and condition of arsenic-containing materials. Applicable work practice guidelines involving the disturbance of arsenic-containing materials are summarized, but are not limited to:

- Employees must utilize appropriate PPE. The PPE includes a disposable coverall, gloves, eye protection, steel-toed boots, a hard hat, and a NIOSH approved appropriate respirator.
- An exposure assessment should be carried out when employees disturb arsenic-containing materials to ensure that workers are not exposed to airborne arsenic concentrations greater than the PEL of 10 $\mu g/m^3$ averaged over an 8-hour period (29 CFR 1910.1018[c] and [e]). Additional periodic exposure monitoring may be required if the arsenic OSHA Action Level of 5 $\mu g/m^3$ averaged over an 8-hour period is exceeded.
- Employees must implement stringent dust control and engineering controls to minimize arsenic concentrations in any airborne dust.
- The work site must be maintained as a controlled area at all times.
- Employees must clean the work area thoroughly using wet methods and a HEPA vacuum. Dry sweeping or air blowing of arsenic debris and dust must be avoided.
- Arsenic-containing debris should be segregated from other wastes, collected, and containerized. Arsenic-containing wastes should be disposed of in accordance with applicable requirements. Wastes should be fully characterized, including a determination of

the waste as hazardous or non-hazardous. A hazardous waste exclusion for wood products may be considered, applicable to certain arsenic-contain building materials. Landfill acceptance criteria should be evaluated prior to transportation for disposal.

- Visually inspect and verify the work area to ensure all arsenic-containing debris and dust has been properly removed.
- Conduct clearance in accordance with contract specifications.

9.0 LIMITATIONS

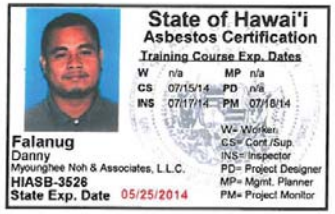
Every reasonable effort was made to identify suspect building materials during the survey. However, this does not imply a guarantee that all suspect building materials were identified by this assessment because certain building materials and/or surfaces may be hidden by walls, flooring, partitions, or other building components. If suspect materials previously unknown become uncovered, additional survey work may be required prior to the planned renovation project.

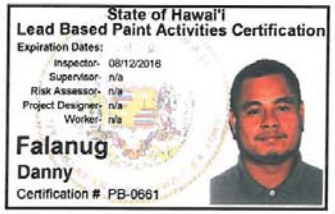
Quantities of hazardous materials provided in this report for contractor's information are based on visual estimates at the time of the survey. Contractors are required to perform in accordance with 29 CFR 1926.1101(k)(3)(i) to identify the presence, location, and quantity of ACM and/or Presumed-ACM before any work is begun.

APPENDIX A

INSPECTOR CERTIFICATIONS

Danny Falanug





APPENDIX B

HOMOGENEOUS MATERIALS IDENTIFIED AND SAMPLE TYPES COLLECTED

Homogeneous Materials Identified and Sample Types Collected

HM ID	Building	Floor	Rooms	Locations	Material Color	Material	Substrate	Asb	Pb	Ars	Result
1	Former Generator Building	1	Interior	Walls	Lt. blue	Skim coat Paint	Concrete block	X	X		ND LCP 2,600 - 3,300 mg/kg
2	Former Generator Building	1	Interior	Door frames, window frames, trim	Lt. blue	Paint	Wood		X		LBP 6,100 - 6,600 mg/kg
3	Former Generator Building	1	Interior	Walls	Black	Paint	Concrete block		X		LBP 5,300 - 6,400 mg/kg
4	Former Generator Building	1	Interior	Floor	Yellow	Skim coat Paint	Concrete	X	X		ND LBP 200,000 - 270,000 mg/kg
5	Former Generator Building	1	Interior	Conduit, electrical box	Blue	Paint	Metal		X		LBP 4,800 - 5,100 mg/kg
6	Former Generator Building	1	Interior	Ceiling	White	12" x 12" Acoustical tiles with holes Mastic	Drywall	X		X	ND Arsenic 2,200 - 2,700 mg/kg
7	Former Generator Building	1	Interior	Ceiling	White	Drywall board	None	X			ACM 2% Amosite
8	Former Generator Building	1	Interior	Support beam	Lt. blue	Paint	Metal		X		LBP 22,000 - 26,000 mg/kg

RMAIA, Inc. - Targeted Hazardous Materials Survey Report
ICSD Pahole Radio Facility, Mokuleia, Hawaii

Homogeneous Materials Identified and Sample Types Collected

HM ID	Building	Floor	Rooms	Locations	Material Color	Material	Substrate	Asb	Pb	Ars	Result
9	Former Generator Building	1	Interior	Conduit, vents	Black	Paint	Metal		X		LCP 280 - 4,400 mg/kg
10	Former Generator Building	1	Interior	Door frames	Black	Paint	Wood		X		LBP 18,000 - 20,000 mg/kg
11	Former Generator Building	1	Exterior	Walls	Tan	Paint	Concrete block		X		LCP 880 - 950 mg/kg
12	Former Generator Building	1	Exterior	Eaves, window bars	Tan	Paint	Metal		X		LBP 69,000 - 72,000 mg/kg
13	Former Generator Building	1	Exterior	Door frames, window frame	Tan	Paint	Wood		X		LBP 15,000 - 46,000 mg/kg
14	Former Generator Building	1	Exterior	Wall	Green	Paint	Concrete block		X		LCP 370 - 700 mg/kg
15	Former Generator Building	Roof	Exterior	Roof	Black	Tar Felt	Metal	X			ND
16	Former Generator Building	1	Exterior	Door frames	Tan	Rubber	Concrete block	X			ND
17	Former Generator Building	1	Exterior	Wall	Black	Caulking	Concrete block	X			ACM 10% Chrysotile

Homogeneous Materials Identified and Sample Types Collected

HM ID	Building	Floor	Rooms	Locations	Material Color	Material	Substrate	Asb	Pb	Ars	Result
18	**Former Generator Building**	**1**	**Exterior**	**Door frames**	**Lt. gray**	**Caulking**	**Wood**	**X**			**ACM 3% Chrysotile**
19	Water Tank 1	1	Exterior	Wall	White	Paint	Metal		X		<100 mg/kg
20	Water Tank 1	Roof	Exterior	Roof	Olive green	Paint	Metal		X		<110 - <340 mg/kg
21	Water Tank 1	1	Interior	Wall	Black	Tank liner	Metal	X			ND
22	Water Tank 2	1	Exterior	Wall	White	Paint	Metal		X		<100 mg/kg
23	Water Tank 2	Roof	Exterior	Roof	Olive green	Paint	Metal		X		<110 - <930 mg/kg
24	Water Tank 2	1	Interior	Wall	Black	Tank liner	Metal	X			ND
25	Water Tank 3	1	Exterior	Wall	Lt. green	Paint	Metal		X		<100 mg/kg
26	Water Tank 3	Roof	Exterior	Roof	Olive green	Paint	Metal		X		<250 - <850 mg/kg
27	Water Tank 3	1	Interior	Wall	Black	Tank liner	Metal	X			ND
28	**Lower Building**	**1**	**Kitchen**	**Wall**	**White**	**Paint**	**Concrete block**		**X**		**LBP 7,000 - 7,900 mg/kg**
29	**Lower Building**	**1**	**Kitchen**	**Electrical box**	**Blue**	**Paint**	**Metal**		**X**		**LBP 8,300 - 12,000 mg/kg**
30	**Lower Building**	**1**	**Kitchen**	**Wall**	**Beige**	**Paint**	**Concrete block**		**X**		**LBP 18,000 mg/kg**
31	Lower Building	1	Storage 2	Ceiling	White	Drywall	None	X			ND

Homogeneous Materials Identified and Sample Types Collected

HM ID	Building	Floor	Rooms	Locations	Material Color	Material	Substrate	Asb	Pb	Ars	Result
32	**Lower Building**	**1**	**Storage 2**	**Walls**	**Lt. green**	**Paint**	**Concrete block**		**X**		**LCP 1,900 - 2,000 mg/kg**
33	**Tower Area**	**1**	**Exterior**	**Debris**	**Orange**	**Paint**	**Metal**		**X**		**LBP 3,900 - 8,400 mg/kg**

Bold values indicate results above the reporting limit.

Abbreviations and Acronyms
Asb - Asbestos
ACM - Asbestos-Containing Material
Ars - Arsenic
HM ID - Homogeneous Material Identifier
LBP - Lead-Based Paint >5,000 mg/kg
LCP - Lead-Containing Material <5,000 mg/kg
mg/kg - milligrams per kilogram, equivalent to parts per million
ND - Not Detected
Pb - Lead

APPENDIX C

ASBESTOS AND LEAD SAMPLE LOCATION AND HAZARDOUS MATERIAL DRAWINGS

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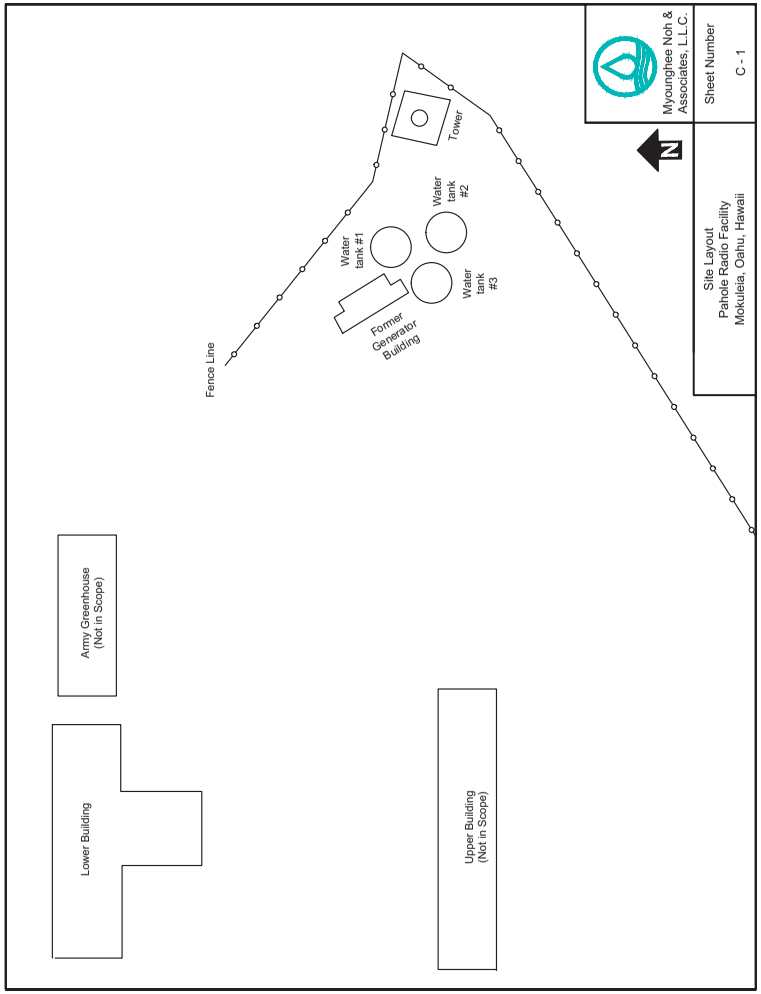
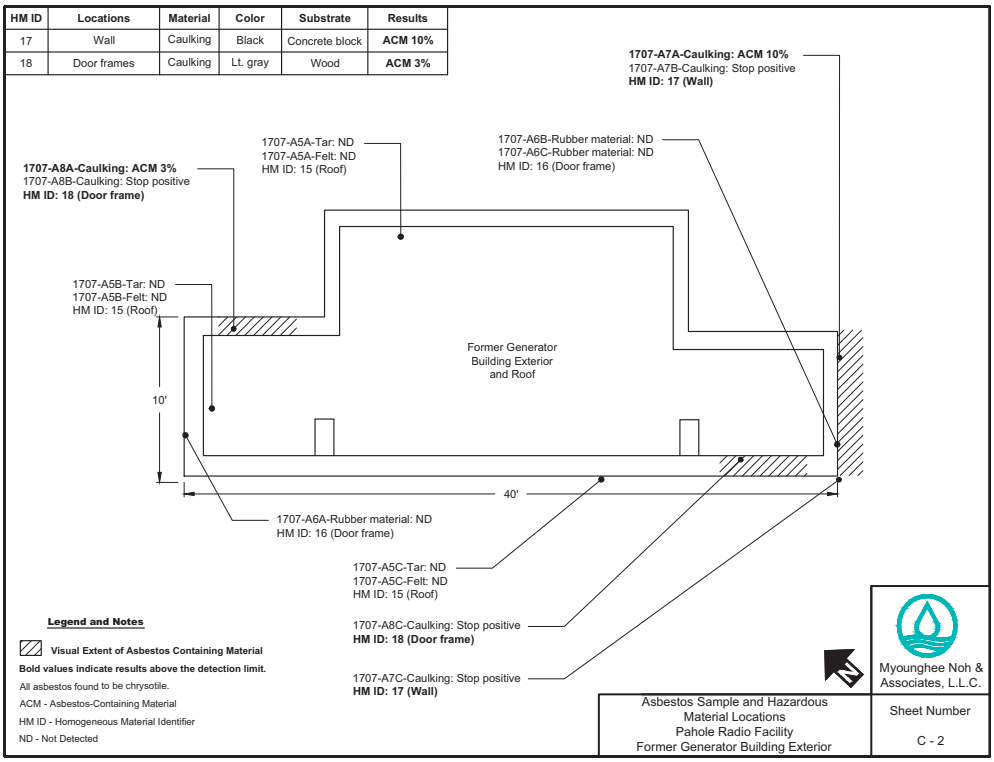
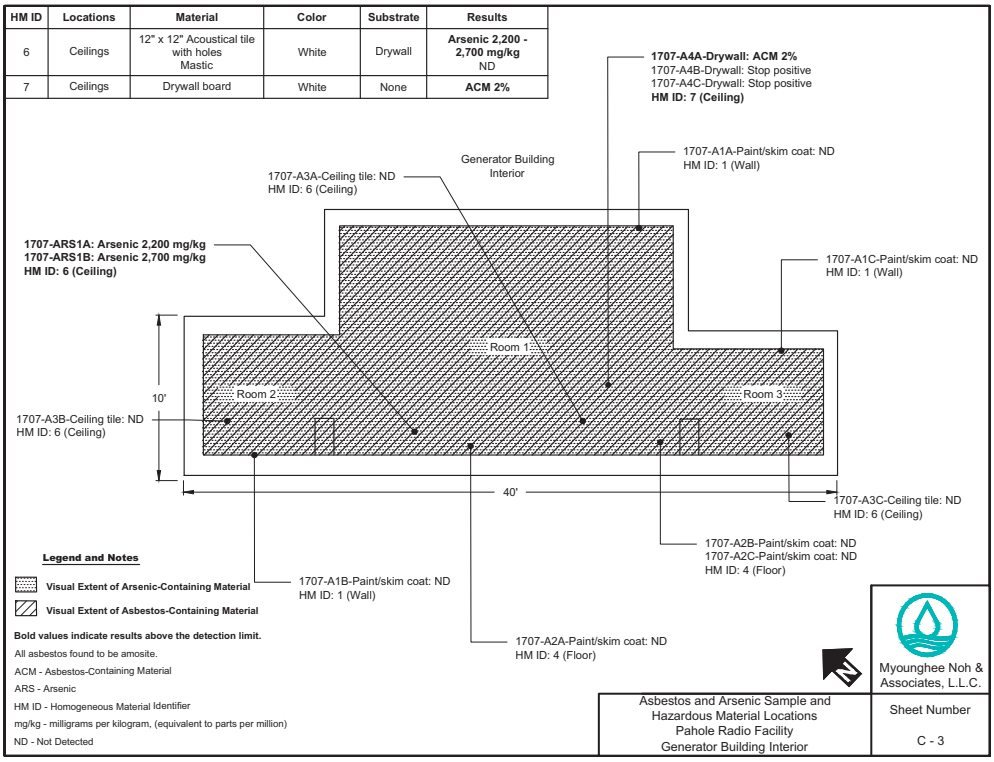
Asbestos Sample and Hazardous Material Locations	C-2 – C-7
Lead Paint Sample and Hazardous Material Locations	C-8 to C-14

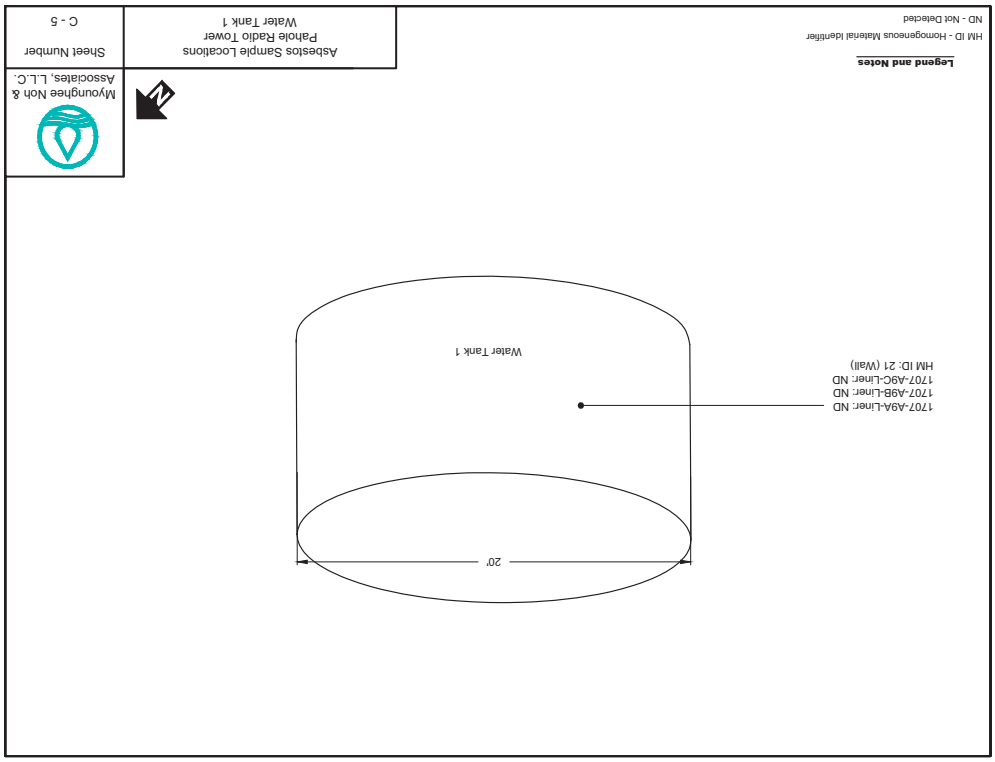


HM ID	Locations	Material	Color	Substrate	Results
17	Wall	Caulking	Black	Concrete block	**ACM 10%**
18	Door frames	Caulking	Lt. gray	Wood	**ACM 3%**



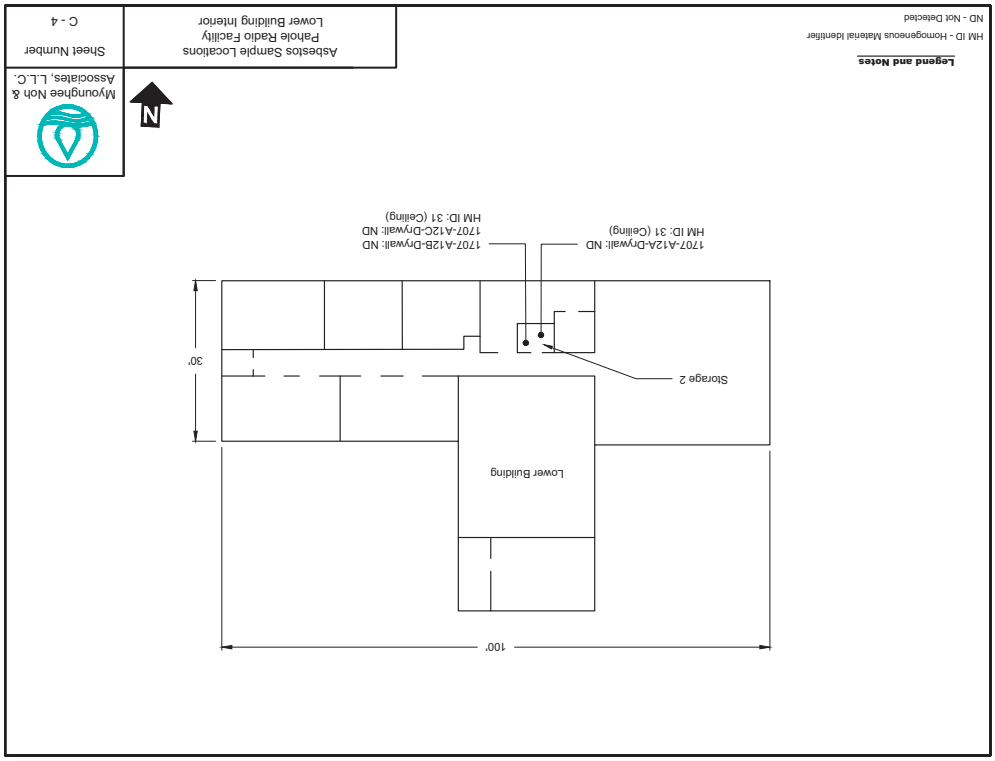
HM ID	Locations	Material	Color	Substrate	Results
6	Ceilings	12" x 12" Acoustical tile with holes Mastic	White	Drywall	**Arsenic 2,200 - 2,700 mg/kg** ND
7	Ceilings	Drywall board	White	None	**ACM 2%**





Existing Conditions - Hazardous Materials Survey Report
01715 - 32

TG 01715 v13.04
DAGS Job No. 12-10-0733



Existing Conditions - Hazardous Materials Survey Report
01715 - 31

TG 01715 v13.04
DAGS Job No. 12-10-0733

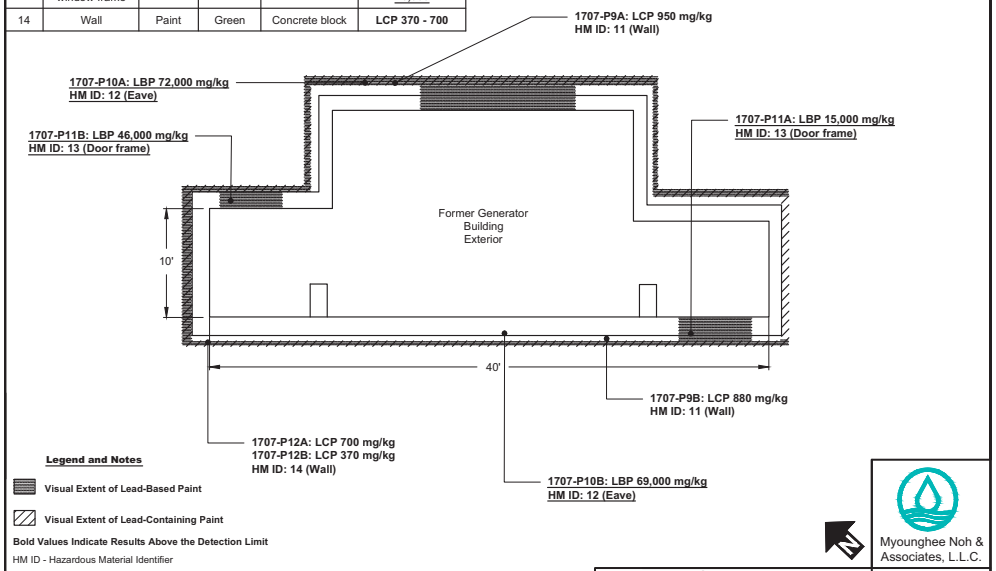
Existing Conditions - Hazardous Materials Survey Report
01715 - 34

TG 01715 v13.04
DAGS Job No. 12-10-0733

Existing Conditions - Hazardous Materials Survey Report
01715 - 33

TG 01715 v13.04
DAGS Job No. 12-10-0733

HM ID	Locations	Material	Color	Substrate	Results (mg/kg)
11	Walls	Paint	Tan	Concrete block	**LCP 880 - 950**
12	Eaves, window bars	Paint	Tan	Metal	**LBP 69,000 - 72,000**
13	Door frames, window frame	Paint	Tan	Wood	**LBP 15,000 - 46,000**
14	Wall	Paint	Green	Concrete block	**LCP 370 - 700**



Legend and Notes

Visual Extent of Lead-Based Paint

Visual Extent of Lead-Containing Paint

Bold Values Indicate Results Above the Detection Limit

HM ID - Hazardous Material Identifier

LBP - Lead-Based Paint ≥ 5,000 mg/kg

LCP - Lead-Containing Paint < 5,000 mg/kg

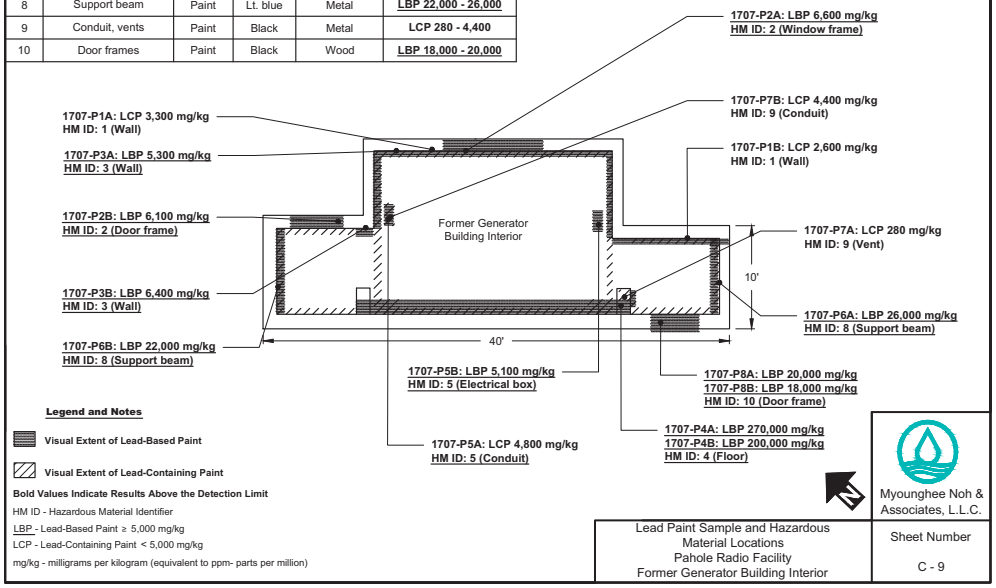
mg/kg - milligrams per kilogram (equivalent to ppm- parts per million)

Myounghee Noh & Associates, L.L.C.

Lead Paint Sample and Hazardous Material Locations
Pahole Radio Tower
Former Generator Building Exterior

Sheet Number
C - 8

HM ID	Locations	Material	Color	Substrate	Results (mg/kg)
1	Walls	Paint	Lt. blue	Concrete block	**LCP 2,600 - 3,300**
2	Door frames, window frames, trim	Paint	Lt. blue	Wood	**LBP 6,100 - 6,600**
3	Walls	Paint	Black	Concrete block	**LBP 5,300 - 6,400**
4	Floor	Paint	Yellow	Concrete	**LBP 200,000 - 270,000**
5	Conduit, electrical box	Paint	Blue	Metal	**LBP 4,800 - 5,100**
8	Support beam	Paint	Lt. blue	Metal	**LBP 22,000 - 26,000**
9	Conduit, vents	Paint	Black	Metal	**LCP 280 - 4,400**
10	Door frames	Paint	Black	Wood	**LBP 18,000 - 20,000**



Legend and Notes

Visual Extent of Lead-Based Paint

Visual Extent of Lead-Containing Paint

Bold Values Indicate Results Above the Detection Limit

HM ID - Hazardous Material Identifier

LBP - Lead-Based Paint ≥ 5,000 mg/kg

LCP - Lead-Containing Paint < 5,000 mg/kg

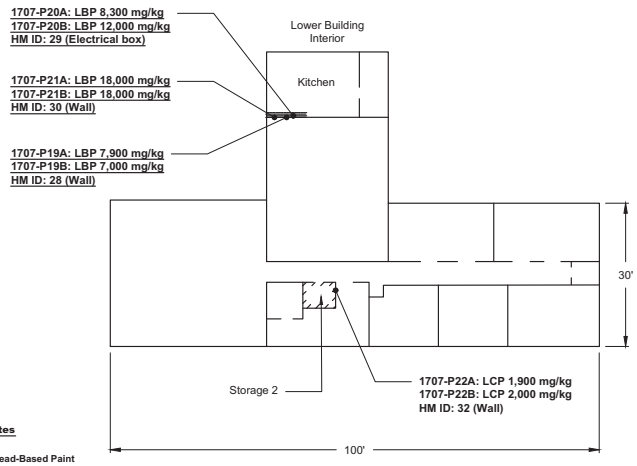
mg/kg - milligrams per kilogram (equivalent to ppm- parts per million)

Myounghee Noh & Associates, L.L.C.

Lead Paint Sample and Hazardous Material Locations
Pahole Radio Facility
Former Generator Building Interior

Sheet Number
C - 9

HM ID	Locations	Material	Color	Substrate	Results (mg/kg)
28	Wall	Paint	White	Concrete block	**LBP 7,000 - 7,900**
29	Electrical box	Paint	Blue	Metal	**LBP 8,300 - 12,000**
30	Wall	Paint	Beige	Concrete block	**LBP 18,000**
32	Walls	Paint	Lt. green	Concrete block	**LCP 1,900 - 2,000**



Legend and Notes

Visual Extent of Lead-Based Paint

Visual Extent of Lead-Containing Paint

Bold Values Indicate Results Above the Detection Limit

HM ID - Hazardous Material Identifier

LBP - Lead-Based Paint ≥ 5,000 mg/kg

LCP - Lead-Containing Paint < 5,000 mg/kg

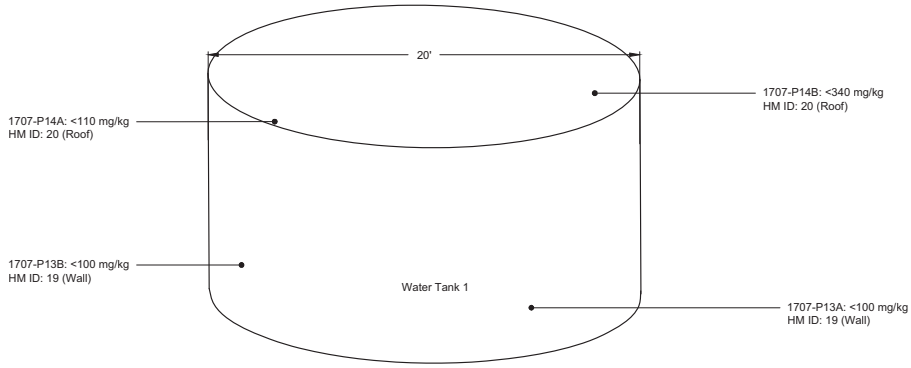
mg/kg - milligrams per kilogram (equivalent to ppm- parts per million)

N

Myounghee Noh & Associates, L.L.C.

Lead Paint Sample and Hazardous Material Locations
Pahole Radio Facility
Lower Building Interior

Sheet Number
C - 10



N

Myounghee Noh & Associates, L.L.C.

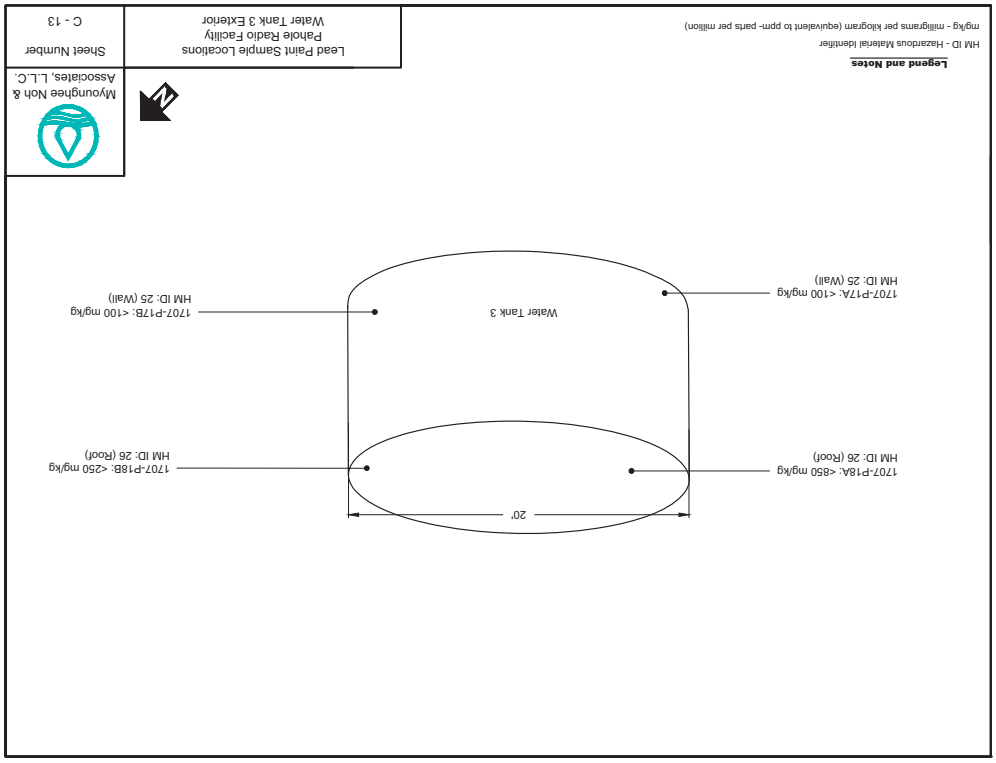
Legend and Notes

HM ID - Hazardous Material Identifier

mg/kg - milligrams per kilogram (equivalent to ppm- parts per million)

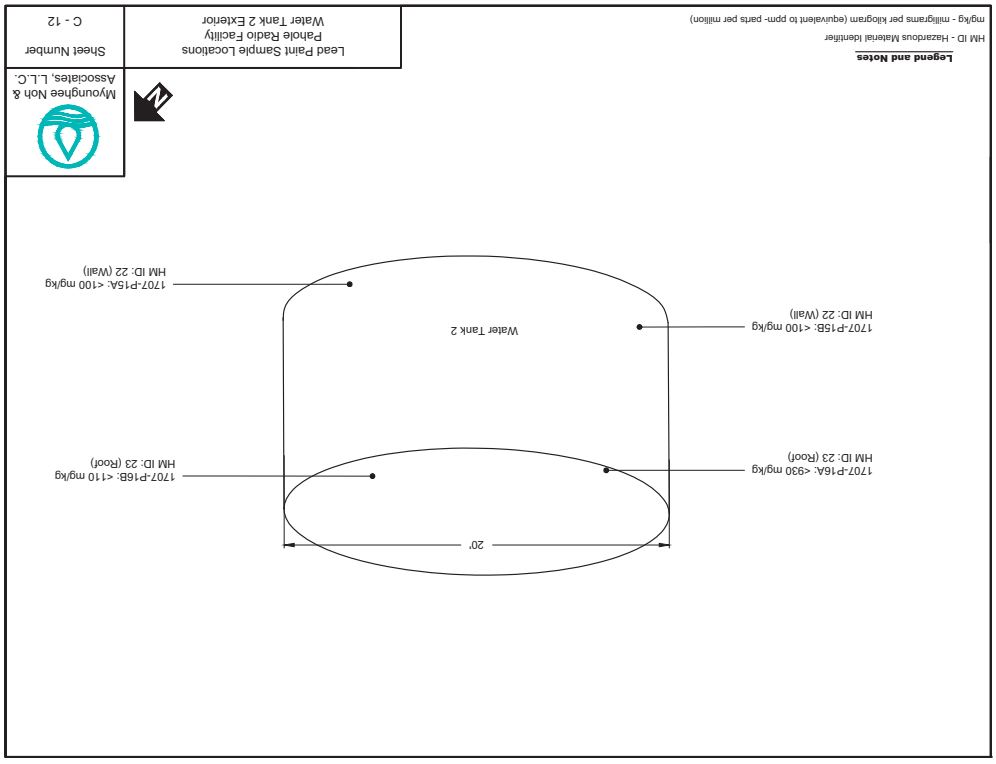
Lead Paint Sample Locations
Pahole Radio Facility
Water Tank 1 Exterior

Sheet Number
C - 11



Existing Conditions - Hazardous Materials Survey Report
01715 - 39

TG 01715 v13.04
DAGS Job No. 12-10-0733



Existing Conditions - Hazardous Materials Survey Report
01715 - 40

TG 01715 v13.04
DAGS Job No. 12-10-0733

APPENDIX D

PHOTOGRAPHS

HM ID	Locations	Material	Color	Substrate	Results (mg/kg)
33	Debris	Paint	Orange	Metal	**LBP 3,900 - 8,400**

HM ID 1
Former Generator Building
Floor 1

Interior
Light blue skim coat and paint on concrete block wall.

Non-ACM
1707-A1A-Paint/skim coat: ND
1707-A1B-Paint/skim coat: ND
1707-A1C-Paint/skim coat: ND

LCP
1707-P1A: 3,300 mg/kg
1707-P1B: 2,600 mg/kg

HM ID 2
Former Generator Building
Floor 1

Interior
Light blue paint on wood window frame.

LBP
1707-P2A: 6,600 mg/kg
1707-P2B: 6,100 mg/kg

HM ID 3
Former Generator Building
Floor 1

Interior
Black paint on concrete block wall.

LBP
1707-P3A: 5,300 mg/kg
1707-P3B: 6,400 mg/kg

RMAIA, Inc. – Targeted Hazardous Materials Survey Report
ICSD Pahole Radio Facility, Mokuleia, Hawaii

HM ID 4
Former Generator Building
Floor 1

Interior
Yellow skim coat and paint on concrete floor.

Non-ACM
1707-A2A-Paint/skim coat: ND
1707-A2B-Paint/skim coat: ND
1707-A2C-Paint/skim coat: ND

LBP
1707-P4A: 270,000 mg/kg
1707-P4B: 200,000 mg/kg

HM ID 5
Former Generator Building
Floor 1

Interior
Blue paint on metal conduit.

LBP
1707-P5A: 4,800 mg/kg
1707-P5B: 5,100 mg/kg

HM ID 6
Former Generator Building
Floor 1

Interior
White 12" x 12" acoustical tiles with holes including mastic on drywall ceiling.

Non-ACM
1707-A3A-Ceiling tile: ND
1707-A3A-Mastic: ND
1707-A3B-Ceiling tile: ND
1707-A3A-Mastic: ND
1707-A3C-Ceiling tile: ND
1707-A3A-Mastic: ND

Arsenic-Containing Material
1707-Ars1A: 2,200 mg/kg
1707-Ars1B: 2,700 mg/kg

HM ID 7
Former Generator Building
Floor 1

Interior
White drywall-board ceiling.

ACM
1707-A4A-Drywall: 2% Amosite
1707-A4B-Stop positive
1707-A4C-Stop positive

HM ID 8
Former Generator Building
Floor 1

Interior
Light blue paint on metal support beam.

LBP
1707-P6A: 26,000 mg/kg
1707-P6B: 22,000 mg/kg

HM ID 9
Former Generator Building
Floor 1

Interior
Black paint on metal vent.

LCP
1707-P7A: 280 mg/kg
1707-P7B: 4,400 mg/kg

HM ID 10
Former Generator Building
Floor 1

Interior
Black paint on wood door frame.

LBP
1707-P8A: 20,000 mg/kg
1707-P8B: 18,000 mg/kg

HM ID 11
Former Generator Building
Floor 1

Exterior
Tan paint on concrete block wall.

LCP
1707-P9A: 950 mg/kg
1707-P9B: 880 mg/kg

HM ID 12
Former Generator Building
Floor 1

Exterior
Tan paint on metal eave.

LBP
1707-P10A: 72,000 mg/kg
1707-P10B: 69,000 mg/kg

HM ID 13
Former Generator Building
Floor 1

Exterior
Tan paint on wood door frame.

LBP
1707-P11A: 15,000 mg/kg
1707-P11B: 46,000 mg/kg

HM ID 14
Former Generator Building
Floor 1

Exterior
Green paint on concrete block wall.

LCP
1707-P12A: 700 mg/kg
1707-P12B: 370 mg/kg

HM ID 15
Former Generator Building
Roof

Exterior
Black built up roofing on metal roof.

Non-ACM
1707-A5A-Tar: ND
1707-A5A-Felt: ND
1707-A5B-Tar: ND
1707-A5B-Felt: ND
1707-A5C-Tar: ND
1707-A5C-Felt: ND

HM ID 16
Former Generator Building
Floor 1

Exterior
Tan rubber door frame on concrete block.

Non-ACM
1707-A6A-Rubber material: ND
1707-A6B-Rubber material: ND
1707-A6C-Rubber material: ND

HM ID 17
Former Generator Building
Floor 1

Exterior
Black caulking on concrete block wall.

ACM
1707-A7A-Caulking: 10% Chrysotile
1707-A7B-Stop positive
1707-A7C-Stop positive

HM ID 18
Former Generator Building
Floor 1

Exterior
Light gray caulking on wood door frame.

ACM
1707-A8A-Caulking: 3% Chrysotile
1707-A8B-Stop positive
1707-A8C-Stop positive

HM ID 19
Water Tank 1
Floor 1

Exterior
White paint on metal wall.

Non-LCP
1707-P13A: <100 mg/kg
1707-P13B: <100 mg/kg

HM ID 20
Water Tank 1
Roof

Exterior
Olive green paint on metal roof.

Non-LCP
1707-P14A: <110 mg/kg
1707-P14B: <340 mg/kg

HM ID 21
Water Tank 1
Floor 1

Interior
Black tank liner on metal wall.

Non-ACM
1707-A9A-Liner: ND
1707-A9B-Liner: ND
1707-A9C-Liner: ND

HM ID 22
Water Tank 2
Floor 1

Exterior
White paint on metal wall.

Non-LCP
1707-P15A: <100 mg/kg
1707-P15B: <100 mg/kg

HM ID 23
Water Tank 2
Roof

Exterior
Olive green paint on metal roof.

Non-LCP
1707-P16A: <930 mg/kg
1707-P16B: <110 mg/kg

HM ID 24
Water Tank 2
Floor 1

Interior
Black tank liner on metal wall.

Non-ACM
1707-A10A-Liner: ND
1707-A10B-Liner: ND
1707-A10C-Liner: ND

HM ID 25
Water Tank 3
Floor 1

Exterior
Light green paint on metal wall.

Non-LCP
1707-P17A: <100 mg/kg
1707-P17B: <100 mg/kg

HM ID 26
Water Tank 3
Roof

Exterior
Olive green paint on metal roof.

Non-LCP
1707-P18A: <850 mg/kg
1707-P18B: <250 mg/kg

HM ID 27
Water Tank 3
Floor 1

Interior
Black tank liner on metal wall.

Non-ACM
1707-A11A-Liner: ND
1707-A11B-Liner: ND
1707-A11C-Liner: ND

RMAIA, Inc. – Targeted Hazardous Materials Survey Report
ICSD Pahole Radio Facility, Mokuleia, Hawaii

HM ID 28
Lower Building
Floor 1

Kitchen
White paint on concrete block wall.

LBP
1707-P19A: 7,900 mg/kg
1707-P19B: 7,000 mg/kg

HM ID 29
Lower Building
Floor 1

Kitchen
Blue paint on metal electrical box.

LBP
1707-P20A: 8,300 mg/kg
1707-P20B: 12,000 mg/kg

HM ID 30
Lower Building
Floor 1

Kitchen
Beige paint on concrete block wall.

LBP
1707-P21A: 18,000 mg/kg
1707-P21B: 18,000 mg/kg

HM ID 31
Lower Building
Floor 1

Storage 2
White drywall on ceiling.

Non-ACM
1707-A12A-Drywall: ND
1707-A12B-Drywall: ND
1707-A12C-Drywall: ND

HM ID 32
Lower Building
Floor 1

Storage 2
Light green paint on concrete block wall.

LCP
1707-P22A: 1,900 mg/kg
1707-P22B: 2,000 mg/kg

HM ID 33
Tower Area
Floor 1

Exterior
Orange paint on metal debris.

LBP
1707-P23A: 8,400 mg/kg
1707-P23B: 3,900 mg/kg

APPENDIX E

LABORATORY ANALYTICAL REPORTS

091319456

Page 1 of 2

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*: №091319456

Company: Myounghee Noh & Associates L.L.C.	LA Testing-Bill to: ☑ Same ☐ Different If Bill to is Different note instructions in Comments** Third Party Billing requires written authorization from third party
Street: 99-1046 Iwaena St.	
City/State/Zip: Aiea, HI 96701	
Report To (Name): Akari Ihara	Fax: ~~8084844660~~
Telephone: 8084849214	Email Address: akari@noh-associates.com
Project Name/Number: CITC 22 RMAA DAGS Pahole Radio Facility	
Please Provide Results: Verbal	Purchase Order: / State Samples Taken: HI

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 3 Day ☐ 4 Day ☐ 1 Week ☐ 2 Week

*For NIOSH TAT's Please Call Ahead to Confirm Lab Hours and Availability

Materials Science and IAQ TATs are in Business Days rather than Hours i.e. 24 Hour = End of Next Business Day)

Asbestos

PCM - Air
☐ NIOSH 7400
☐ w/ 8hr. TWA

TEM - Air ☐ 4-4 Shr TAT (AHERA ONLY)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Water
Fibers ≥10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

PLM - Bulk
☒ PLM EPA 600/R-93/116
☐ PLM EPA NOB (<1%)
☐ NYS 198.1 (friable-NY)
☐ NYS 198.6 (non-friable-NY)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/ Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

TEM - Dust
☐ Microvac – ASTM D 5755
☐ Wipe-ASTM D6480

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP

Soil/Rock/Vermiculite
☐ PLM CARB 435 – A (0.25% sensitivity)
☐ PLM CARB 435 – B (0.1% sensitivity)
☐ TEM CARB 435 – B (0.1% sensitivity)
☐ EPA Reg. 1 Screening Protocol (Qualitative)

Other:

Lead (Pb)

Flame Atomic Absorption
☐ Chips SW846-7000B or AOAC 974.02
☐ Soil SW846-7000B/7420
☐ Air NIOSH 7082
☐ Wastewater SM3111B or SW846-7000B/7420
☐ ASTM Wipe SW846-7000B/7420
☐ non ASTM Wipe SW846-7000B/7420
☐ TCLP SW846-1311/7420/SM 3111B

Graphite Furnace Atomic Absorption
☐ Soil SW846-7421 ☐ Wastewater EPA 200.9
☐ Air NIOSH 7105 ☐ Drinking Water EPA 200.9

ICP
☐ Air NIOSH 7300 Modified
☐ non ASTM Wipe SW846-6010B or C
☐ ASTM Wipe SW846-6010B or C
☐ Soil SW846-6010 B or C
☐ Waste Water SW846-6010B or C
☐ TCLP SW846-6010B or C

Other: ☐

Materials Science

☐ Common Particle ID (large particles)
☐ Full Particle ID (environmental dust)
☐ Basic Material ID (solids)
☐ Advanced Material ID
☐ Physical Testing (Tensile, Compression)
☐ Combustion-by-products (soot, char, etc.)
☐ X-Ray Fluorescence (elem. analysis)
☐ X-Ray Diffraction (Crystalline Part.)
☐ MMVF s (Fibrous glass, RCF s)
☐ Particle Size (sieve/microscopy/laser)
☐ Combustible Dust
☐ Petrographic Examination

Other: ☐

Microbiology

Wipe and Bulk Samples
☐ Mold & Fungi – Direct Examination
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi Culture (Genus & Species)
☐ Bacterial Count & ID (Up to Three Types)
☐ Bacterial Count & ID (Up to Five Types)
☐ MRSA
☐ *Pseudomonas aeruginosa*

Water Samples
☐ Total Coliform & E.coli (P/A)
☐ Fecal Coliform (SM 9222D)
☐ Sewage Screen
☐ Heterotrophic Plate Count (SM 9215)

Air Samples
☐ Mold & Fungi (Spore Trap)
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi (Genus & Species)
☐ Bacterial Culture & ID (Up to Three Types)
☐ Bacterial Culture & ID (Up to Five Types)
☐ Endotoxin Testing
Real Time Q-PCR (See Analytical Guide for Code)
Code:

Legionella
☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4

Other: ☐

IAQ

Nuisance Dust NIOSH ☐ 0500 ☐ 0600
Airborne Dust ☐ PM10 ☐ TSP
Silica Analysis: ☐ All Species
Silica Analysis – Single Species
☐ Alpha Quartz ☐ Cristobalite ☐ Tridymite
☐ HVAC Efficiency
☐ Carbon Black
☐ Airborne Oil Mist

Other: ☐

Client Sample #'s	1707-A1A — A12C	Total # of Samples:	36
Relinquished (Client):	Date: 12/10/13	Time:	CTR
Received (Lab):	Date: 12/10/13	Time:	11:[illegible]

Comments/Special Instructions: See field forms
Positive Stop

http://latesting.com/COC_Print.cfm 3/15/2010

091319456

Page 2 of 2

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*: №091319456

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
1707-A1A	See field form		
-A1B	Positive Stop		
-A1C			
1707-A12A			
-A12B			
-A12C			

Comments/Special Instructions: See field form
Positive Stop

Controlled Document – Asbestos Testing COC – A1.0 – 11/29/2009 Page 2 of 2 Pages

http://latesting.com/COC_Print.cfm 3/15/2010

091319456

№ 091319456

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
61		1	1,2,3	walls	Lt. Blue	P/SC	Concrete Block	G (F) P	Y (N) / TSI S (M)	1,000	silver

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 1 A	1	wall		5	
1707-A 1 B	2	↓			
1707-A 1 C	3	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
4		1	1	Floor	yellow	P/SC	concrete	G F (P)	Y (N) / TSI S (M)	50	harvest gold

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 2 A	1	Floor		13	
1707-A 2 B	↓	↓			
1707-A 2 C					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
6		1	1,2,3	Ceiling	white w/ holes	12"x12" Canec tiles	DW ~~Dry wall~~ DF	G (F) P	Y N / TSI S M	200	maroon

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 3 A	1	ceiling		15	
1707-A 3 B	2	↓			
1707-A 3 C	3				

Page 1 of 5 Myounghee Noh & Associates, L.L.C.

091319456

№ 091319456

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
7	GB	1	1,2,3	Ceilings	white	Drywall	None	G (F) P	Y (N) / TSI S (M)	200	

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 4 A	1	ceiling	GB	15	yellow
1707-A 4 B	↓	↓			
1707-A 4 C					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
15	GB	1	Exterior	Roof	Black	BuR	DF ~~Wood~~ Metal	G F P	Y N / TSI S M		blue green

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 5 A	Exterior	Roof	GB	30	
1707-A 5 B	↓	↓			
1707-A 5 C					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM / Type	Area Sq. ft or L. ft	Hatch Color
16	GB	1	Exterior	Door frames	Tan	Rubber	Concrete Block	G F (P)	Y (N) / TSI S (M)	40	yellow

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 6 A	Exterior	Door frame	GB	25	
1707-A 6 B	↓	↓			
1707-A 6 C					

Page 2 of 5 Myounghee Noh & Associates, L.L.C.

091319456

№ 091319456

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility — Location: Pahole Hawaii
Inspector Initials: Danny — Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM Type	Area Sq. ft or L. ft	Hatch Color
17	Generator Building	1	Exterior	wall	Black	Caulking	CC Block	G (F) P	Y (N) TSI S (M)	5	orange

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 7 A	Exterior	wall	GB	34	
1707-A 7 B	↓	↓			
1707-A 7 C					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM Type	Area Sq. ft or L. ft	Hatch Color
18	GB	1	Exterior	~~Door~~ Door frames	Lt. gray	Caulking	wood	G F (P)	Y (N) TSI S (M)	40	Mauve

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 8 A	Exterior	Door frame	GB	32	
1707-A 8 B	↓				
1707-A 8 C					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM Type	Area Sq. ft or L. ft	Hatch Color
~~Tank 3~~	~~Tank 3~~	~~1~~	~~Interior~~ Delete	~~Wall~~ DF	~~Black~~	~~R Tank liner~~	~~M~~	~~G F P~~	~~Y (N)~~ ~~TSI S (M)~~		

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
~~1707-A A~~			~~Tank 3~~		
~~1707-A B~~					
~~1707-A C~~					

Page 3 of 5 — Myounghee Noh & Associates, L.L.C.

091319456

№ 091319456

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility — Location: Pahole Hawaii
Inspector Initials: Danny — Date & Time: 12-04-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM Type	Area Sq. ft or L. ft	Hatch Color
21	Tank 1	1	Interior	Wall	Black	DF ~~watertank~~ liner	Metal	G (F) P	Y (N) TSI S (M)	1,300	harvest yellow

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 9 A	Interior	wall	Tank 1	46	20' water Tank
1707-A 9 B	↓	↓			
1707-A 9 C					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM Type	Area Sq. ft or L. ft	Hatch Color
24	Tank 2	1	Interior	Wall	Black	DF ~~watertank~~ liner	Metal	G F P	Y (N) TSI S (M)	1,300	Lt. orange

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 10 A	Interior	Wall	Tank 2	47	10' water Tank
1707-A 10 B	↓	↓			
1707-A 10 C					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Friable ACM Type	Area Sq. ft or L. ft	Hatch Color
27	Tank 3	1	Interior	Wall	Black	DF ~~watertank~~ liner	Metal	G F P	Y (N) TSI S (M)	1,300	Lt. Brown

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-A 11 A	Interior	wall	Tank 3	48	10' water Tank
1707-A 11 B	↓	↓			
1707-A 11 C					

Page 4 of 5 — Myounghee Noh & Associates, L.L.C.

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http://www.EMSL.com sanleandrolab@emsl.com

EMSL Order: 091319456
CustomerID: 32MYOU50
CustomerPO: 017012
ProjectID:

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Phone: (808) 484-9214
Fax:
Received: 12/10/13 11:15 AM
Analysis Date: 12/11/2013
Collected: 12/4/2013

Project: **017012 RMAA DAGS Pahole Radio Facility**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
1707-A 1 A- Paint/Skim Coat *091319456-0001*	1	Gray/Blue Non-Fibrous Heterogeneous	Insparable paint layer included in analysis.	100% Non-fibrous (other)	**None Detected**
1707-A 1 B- Paint/Skim Coat *091319456-0002*	1	Gray/Blue Non-Fibrous Heterogeneous	Insparable paint layer included in analysis.	100% Non-fibrous (other)	**None Detected**
1707-A 1 C- Paint/Skim Coat *091319456-0003*	1	Gray/Blue Non-Fibrous Heterogeneous	Insparable paint layer included in analysis.	100% Non-fibrous (other)	**None Detected**
1707-A 2 A- Paint/Skim Coat *091319456-0004*	4	Brown/Tan Non-Fibrous Heterogeneous	Insparable paint layer included in analysis.	100% Non-fibrous (other)	**None Detected**
1707-A 2 B- Paint/Skim Coat *091319456-0005*	4	Brown/Tan Non-Fibrous Heterogeneous	Insparable paint layer included in analysis.	100% Non-fibrous (other)	**None Detected**
1707-A 2 C- Paint/Skim Coat *091319456-0006*	4	Brown/Tan Non-Fibrous Homogeneous	Insparable paint layer included in analysis.	100% Non-fibrous (other)	**None Detected**

Analyst(s)
Matthew Batongbacal (33)

Baojia Ke, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. San Leandro, CA(NVLAP Lab Code 101048-3) WA C884

Initial report from 12/11/2013 22:30:34

Test Report PLM-7.28.9 Printed: 12/11/2013 10:30:34 PM

TG 01715 v13.04
DAGS Job No. 12-10-0733

Existing Conditions - Hazardous Materials Survey Report
01715 - 62

Hazardous Homogeneous Materials and Sampling Survey Field Form: Asbestos

Project # & Name: 01707 2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-04-13

HM ID	Building	Flr.	Rooms	Material Color	Locations	Sample Location	Bldg.	PIC ID	Notes	Condition	Friable ACM Type	Area Sq. ft or L. ft	Hatch Color
31	lower Building	1	storage	White	Ceiling		DW	None		G F P	Y N TSI S M	2d	

Sample ID: 1707-A 1 A, 1 B, 1 C
Room Sampled: storage
Sample Location: Ceiling
Bldg.: LB
PIC ID: 38

Sample ID: 1707-A A, B, C
Room Sampled:
Sample Location:
Bldg.:
PIC ID:

Page 5 of 5

Myounghee Noh & Associates, L.L.C.

TG 01715 v13.04
DAGS Job No. 12-10-0733

Existing Conditions - Hazardous Materials Survey Report
01715 - 61

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http://www.EMSL.com sanleandrolab@emsl.com

EMSL Order:	091319456
CustomerID:	32MYOU50
CustomerPO:	017012
ProjectID:	

Attn: **Akari Ihara**
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99-1046 Iwaena Street
Suite 210A
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Phone:	(808) 484-9214
Fax:	
Received:	12/10/13 11:15 AM
Analysis Date:	12/11/2013
Collected:	12/4/2013

Project: **017012 RMAA DAGS Pahole Radio Facility**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
1707-A 3 A-Ceiling Tile *091319456-0007*	6	Brown/White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	**None Detected**
1707-A 3 B-Ceiling Tile *091319456-0008*	6	Brown/White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	**None Detected**
1707-A 3 C-Ceiling Tile *091319456-0009*	6	Brown Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (other)	**None Detected**
1707-A 4 A-Drywall *091319456-0010*	7	White Fibrous Homogeneous	5% Cellulose 5% Glass	88% Non-fibrous (other)	**2% Amosite**
1707-A 4 B-Drywall *091319456-0011*	7				**Stop Positive (Not Analyzed)**
1707-A 4 C-Drywall *091319456-0012*	7				**Stop Positive (Not Analyzed)**
1707-A 5 A-Tar *091319456-0013*	15	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1707-A 5 A-Felt *091319456-0013A*	15	Black Fibrous Homogeneous	65% Cellulose	35% Non-fibrous (other)	**None Detected**

Analyst(s)
Matthew Batongbacal (33)

Baojia Ke, Laboratory Manager
or other approved signatory

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Project: **017012 RMAA DAGS Pahole Radio Facility**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
1707-A 5 B-Tar *091319456-0014*	15	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1707-A 5 B-Felt *091319456-0014A*	15	Black Fibrous Homogeneous	65% Cellulose	35% Non-fibrous (other)	**None Detected**
1707-A 5 C-Tar *091319456-0015*	15	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1707-A 5 C-Felt *091319456-0015A*	15	Black Fibrous Homogeneous	65% Cellulose	35% Non-fibrous (other)	**None Detected**
1707-A 6 A-Rubber Material *091319456-0016*	16	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1707-A 6 B-Rubber Material *091319456-0017*	16	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1707-A 6 C-Rubber Material *091319456-0018*	16	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1707-A 7 A-Caulking *091319456-0019*	17	Black Fibrous Homogeneous		90% Non-fibrous (other)	**10% Chrysotile**

Analyst(s)
Matthew Batongbacal (33)

Baojia Ke, Laboratory Manager
or other approved signatory

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Project: **017012 RMAA DAGS Pahole Radio Facility**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
1707-A 7 B-Caulking *091319456-0020*	17				**Stop Positive (Not Analyzed)**
1707-A 7 C-Caulking *091319456-0021*	17				**Stop Positive (Not Analyzed)**
1707-A 8 A-Caulking *091319456-0022*	18	Gray Non-Fibrous Homogeneous		97% Non-fibrous (other)	**3% Chrysotile**
1707-A 8 B-Caulking *091319456-0023*	18				**Stop Positive (Not Analyzed)**
1707-A 8 C-Caulking *091319456-0024*	18				**Stop Positive (Not Analyzed)**
1707-A 9 A-Liner *091319456-0025*	21	White/Black Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (other)	**None Detected**
1707-A 9 B-Liner *091319456-0026*	21	White/Black Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (other)	**None Detected**
1707-A 9 C-Liner *091319456-0027*	21	White/Black Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (other)	**None Detected**
1707-A 10 A-Liner *091319456-0028*	24	Black Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (other)	**None Detected**

Analyst(s)
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Baojia Ke, Laboratory Manager
or other approved signatory

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Project: **017012 RMAA DAGS Pahole Radio Facility**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
1707-A 10 B-Liner *091319456-0029*	24	Black Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (other)	**None Detected**
1707-A 10 C-Liner *091319456-0030*	24	Black Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (other)	**None Detected**
1707-A 11 A-Liner *091319456-0031*	27	Black Fibrous Homogeneous	40% Synthetic	60% Non-fibrous (other)	**None Detected**
1707-A 11 B-Liner *091319456-0032*	27	Black Fibrous Homogeneous	40% Synthetic	60% Non-fibrous (other)	**None Detected**
1707-A 11 C-Liner *091319456-0033*	27	Black Fibrous Homogeneous	40% Synthetic	60% Non-fibrous (other)	**None Detected**
1707-A 12 A-Drywall *091319456-0034*	31	White Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	**None Detected**
1707-A 12 B-Drywall *091319456-0035*	31	White Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	**None Detected**
1707-A 12 C-Drywall *091319456-0036*	31	White Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (other)	**None Detected**

Analyst(s)
Matthew Batongbacal (33)

Baojia Ke, Laboratory Manager
or other approved signatory

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Initial report from 12/11/2013 22:30:34

321321617

Page 1 of 2

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*: 321321617

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Company: Myounghee Noh & Associates L.L.C.

LA Testing-Bill to: ☑ Same ☐ Different
If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party

Street: 99-1046 Iwaena St.

City/State/Zip: Aiea, HI 96701

Report To (Name): Akari Ihara — **Fax:** ~~8084849050~~ OF

Telephone: 8084849214 — **Email Address:** akari@noh-associates.com

Project Name/Number: 017012 RMAA DAGS Pahole Radio Facility

Please Provide Results: email — **Purchase Order:** — **State Samples Taken:** HI

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 3 Day ☐ 4 Day ☐ 1 Week ☐ 2 Week

*For RUSH TAT's Please Call Ahead to Confirm Lab Hours and Availability
Materials Science and IAQ TATs are in Business Days rather than Hours (i.e. 24 Hour = End of Next Business Day)

Asbestos

PCM - Air
☐ NIOSH 7400
☐ w/ 8hr. TWA

TEM- Air ☐ 4.5hr TAT (AHERA ONLY)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Water
Fibers ≥10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

PLM - Bulk
☐ PLM EPA 600/R-93/116
☐ PLM EPA NOB (<1%)
☐ NYS 198.1 (friable-NY)
☐ NYS 198.6 (non-friable-NY)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/ Gravimetric
☐ 400 (<0.25%) ☐ 1000 (<0.1%)

TEM - Dust
☐ Microvac – ASTM D 5755
☐ Wipe-ASTM D6480

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP

Soil/Rock/Vermiculite
☐ PLM CARB 435 – A (0.25% sensitivity)
☐ PLM CARB 435 – B (0.1% sensitivity)
☐ TEM CARB 435 – B (0.1% sensitivity)
☐ EPA Reg. 1 Screening Protocol (Qualitative)
Other:

Lead (Pb)

Flame Atomic Absorption
☒ Chips SW846-7000B or AOAC 974.02
☐ Soil SW846-7000B/7420
☐ Air NIOSH 7082
☐ Wastewater SM3111B or SW846-7000B/7420
☐ ASTM Wipe SW846-7000B/7420
☐ non ASTM Wipe SW846-7000B/7420
☐ TCLP SW846-1311/7420/SM 3111B

ICP
☐ Air NIOSH 7300 Modified
☐ non ASTM Wipe SW846-6010B or C
☐ ASTM Wipe SW846-6010B or C
☐ Soil SW846-6010 B or C
☐ Waste Water SW846-6010B or C
☐ TCLP SW846-6010B or C

Graphite Furnace Atomic Absorption
☐ Soil SW846-7421 ☐ Wastewater EPA 200.9
☐ Air NIOSH 7105 ☐ Drinking Water EPA 200.9

Other: ☐

Materials Science

☐ Common Particle ID (large particles)
☐ Full Particle ID (environmental dust)
☐ Basic Material ID (solids)
☐ Advanced Material ID
☐ Physical Testing (Tensile, Compression)
☐ Combustion-by-products (soot, char, etc.)
☐ X-Ray Fluorescence (elem. analysis)
☐ X-Ray Diffraction (Crystalline Part.)
☐ MMVF's (Fibrous glass, RCF's)
☐ Particle Size (sieve/microscopy/laser)
☐ Combustible Dust
☐ Petrographic Examination
Other: ☐

Microbiology

Wipe and Bulk Samples
☐ Mold & Fungi – Direct Examination
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi Culture (Genus & Species)
☐ Bacterial Count & ID (Up to Three Types)
☐ Bacterial Count & ID (Up to Five Types)
☐ MRSA
☐ *Pseudomonas aeruginosa*

Water Samples
☐ Total Coliform & E.coli (P/A)
☐ Fecal Coliform (SM 9222D)
☐ Sewage Screen
☐ Heterotrophic Plate Count (SM 9215)

Air Samples
☐ Mold & Fungi (Spore Trap)
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi (Genus & Species)
☐ Bacterial Culture & ID (Up to Three Types)
☐ Bacterial Culture & ID (Up to Five Types)
☐ Endotoxin Testing

Real Time Q-PCR (See Analytical Guide for Code)
Code:

Legionella
☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4

Other: ☐

IAQ

Nuisance Dust NIOSH ☐ 0500 ☐ 0600
Airborne Dust ☐ PM10 ☐ TSP
Silica Analysis: ☐ All Species
Silica Analysis – Single Species
☐ Alpha Quartz ☐ Cristobalite ☐ Tridymite
☐ HVAC Efficiency
☐ Carbon Black
☐ Airborne Oil Mist
Other: ☐

Client Sample #'s: 1707-P1A → P23B — **Total # of Samples:** 46

Relinquished (Client): [signature] — **Date:** 12-10-13 — **Time:** 0800

Received (Lab): [signature] — **Date:** 12/10/13 — **Time:** 11:15AM

Comments/Special Instructions: See field forms

http://latesting.com/COC_Print.cfm 3/15/2010

321321617

Page 2 of 2

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*: 321321617

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
1707-P1A	See field form		
-P1B			
1707-P23A			
-P23B			

Comments/Special Instructions: See field form

Controlled Document – Asbestos Testing COC – A1.0 – 11/29/2009

Page 2 of 2 Pages

http://latesting.com/COC_Print.cfm 3/15/2010

321321617

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
1	Generator Building (GB)	1	1, 2, 3	walls	Lt. Blue	P/SC	Concrete Block	G (F) P	1,000	red orange

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 1 A	1	wall	GB	6	
1707-P 1 B	2	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
2	GB	1	1, 2, 3	Window frame, Door frames, Trim	Lt. Blue	P	wood	G F (P)	100 ~~60~~	Turquoise

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 2 A	1	window frame	GB	11	
1707-P 2 B	2	Door frame			

HM ID	Building.	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
3	GB	1	1, 2, 3	wall	Black	P	concrete Block	G (F) P	50	yellow green

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 3 A	1	wall	GB	10	
1707-P 3 B	2	↓			

Page 1 of 8

Myrunghee Noh & Associates, LLC

321321617

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
4	GB	1	1	Floor	yellow	P	Concrete	G F (P)	50	Violet Purple

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 4 A	1	floor	GB	13	
1707-P 4 B	↓	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
5	~~D~~ GB	1	1	Conduits, Electrical Box	Blue	P	Metal	G F (P)	30	blue

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 5 A	1	Electrical Box	GB	~~37~~ 9	
1707-P 5 B	↓	Conduits			

HM ID	Building.	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
8	GB	1	3	Support ~~Bm~~ L Beam	Lt. Blue	P	Metal	G F (P)	5	green

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 6 A	3	support L Beam	GB	16	
1707-P 6 B	↓	↓			

Page 2 of 8

321321617

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility — Location: Pahole Hawaii
Inspector Initials: Danny — Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
9	GB	1	1	Conduits, Vents	Black	P	M	G (F) P	2	orange

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 7 A	1	vent	GB	31	
1707-P 7 B	↓	conduit			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
10	GB	1	2,3	Door frames	Black	P	wood	G F (P)	4	magenta

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 8 A	2	Door frame	GB	18	
1707-P 8 B	3	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
11	GB	1	Exterior	Walls	Tan	P	Concrete Block	G (F) P		green

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 9 A	Exterior	wall	GB	19	
1707-P 9 B	↓	↓			

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321321617

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility — Location: Pahole Hawaii
Inspector Initials: Danny — Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
12	GB	1	Exterior	Window Bars, Eaves	Tan	P	Metal	G F (P)		Blue

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 10 A	Exterior	Eaves	GB	24	
1707-P 10 B	↓	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
13	GB	1	Exterior	Door frames, Window frame	Tan	P	wood	G F (P)		magenta

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 11 A	Exterior	Door frame	GB	28	
1707-P 11 B	↓	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
14	GB	1	Exterior	wall	Green	P	Concrete Block	(G) F P		red orange

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 12 A	Exterior	wall	GB	27	
1707-P 12 B	↓	↓			

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Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-04-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
19	Tank #1	1	Exterior	Wall	white	P	Metal	G F P	1,300	red

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 13 A	Exterior	Wall	Tank 1	40	20ft. Tank
1707-P 13 B	↓	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
20	Tank 1	R	Exterior	Roof	Olive green	P	Metal	G F P	320 ~~1,300~~ DF	sky blue

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 14 A	Exterior	Roof	Tank 1	41	20ft Tank
1707-P 14 B	↓	↓			

HM ID	Building.	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
22	Tank 2	1	Exterior	Wall	white	P	Metal	G F P	630	bubble gum

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 15 A	Exterior	Wall	Tank 2	42	10ft. Tank
1707-P 15 B	↓	↓			

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Myoungbee Noh & Associates, L.L.C.

321321617

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-04-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
23	Tank 2	R	Exterior	Roof	Olive green	P	Metal	G F P	320	Tan

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 16 A	Exterior	Roof	Tank 2	43	10ft. Tank
1707-P 16 B	↓	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
25	Tank 3	1	Exterior	Wall	Lt. green	P	Metal	G F P	630	Navy blue

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 17 A	Exterior	Wall	Tank 3	44	10ft. Tank
1707-P 17 B	↓	↓			

HM ID	Building.	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
26	Tank 3	R	Exterior	Roof	Olive green	P	Metal	G F P	320	

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 18 A	Exterior	Roof	Tank 3	45	10ft. Tank
1707-P 18 B	↓	↓			

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Myoungbee Noh & Associates, L.L.C.

321321617

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-04-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area (Sq. ft) or L. ft	Hatch Color
28	lower Building	1	Kitchen	wall	white	P	CC Block	(G) F P	50	~~green~~ green

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 19 A	~~Kitchen~~ Kitchen	wall	LB	36	
1707-P 19 B	↓	↓			

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area (Sq. ft) or L. ft	Hatch Color
29	Lower Building	1	Kitchen	Electrical Box, conduits	Blue	P	Metal	G (P) P	30	yellow

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 20A	Kitchen	Electrical Box	LB	35	
1707-P 20 B	↓	↓			

HM ID	Building.	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area (Sq. ft) or L. ft	Hatch Color
30	Lower Building	1	Kitchen	wall	Beige	P	CC Block	(G) F P	20	Pink

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 21 A	Kitchen	wall	LB	37	
1707-P 21 B	↓	↓			

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Mvounghee Noh & Associates, LLC

321321617

Hazardous Homogeneous Materials and Sampling Survey Field Form: Lead Paint

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-04-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area (Sq. ft) or L. ft	Hatch Color
32	lower building	1	Storage	walls	Lt. green	P	CC Block	(G) F P	160	purple

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	PIC ID	Notes
1707-P 22 A	Storage	wall	LB	~~LB39~~	39	
1707-P 22B	↓	↓				

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area (Sq. ft) or L. ft	Hatch Color
33	Tower	1	Exterior	Ground	orange	P	Metal ~~Wood~~	G F (P)	200	

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P 23 A	Exterior	Ground	Tower		Rusted metal on the ground
1707-P 23 B	↓	↓			

HM ID	Building.	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
								G F P		

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-P A					
1707-P B					

Page 8 of 8

Mvounghee Noh & Associates, LLC

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone/Fax: (323) 254-9960 / (323) 254-9982
http://www.LATesting.com pasadenalab@latesting.com

LA Testing Order: 321321617
CustomerID: 32MYOU50
CustomerPO:
ProjectID:

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Phone: (808) 484-9214
Fax:
Received: 12/10/13 11:15 AM
Collected: 12/4/2013

Project: **017072 RMAA DAGS Pahole Radio Facility**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	Lab ID	Collected	Analyzed	Lead Concentration
1707-P1A Site: 1	0001	12/4/2013	12/10/2013	3300 ppm
1707-P1B Site: 1	0002	12/4/2013	12/10/2013	2600 ppm
1707-P2A Site: 2	0003	12/4/2013	12/10/2013	6600 ppm
1707-P2B Site: 2	0004	12/4/2013	12/10/2013	6100 ppm
1707-P3A Site: 3	0005	12/4/2013	12/10/2013	5300 ppm
1707-P3B Site: 3	0006	12/4/2013	12/10/2013	6400 ppm
1707-P4A Site: 4	0007	12/4/2013	12/10/2013	270000 ppm
1707-P4B Site: 4	0008	12/4/2013	12/10/2013	200000 ppm
1707-P5A Site: 5	0009	12/4/2013	12/10/2013	4800 ppm
1707-P5B Site: 5	0010	12/4/2013	12/10/2013	5100 ppm
1707-P6A Site: 8	0011	12/4/2013	12/10/2013	26000 ppm
1707-P6B Site: 8	0012	12/4/2013	12/10/2013	22000 ppm
1707-P7A Site: 9	0013	12/4/2013	12/10/2013	280 ppm
1707-P7B Site: 9	0014	12/4/2013	12/10/2013	4400 ppm
1707-P8A Site: 10	0015	12/4/2013	12/10/2013	20000 ppm

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. The QC data associated with these results included in this report meet the method QC requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. * slight modifications to methods applied. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request.
Samples analyzed by LA Testing South Pasadena, CA CA ELAP 2283, AIHA-LAP, LLC ELLAP 102814

Initial report from 12/11/2013 10:25:29

Test Report ChmSnglePrm/nQC-7.21.0 Printed: 12/11/2013 10:25:29 AM Page 1 of 4

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone/Fax: (323) 254-9960 / (323) 254-9982
http://www.LATesting.com pasadenalab@latesting.com

LA Testing Order: 321321617
CustomerID: 32MYOU50
CustomerPO:
ProjectID:

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Phone: (808) 484-9214
Fax:
Received: 12/10/13 11:15 AM
Collected: 12/4/2013

Project: **017072 RMAA DAGS Pahole Radio Facility**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	Lab ID	Collected	Analyzed	Lead Concentration
1707-P8B Site: 10	0016	12/4/2013	12/10/2013	18000 ppm
1707-P9A Site: 11	0017	12/4/2013	12/10/2013	950 ppm
1707-P9B Site: 11	0018	12/4/2013	12/10/2013	880 ppm
1707-P10A Site: 12	0019	12/4/2013	12/10/2013	72000 ppm
1707-P10B Site: 12	0020	12/4/2013	12/11/2013	69000 ppm
1707-P11A Site: 13	0021	12/4/2013	12/11/2013	15000 ppm
1707-P11B Site: 13	0022	12/4/2013	12/11/2013	46000 ppm
1707-P12A Site: 14	0023	12/4/2013	12/11/2013	700 ppm
1707-P12B Site: 14	0024	12/4/2013	12/11/2013	370 ppm
1707-P13A Site: 19	0025	12/4/2013	12/11/2013	<100 ppm
1707-P13B Site: 19	0026	12/4/2013	12/11/2013	<100 ppm
1707-P14A Site: 20	0027	12/4/2013	12/11/2013	<110 ppm
1707-P14B Site: 20	0028	12/4/2013	12/11/2013	<340 ppm
1707-P15A Site: 22	0029	12/4/2013	12/11/2013	<100 ppm
1707-P15B Site: 22	0030	12/4/2013	12/11/2013	<100 ppm

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

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Initial report from 12/11/2013 10:25:29

Test Report ChmSnglePrm/nQC-7.21.0 Printed: 12/11/2013 10:25:29 AM Page 2 of 4

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Suite 210A
Aiea, HI 96701

Phone: (808) 484-9214
Fax:
Received: 12/10/13 11:15 AM
Collected: 12/4/2013

Project: **017072 RMAA DAGS Pahole Radio Facility**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	Lab ID	Collected	Analyzed	Lead Concentration
1707-P16A	0031	12/4/2013	12/11/2013	<930 ppm
	Site: 23			
1707-P16B	0032	12/4/2013	12/11/2013	<110 ppm
	Site: 23			
1707-P17A	0033	12/4/2013	12/11/2013	<100 ppm
	Site: 25			
1707-P17B	0034	12/4/2013	12/11/2013	<100 ppm
	Site: 25			
1707-P18A	0035	12/4/2013	12/11/2013	<850 ppm
	Site: 26			
1707-P18B	0036	12/4/2013	12/11/2013	<250 ppm
	Site: 26			
1707-P19A	0037	12/4/2013	12/11/2013	7900 ppm
	Site: 28			
1707-P19B	0038	12/4/2013	12/11/2013	7000 ppm
	Site: 28			
1707-P20A	0039	12/4/2013	12/10/2013	8300 ppm
	Site: 29			
1707-P20B	0040	12/4/2013	12/10/2013	12000 ppm
	Site: 29			
1707-P21A	0041	12/4/2013	12/10/2013	18000 ppm
	Site: 30			
1707-P21B	0042	12/4/2013	12/10/2013	18000 ppm
	Site: 30			
1707-P22A	0043	12/4/2013	12/10/2013	1900 ppm
	Site: 32			
1707-P22B	0044	12/4/2013	12/10/2013	2000 ppm
	Site: 32			
1707-P23A	0045	12/4/2013	12/10/2013	8400 ppm
	Site: 33			

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

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Initial report from 12/11/2013 10:25:29

Test Report ChmSnglePrm/nQC-7.21.0 Printed: 12/11/2013 10:25:29 AM Page 3 of 4

LA Testing
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Phone/Fax: (323) 254-9960 / (323) 254-9982
http://www.LATesting.com pasadenalab@latesting.com

LA Testing Order: 321321617
CustomerID: 32MYOU50
CustomerPO:
ProjectID:

Attn: **Akari Ihara**
Myounghee Noh & Associates, LLC
99-1046 Iwaena Street
Suite 210A
Aiea, HI 96701

Phone: (808) 484-9214
Fax:
Received: 12/10/13 11:15 AM
Collected: 12/4/2013

Project: **017072 RMAA DAGS Pahole Radio Facility**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B*/7000B)

Client Sample Description	Lab ID	Collected	Analyzed	Lead Concentration
1707-P23B	0046	12/4/2013	12/10/2013	3900 ppm
	Site: 33			

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. The QC data associated with these results included in this report meet the method QC requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. * slight modifications to methods applied. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request.
Samples analyzed by LA Testing South Pasadena, CA CA ELAP 2283, AIHA-LAP, LLC ELLAP 102814

Initial report from 12/11/2013 10:25:29

Test Report ChmSnglePrm/nQC-7.21.0 Printed: 12/11/2013 10:25:29 AM Page 4 of 4

331318855

Page 1 of 2

331318855

Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*:

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Company: Myounghee Noh & Associates L.L.C.
Street: 99-1046 Iwaena St.
City/State/Zip: Aiea, HI 96701
Report To (Name): Akari Ihara
Telephone: 8084849214

LA Testing-Bill to: ☑ Same ☐ Different
If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party

Fax: ~~8084844660~~ DF
Email Address: akari@noh-associates.com

Project Name/Number: 01707 2 RMAA DAGS Pahole Radio Facility
Please Provide Results: email
Purchase Order:
State Samples Taken: HI

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 3 Day ☐ 4 Day ☐ 1 Week ☐ 2 Week

*For RUSH TAT's Please Call Ahead to Confirm Lab Hours and Availability
Materials Science and IAQ TATs are in Business Days rather than Hours (i.e. 24 Hour – End of Next Business Day)

Asbestos

PCM - Air
☐ NIOSH 7400
☐ w/ 8hr. TWA

TEM- Air ☐ 4-6.9hr TAT (AHERA ONLY)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Water
Fibers ≥10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

PLM - Bulk
☐ PLM EPA 600/R-93/116
☐ PLM EPA NOB (<1%)
☐ NYS 198.1 (friable-NY)
☐ NYS 198.6 (non-friable-NY)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/ Gravimetric
☐ 400 (<0.25%) ☐ 1000 (<0.1%)

TEM - Dust
☐ Microvac – ASTM D 5755
☐ Wipe-ASTM D6480

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP

Soil/Rock/Vermiculite
☐ PLM CARB 435 – A (0.25% sensitivity)
☐ PLM CARB 435 – B (0.1% sensitivity)
☐ TEM CARB 435 – B (0.1% sensitivity)
☐ EPA Reg. 1 Screening Protocol (Qualitative)
Other:

Lead (Pb)

Flame Atomic Absorption
☐ Chips SW846-7000B or AOAC 974.02
☐ Soil SW846-7000B/7420
☐ Air NIOSH 7082
☐ Wastewater SM3111B or SW846-7000B/7420
☐ ASTM Wipe SW846-7000B/7420
☐ non ASTM Wipe SW846-7000B/7420
☐ TCLP SW846-1311/7420/SM 3111B

ICP
☐ Air NIOSH 7300 Modified
☐ non ASTM Wipe SW846-6010B or C
☐ ASTM Wipe SW846-6010B or C
☐ Soil SW846-6010 B or C
☐ Waste Water SW846-6010B or C
☐ TCLP SW846-6010B or C

Graphite Furnace Atomic Absorption
☐ Soil SW846-7421
☐ Air NIOSH 7105
☐ Wastewater EPA 200.9
☐ Drinking Water EPA 200.9

Other: ☐

Materials Science

☐ Common Particle ID (large particles)
☐ Full Particle ID (environmental dust)
☐ Basic Material ID (solids)
☐ Advanced Material ID
☐ Physical Testing (Tensile, Compression)
☐ Combustion-by-products (soot, char, etc.)
☐ X-Ray Fluorescence (elem. analysis)
☐ X-Ray Diffraction (Crystalline Part.)
☐ MMVF's (Fibrous glass, RCF's)
☐ Particle Size (sieve/microscopy/laser)
☐ Combustible Dust
☐ Petrographic Examination
Other: ☒ Arsenic

Microbiology

Wipe and Bulk Samples
☐ Mold & Fungi – Direct Examination
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi Culture (Genus & Species)
☐ Bacterial Count & ID (Up to Three Types)
☐ Bacterial Count & ID (Up to Five Types)
☐ MRSA
☐ *Pseudomonas aeruginosa*

Air Samples
☐ Mold & Fungi (Spore Trap)
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi (Genus & Species)
☐ Bacterial Culture & ID (Up to Three Types)
☐ Bacterial Culture & ID (Up to Five Types)
☐ Endotoxin Testing
Real Time Q-PCR (See Analytical Guide for Code)
Code:
Legionella
☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4
Other: ☐

Water Samples
☐ Total Coliform & E.coli (P/A)
☐ Fecal Coliform (SM 9222D)
☐ Sewage Screen
☐ Heterotrophic Plate Count (SM 9215)

IAQ

Nuisance Dust NIOSH ☐ 0500 ☐ 0600
Airborne Dust ☐ PM10 ☐ TSP
Silica Analysis: ☐ All Species
Silica Analysis – Single Species
☐ Alpha Quartz ☐ Cristobalite ☐ Tridymite
☐ HVAC Efficiency
☐ Carbon Black
☐ Airborne Oil Mist
Other: ☐

Client Sample #'s 1707-Ars1A, Ars1B
Total # of Samples: 2
Relinquished (Client): [signature] **Date:** 12-10-13 **Time:** ~~0800~~ 0800
Received (Lab): CR (EMSL) **Date:** 12/10/13 **Time:** 11:15 am

Comments/Special Instructions: See field forms
Relinquished: C Rodriguez 12/10/13
Rec: [signature] 12/10/13 1:10pm

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Asbestos Testing Chain of Custody

LA Testing Order Number *(Lab Use Only)*:

South Pasadena, CA - Los Angeles County
520 Mission Street
South Pasadena, CA 91030
PHONE: 1-800-303-0047
FAX: 323-254-9982

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
1707-Ars1A	See field forms		
↓ -Ars1B			

Comments/Special Instructions: See field forms

Controlled Document – Asbestos Testing COC – A1.0 – 11/29/2009

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LA Testing
11652 Knott Street Unit F5, Garden Grove CA 92841

Order ID: 331318855

Attn:	Akari Ihara Myounghee Noh & Associates, LLC 99-1046 Iwaena Street, Suite 210A Aiea, HI 96701	Customer ID:	32MYOU50
		Customer PO:	
		Date Received:	12/10/13
Email:	akari@noh-associates.com	LA Testing Order:	331318855
Phone:	808-484-9214		
Project:	01707_2 RMAA DAGS Pahole Radio Facility		
Report Date:	12/12/13	Date Analyzed:	12/12/13

Metals in Bulk by ICP – 6010B

Lab ID	Client ID	Analyte	mg/Kg	Reporting Limit mg/Kg
331318855-0001	1707-ArsIA	Arsenic	2200	20
331318855-0002	1707-ArsIB	Arsenic	2700	20

Sample received in acceptable condition unless otherwise noted. This report may not be reproduced except in full, without written approval by LA Testing. Unless otherwise noted, the results in this report have not been blank corrected. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted.

JD
Analyst

Michael Chapman

Michael Chapman- Laboratory Manager
Or other approved signatory

AIHA Accredited - Laboratory ID #101650
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DAGS Job No. 12-10-0733

Existing Conditions - Hazardous Materials Survey Report
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Hazardous Homogeneous Materials and Sampling Survey Field Form: Arsenic

Project # & Name: 01707_2 RMAA DAGS Pahole Radio Facility Location: Pahole Hawaii
Inspector Initials: Danny Date & Time: 12-4-13

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
6	GB	1	1	Ceiling	White	12"x12" Ceiling Tiles	DW	G F P	200	

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-Ars A	1	Ceiling			
1707-Ars B					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
								G F P		

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-Ars A					
1707-Ars B					

HM ID	Building	Flr.	Rooms	Locations	Material Color	Material	Substrate	Condition	Area Sq. ft or L. ft	Hatch Color
								G F P		

Sample ID	Room Sampled	Sample Location	Bldg.	PIC ID	Notes
1707-Ars A					
1707-Ars B					

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Myounghee Noh & Associates LLC

331318855

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DAGS Job No. 12-10-0733

Existing Conditions - Hazardous Materials Survey Report
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