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FEB 23 2021

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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

Feb 1, 2021

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

Dear Mr. Kawaoka:

With this letter, we hereby submit a Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the "Department of Land and Natural Resources Administration Building and Base Yard in North Kona, Hawaii," to be published in the next available edition of the *Environmental Notice*. The proposed project involves a portion of TMK (3) 7- 3- 010: 061 on the island of Hawai'i.

Simultaneous with this letter, we are submitting the electronic version of the OEQC Publication Form and a PDF formatted electronic copy of the DEA-AFONSI through the online submission platform.

If there are any questions, please contact Mr. Brandon Kim, Project Engineer, at 587-0248 or via email to brandon.j.kim@hawaii.gov.

Sincerely,

Suzanne D. Case

SUZANNE D. CASE
Chairperson

21-117

From: webmaster@hawaii.gov
To: HI Office of Environmental Quality Control
Subject: New online submission for The Environmental Notice
Date: Saturday, February 13, 2021 2:55:34 PM

Action Name

DLNR Administration Building and Base Yard in North Kona, Hawaii

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

North Kona, Hawaiʻi

Tax Map Key(s) (TMK(s))

(3) 7-3-010: 061 (por.)

Action type

Agency

Other required permits and approvals

Numerous - Permits and approvals are discussed in Chapter 5 Permits and Approvals of the Draft EA

Proposing/determining agency

Department of Land and Natural Resources

Agency contact name

Brandon Kim

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Map It

Was this submittal prepared by a consultant?

Yes

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1622 Kanakanui Street
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Map It

Action summary

The Department of Land and Natural Resources (DLNR) proposes to develop a new administration facility in North Kona that will allow the department to consolidate services in West Hawaii. The project is the development of a modern, energy efficient facility that accommodates present and future operational needs. Site security with respect to theft and vandalism is a high priority due to the enforcement functions and missions of DLNR's divisions. The proposed facility will include three, separate, but similar administration buildings that have the same structural system. There are storage areas, a conference room, a secured base yard and two parking areas. DLNR's divisions will share the new administration building and each division may have a base yard.

The project may be developed in phases due to funding options and constraints. DLNR's new facility will require the installation of infrastructure during the earliest phase of development.

Reasons supporting determination

HRS 343 significance criteria is discussed in Chapter 6 Determination of the Draft EA

Attached documents (signed agency letter & EA/EIS)

- DEA-DLNR-West-Hawaii.pdf
- DLNR-West-HI-Facility-Draft-EA-OEQC-Submittal-part-1-signed.pdf

Action location map

- DLNR-West-Hawaii-Project-Location.zip

Authorized individual

Claire Oshiro

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

Draft Environmental Assessment for the Department of Land and Natural Resources Administration Building and Base Yard in North Kona, Hawai‘i

Prepared For:

State of Hawai‘i

Department of Land and Natural Resources, Engineering Division

Prepared By:

THE LIMTIACO CONSULTING GROUP

CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 2021

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Draft Environmental Assessment

for the

DEPARTMENT OF LAND AND NATURAL RESOURCES ADMINISTRATION BUILDING AND BASE YARD IN NORTH KONA, HAWAIʻI

Tax Map Key (3) 7-3-010: 061 (por.)

This environmental document has been prepared pursuant to
Chapter 343, Hawaiʻi Revised Statutes

Prepared For:

State of Hawaiʻi
Department of Land and Natural Resources
Engineering Division

Prepared By:

The Limtiaco Consulting Group
Civil Engineering and Environmental Consultants
1622 Kanakanui Street
Honolulu, Hawaiʻi 96817

January 2021

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LIST OF ABBREVIATIONS

Abbreviation	Definition
AFONSI	Anticipated Finding of No Significant Impact
ASA	Aquifer Sector Area
ASYA	Aquifer System Area
BMPs	Best Management Practices
CWRM	Department of Land and Natural Resources, Commission on Water Resource Management
CZM	Coastal Zone Management
DAGS	State of Hawaiʻi, Department of Accounting and General Services
DAR	Department of Land and Natural Resources, Division of Aquatic Resources
DEM	Hawaiʻi County Department of Environmental Management
DOBOR	Department of Land and Natural Resources, Division of Boating and Ocean Recreation
DOCARE	Department of Land and Natural Resources, Division of Conservation and Resources Enforcement
DOFAW	Department of Land and Natural Resources, Division of Forestry and Wildlife
DHHL	State of Hawaiʻi, Department of Hawaiian Homelands
DLNR	State of Hawaiʻi, Department of Land and Natural Resources
DOH	State of Hawaiʻi, Department of Health
DOT	State of Hawaiʻi, Department of Transportation
DPW	Hawaiʻi County Department of Public Works
DWS	Hawaiʻi County Department of Water Supply
EA	Environmental Assessment
ENG	Department of Land and Natural Resources, Engineering Division
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
gdp	gallons per day
HAR	Hawaiʻi Administrative Rules
HELCO	Hawaiian Electric Light Company, Inc.
HRS	Hawaiʻi Revised Statutes
IBC	International Building Code

LIST OF ABBREVIATIONS (Continued)

Abbreviation	Definition
IWS	Individual Wastewater System
LSB	Land Study Bureau (of the University of Hawaiʻi)
LUC	State of Hawaiʻi, Land Use Commission
LUO	Hawaiʻi County Land Use Ordinance
LUPAG	Land Use Pattern Allocation Guide
MGD	Million gallons per day
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NPS	U.S. Department of the Interior, National Park Service
OEQC	State of Hawaiʻi, Office of Environmental Quality Control
OP	State of Hawaiʻi, Office of Planning
SCS	Scientific Consultant Services, Inc.
SHPD	Department of Land and Natural Resources, Historic Preservation Division
SP	Department of Land and Natural Resources, Division of State Parks
SMA	Special Management Area
TIAR	Traffic impact assessment report
TMDL	Total Maximum Daily Load
TMK	Tax Map Key
UIC	Underground Injection Control
WWTP	Wastewater Treatment Plant

PROJECT SUMMARY

Proposing/Determination Agency:	Department of Land and Natural Resources (DLNR), Engineering Division
Contact:	Mr. Brandon Kim, Project Engineer
Location:	North Kona, Hawai‘i
Tax Map Key:	(3) 7-3-010: 061 (por.)
Land Area:	roughly 5 acres (whereas parcel is 79.098 acres)
Recorded Fee Owner:	State of Hawai‘i
Existing Use:	Open (undeveloped)
Proposed Use:	DLNR administration facility with a shared base yard
Community Plan Region:	**North Kona District**
Land Use Designations:	
State Land Use	Urban
Development Plan	Residential
County Zoning	O - Open District (No Setbacks or Height Restrictions)
Action Requested:	DLNR proposes to develop a new administration facility in North Kona that will allow the department to consolidate services at a central location in West Hawai‘i. The project is the development of a modern, energy efficient facility that accommodates present and future operational needs such as staff administrative offices, meeting room(s), a secure base yard, outdoor storage areas and parking. DLNR’s divisions will share the new administration building and each division may have a base yard. The project may be developed in phases due to funding options and constraints. DLNR’s new facility will require the installation of infrastructure during the earliest phase of development.
Agency Determination:	Anticipated Finding of No Significant Impact (AFONSI)

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1. SETTING AND PROJECT DESCRIPTION

1.1. Introduction and Background

The State of Hawaiʻi, Department of Land and Natural Resources (DLNR) proposes to develop a new administration facility (hereafter, "proposed facility") at Keāhole in North Kona. A previous Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the DLNR Community Conference Center and Administration Facility in Kealakehe was published in the June 8, 2017 issue of *The Environmental Notice*. DLNR has revised its project and will consolidate five divisions instead of seven within its proposed facility that would be sited approximately one mile from the Ellison Onizuka Kona International Airport (hereafter Kona International Airport). The previously selected site near the existing Honokōhau Small Boat Harbor Facility and *makai* (or seaward) of the Queen Kaʻahumanu Highway was determined to be infeasible during the design phase of the project and will not be developed for DLNR's administrative functions for the foreseeable future.

The project site is an undeveloped portion of the state-owned parcel identified as Tax Map Key (TMK) 7-3-010: 061, which is located *mauka* (or landward) of the Queen Kaʻahumanu Highway and near the intersection of Kaiminani Drive and Laui Street (see Figure 1). DLNR has reduced the scope of its project by eliminating the community conference center and climate-controlled collections warehouse. The proposed facility discussed in this EA will include three, separate, but similar administration buildings that have the same structural system. There are storage areas, a conference room, a secured base yard and two parking areas in the conceptual design of the proposed facility. The project will likely be phased, with one building constructed per phase based upon need and funding availability.

DLNR is proposing the development of a modern, energy efficient facility that accommodates present and future operational needs. The consolidation of several divisions at the proposed facility in West Hawaiʻi is anticipated to improve operational efficiencies. The proposed facility will be generally oriented along Kaiminani Drive. Site photographs and conceptual renderings of the project are in Appendix A. The first building will accommodate administrative functions of the Division of State Parks (SP) and include warehouse space for SP. The first phase of the project will also include a secured storage area for the Commission on Water Resource Management (CWRM). A second building will accommodate the administrative functions and secure storage areas for the Division of Aquatic Resources (DAR) and State Historic Preservation Division (SHPD). The third building will accommodate another division or divisions of the DLNR to be determined based on strategic operational needs. For example, some staff and administrative functions of the Division of Conservation and Resources Enforcement (DOCARE) may relocate to the proposed facility from existing space at the Honokōhau Small Boat Harbor Facility.

The proposed facility represents a commitment to the continued presence of DLNR in West Hawai‘i. DLNR’s divisions that have ocean-related resource management and enforcement responsibilities will continue to utilize the existing Honokōhau Small Boat Harbor Facility, which is encumbered under Governor’s Executive Order No. 4334 to the Division of Boating and Ocean Recreation (DOBOR) for small boat harbor and related purposes. DOBOR is expected to remain at the existing harbor facility for the foreseeable future; the following divisions are expected to be housed at the proposed facility along Kaiminani Drive, which is approximately 5 miles from the harbor:

- CRWM. This division administers the State Water Code. Its service aspects include planning, surveying, regulating, monitoring, and conserving the State’s water resources in accordance with adopted plans.
- DAR. The mission of DAR is to manage, conserve and restore the State’s unique aquatic resources and ecosystems. DAR administers programs in commercial fisheries and resource enhancement; aquatic resources protection, habitat enhancement, and education; and recreational fisheries.
- DOCARE. This division is tasked with enforcing state laws that serve to protect, conserve and manage Hawai‘i’s unique and limited natural, cultural and historic resources held in public trust. DOCARE’s patrol responsibilities include small boat harbors, parks and public lands. It is tasked with collecting and securing evidence such as impounded vehicles.
- SHPD. This division maintains the Inventory of Historic Properties and reviews planning and construction documents. SHPD is also responsible for ensuring the proper handling of disinterred remains or *iwi*.
- SP. This division manages and administers public lands and interest areas that are part of the Hawai‘i Park System.

The earliest phase of development for the proposed facility will include the installation of infrastructure (e.g., water, individual wastewater system, electrical/communication systems) and construction of a new driveway for access and egress from Kaiminani Drive. There will be spaces where division personnel can interact with the public it serves and support the programs and services it provides in Hawai‘i County. The secured base yard and storage areas will have access controls to protect government vessels, vehicles, equipment, tools, records, and other storage items. The proposed facility will be accessible in accordance with the Americans with Disabilities Act guidelines. Parking areas for staff and the public will be developed within the project site. Figure 2 depicts the described relocations of DLNR’s divisions as currently envisioned.

LEGEND

PROPERTY LINE

PROJECT LIMITS

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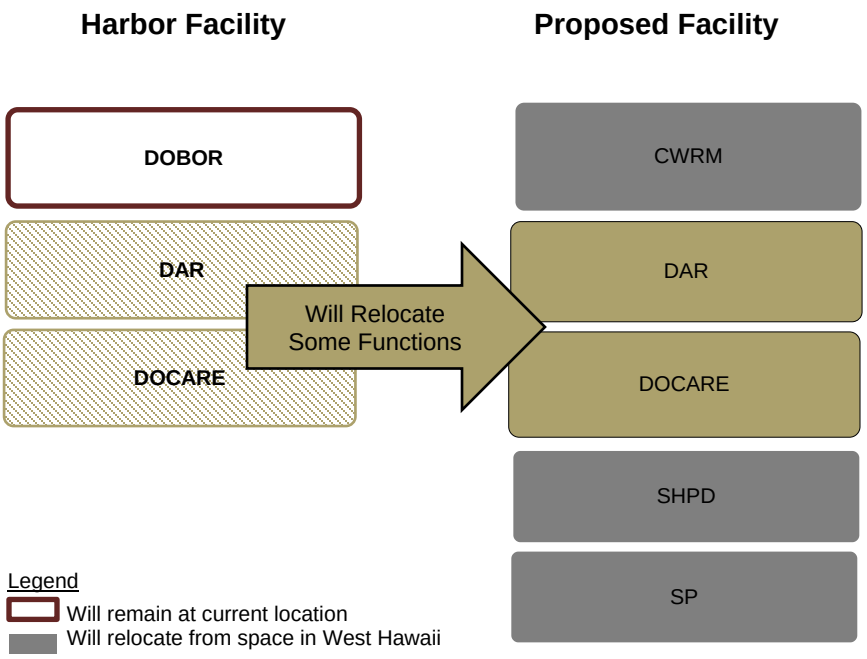
DLNR Administration Facility in North Kona District
Project Location and Vicinity Map

FIGURE 1

SCALE: 1"=2000'

DATE: January 2021

Figure 2 Planned Locations for DLNR's Divisions



DLNR's project would utilize State of Hawai'i lands and funds and, therefore, requires the preparation of an Environmental Assessment (EA) pursuant to Chapter 343, HRS and associated Title 11, Chapter 200.1, Hawai'i Administrative Rules (HAR). This EA was prepared to examine potential project impacts and to provide for public participation as required and defined in the statutes. The project site is not located within the Special Management Area (SMA).

1.2. Project Need and Objectives

The completion of DLNR's project would facilitate the consolidation of five divisions at a single permanent location in West Hawai'i. The proposed facility would provide adequate space and site security for the current and future operations of CWRM, DAR, DOCARE, SP, and SHPD that pertain to its administration, management, protection and conservation efforts. Site security with respect to theft and vandalism is a high priority due to the enforcement functions and missions of DLNR's divisions. The siting of the proposed facility addresses functional and spatial challenges created by divisions that operate from a combination of permanent and temporary locations scattered throughout West Hawai'i.

Completion of the proposed project would allow DLNR to achieve several objectives:

- Accommodate present and future operational needs in a modern, energy efficient facility with secure storage areas and base yards;
- Deliver DLNR programs and services more efficiently from a permanent location in West Hawaiʻi;
- Utilize state-owned land encumbered for public uses; and
- Continue agency efforts pertaining to state parks; historical sites; forests and forest reserves; aquatic sanctuaries; public fishing areas; boating, ocean recreation, and coastal programs; wildlife sanctuaries; game management areas; public hunting areas; and natural area reserves.

1.3. Site Location and Description

The project site comprises undeveloped state-owned land located approximately one mile from the Kona International Airport and 2,000 feet *mauka* of the Queen Kaʻahumanu Highway (refer to Figure 1). The northern boundary of the project site is defined by Kaiminani Drive, which is an undivided two-lane collector roadway that serves as a primary east-west corridor between the Kona International Airport and Kalaoa residential neighborhood in North Kona. The 5-acre project site adjoins existing agricultural park development and is within the 79-acre state-owned parcel identified as TMK 7-3-010: 061. The southern boundary of the project site is defined by an adjacent agricultural lot and the western boundary is defined by Laui Street. The project site slopes gently west towards the Pacific Ocean.

Appendix A contains photographs of the landscape within the project site, which is generally characterized as grassland over old lava flows from the Hualālai volcano. The biological field survey conducted by AECOS, Inc. (see Appendix B) noted the presence of two indigenous (or native to Hawaiʻi) species within the project site: *ʻuhaloa* (*Waltheria indica*) and *pili* (*Heteropogon contortus*). Weedy, ruderal plants are more numerous in disturbed areas and along the edges of Kaiminani Drive and Laui Street, and there is one small silk oak tree (*Grevillea robusta*) within the project site.

Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey of the project site (see Appendix C) that has resulted in additional documentation for one previously recorded refuge cave feature that contains two burials (Site #50-10-27-262). An entrance to the feature provides access to three lava tubes that extend outward to the north, south and west from the center of the project site. The recordation of a rectangular rock mound (Site #50-10-27-31109) and a group of pāhoehoe excavations (Site #50-10-27-31110) was also accomplished.

Municipal water system infrastructure currently exists in the vicinity of the project site, which is located at the Kaiminani Drive and Laui Street intersection. Electrical and communications infrastructure is generally located along established roadways including Kaiminani Drive and Laui Street. In the late 1970s, the anticipated agricultural park development considered wastewater disposal via cesspools because the area had no municipal sewer facilities (M&E Pacific, Inc., 1977). Existing utility infrastructure located along Queen Kaʻahumanu Highway allows for wastewater conveyance to the Kealakehe Wastewater Treatment Plant; however, there are no municipal sewer facilities in the vicinity of the project site.

The State Land Use designation for DLNR's 79-acre parcel is Urban (see Figure 3). The Land Use Pattern Allocation Guide (LUPAG) Map designates DLNR's entire parcel as Important Agriculture (see Figure 4). The County of Hawaiʻi zoning designation for the project site is Open (see Figure 5). Permitted uses pursuant to Chapter 25-5-162(a)(3) of the Hawaiʻi County Code include "*Community building, as permitted under §25-4-11*." DLNR's project is a public use that would be consistent with §25-4-11(c):

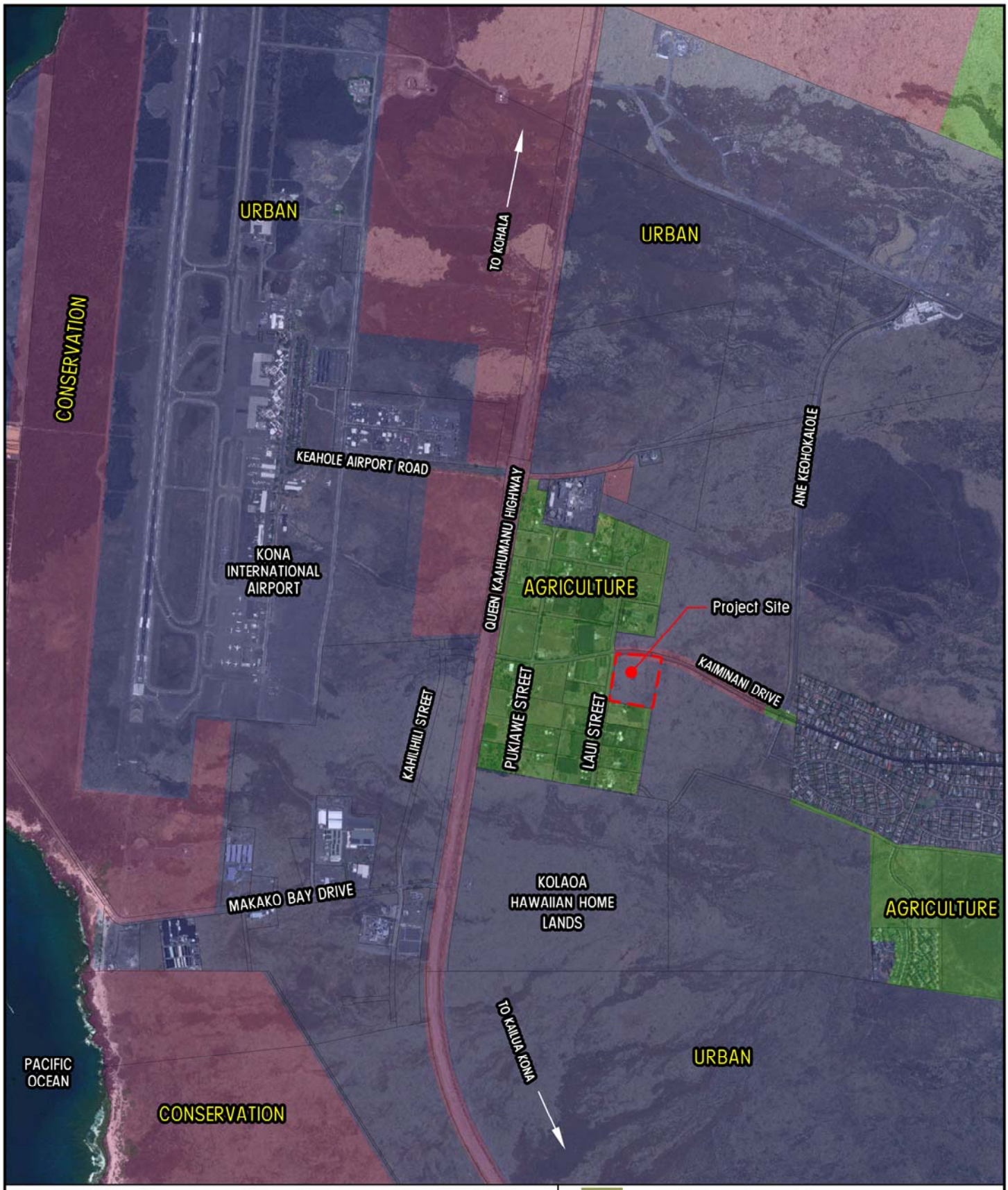
> *Public uses, structures and buildings and community buildings are permitted uses in any district, provided that the director has issued plan approval for such use*.

There are no setbacks or height restrictions per the Hawaiʻi County's Land Use Ordinance. Plan approval will be required for DLNR's project.

1.4. Historical Setting

The information in this section is summarized from the cultural impact assessment report prepared by SCS unless otherwise noted. See Appendix D for the report.

The earliest voyagers from the Marquesas and Central Polynesia established communities on the wetter and more fertile windward shores of the Island of Hawaiʻi. Marine and terrestrial resources were available to support growing communities engaged in fishing, horticulture, animal husbandry and the utilization of available flora and fauna. The establishment of food production systems including fishponds allowed coastal populations to expand inland. The earliest known settlements along the dry, rocky, leeward shores of Hawaiʻi Island include temporary habitation caves used when fishing and permanent habitation sites associated with fishpond production. The settlement pattern on the drier, barren, leeward side of Hawaiʻi Island may have started from inland areas that could support the cultivation of taro and sweet potato. The early inhabitants of West Hawaiʻi may have utilized a kinship-based exchange system to share agricultural and marine resources with the inland and shoreline community members.



LEGEND

- AGRICULTURE
- CONSERVATION
- URBAN

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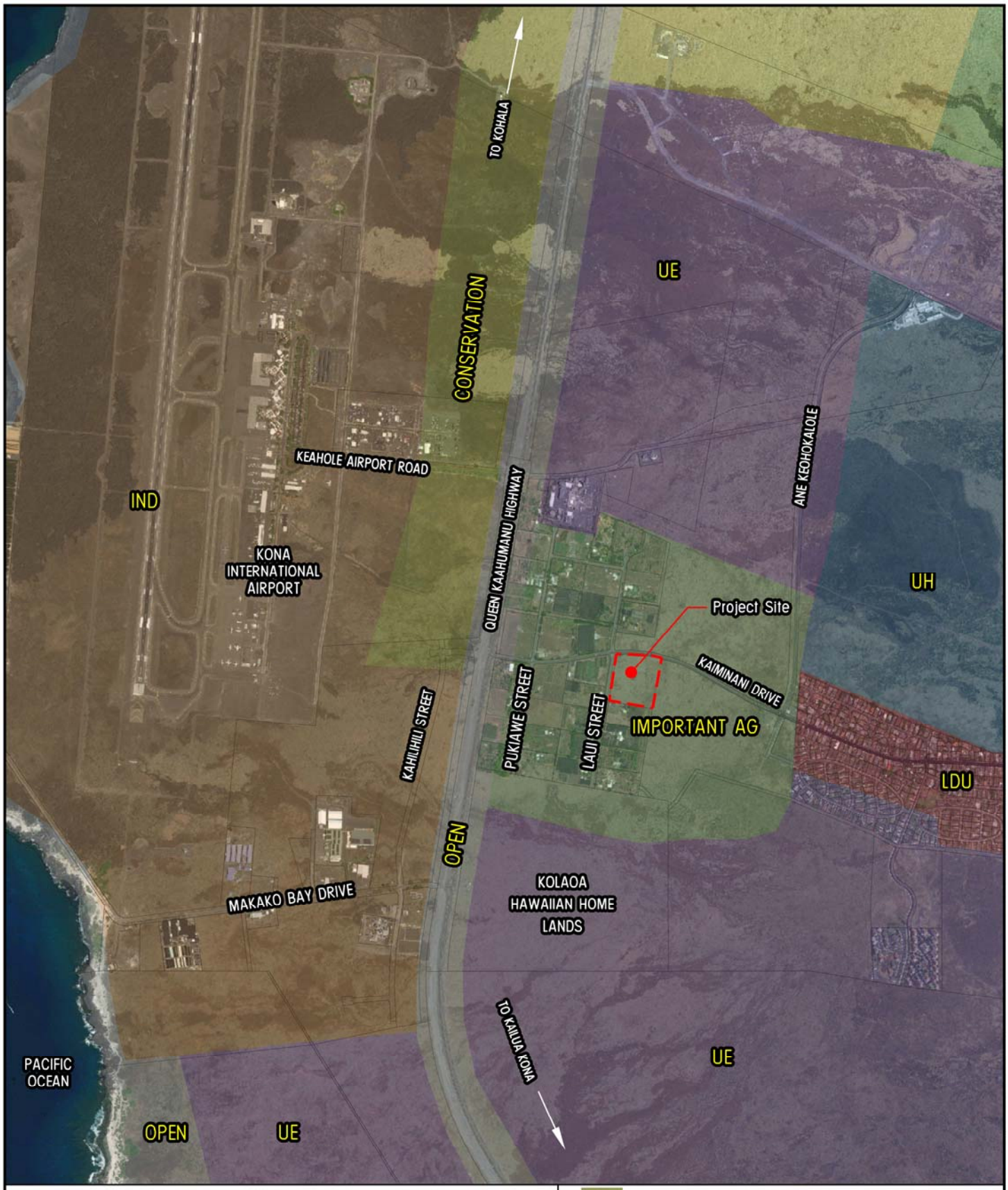
DLNR Administration Facility in North Kona District
State Land Use Map

FIGURE 3

SCALE: 1"=2000'

DATE: January 2021



LEGEND

- INDUSTRIAL (IND)
- URBAN EXPANSION (UE)
- OPEN
- CONSERVATION
- LOW DENSITY URBAN (LDU)
- UNIVERSITY USE (UH)
- IMPORTANT AGRICULTURE

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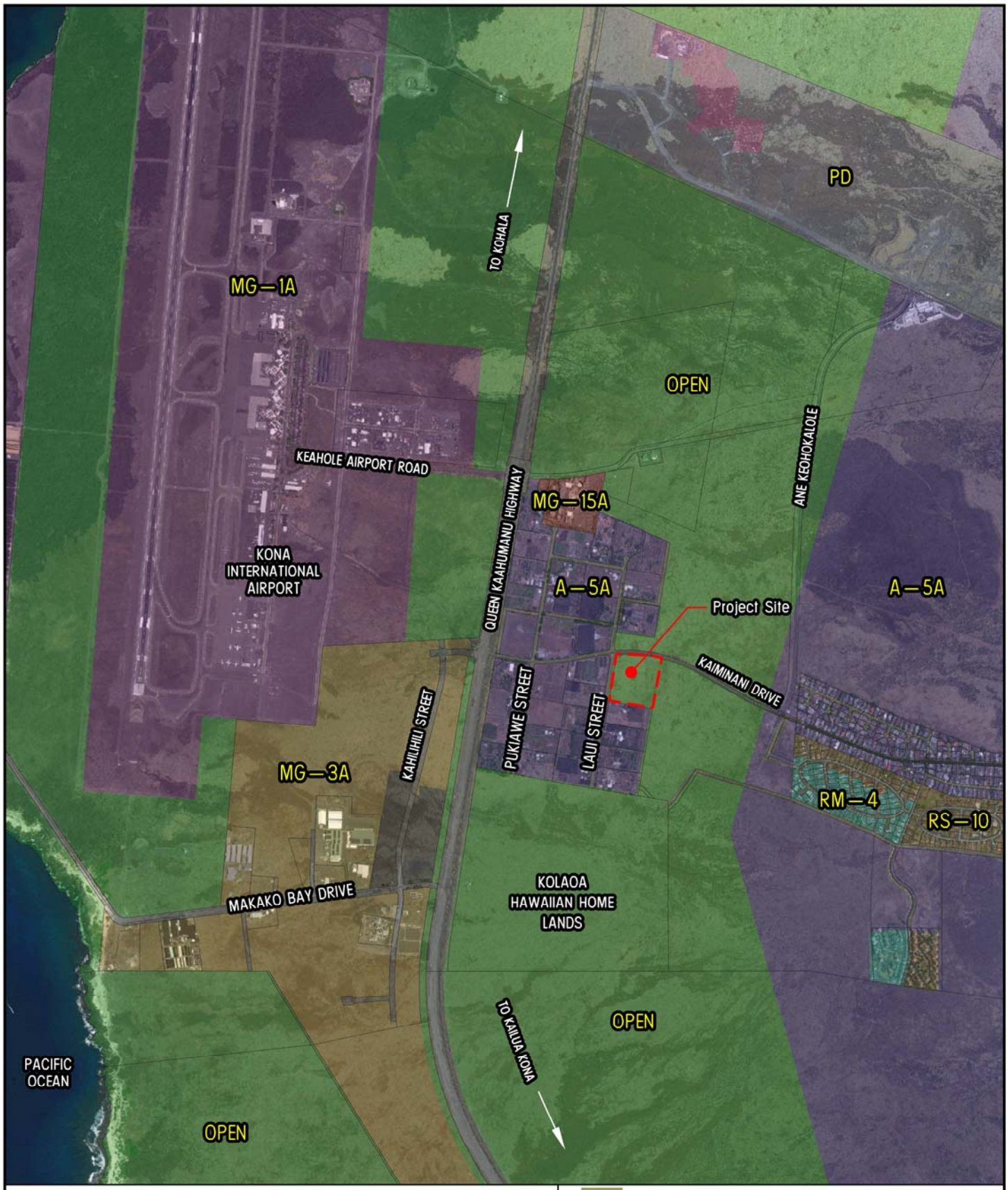
DLNR Administration Facility in North Kona District
LAND USE ALLOCATION

FIGURE 4

SCALE: 1"=2000'

DATE: January 2021



LEGEND

	A–5A		OPEN
	MG–1A		PD
	MG–3A		RM–4
	MG–15A		RS–10

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DLNR Administration Facility in North Kona District
HAWAII COUNTY ZONING

FIGURE 5

SCALE: 1"=2000'

DATE: January 2021

The improvement of dry-land cultivation methods may have allowed permanent communities in West Hawai‘i to expand and thrive. The emerging Hawaiian culture was self-sufficient and organized as a fairly rigid caste structure that incorporated communal subsistence. The various island communities grew and were influenced by larger competitive political zones. The project site is closest to the political center for Kona, which is to the south. By the 1700s, the communities of Kona, North Kohala, Waimea, and Lālāmilo had permanent, large-scale agricultural field systems in contrast to lands in the project area, which contain little to no soils. The following dryland crops may have been cultivated in upland areas: taro, sweet potatoes, gourds, breadfruit, bananas, paper mulberry, *ti*, and sugar cane.

Small fishing communities and villages between larger population areas and political centers were connected via trail systems over barren *pāhoehoe* and *‘a‘ā* lava flows. The Hawaiians utilized canoes for shoreline travel whereas trail systems connected Kona with North and South Kohala. Other *mauka-makai* trail systems connected upland agricultural areas with coastal villages.

Permanent villages along the Kona coastline had large populations prior to the 1779 arrival in Kealakekua Bay of British Captain James Cook, who observed that the area was flourishing (County of Hawai‘i Planning Department, 2005, 2006, 2007, 2009, 2012, 2014, as Amended). Foreign ships bypassed the Kona area for many years after Captain Cook’s death (Ibid.). In 1791, Kamehameha I became the ruler of Hawai‘i Island; in 1792, Captain George Vancouver brought orange trees, grapevines, other plants, and cattle to Kona for King Kamehameha I and his chiefs; and in 1812, King Kamehameha I established his permanent residence and the capital for the kingdom of Hawai‘i in Kailua-Kona (Ibid.).

The introduction of cattle and horses during the reign of King Kamehameha I contributed to the establishment of ranching in Kona (Wilson Okamoto Corporation, 2008, 2019, as Amended). The prevalence of western influences was bolstered by the abolishment of the *kapu* system after the death of King Kamehameha I in 1819 and the establishment of the first Christian church in Kailua by missionaries in 1834 (Ibid.).

The era from 1845 to 1900 is characterized by the introduction of private land ownership and commercial ventures (e.g., cattle ranching, sandalwood collection, supplying whaling vessels, and the cultivation of coffee, sugarcane, and other food crops). The Māhele of 1848 (which abolished the previous semi-feudal land tenure system) and the Alien Land Ownership Act and the Kuleana Act of 1850 (which allowed the sale of land in fee simple to resident aliens and the award of *kuleana* lands to native tenants) were enacted during the reign of Kamehameha III. Hawaiian lands were ultimately divided between the king, the chiefs, and the government. The vast majority of lands in the project vicinity became government lands during the Māhele.

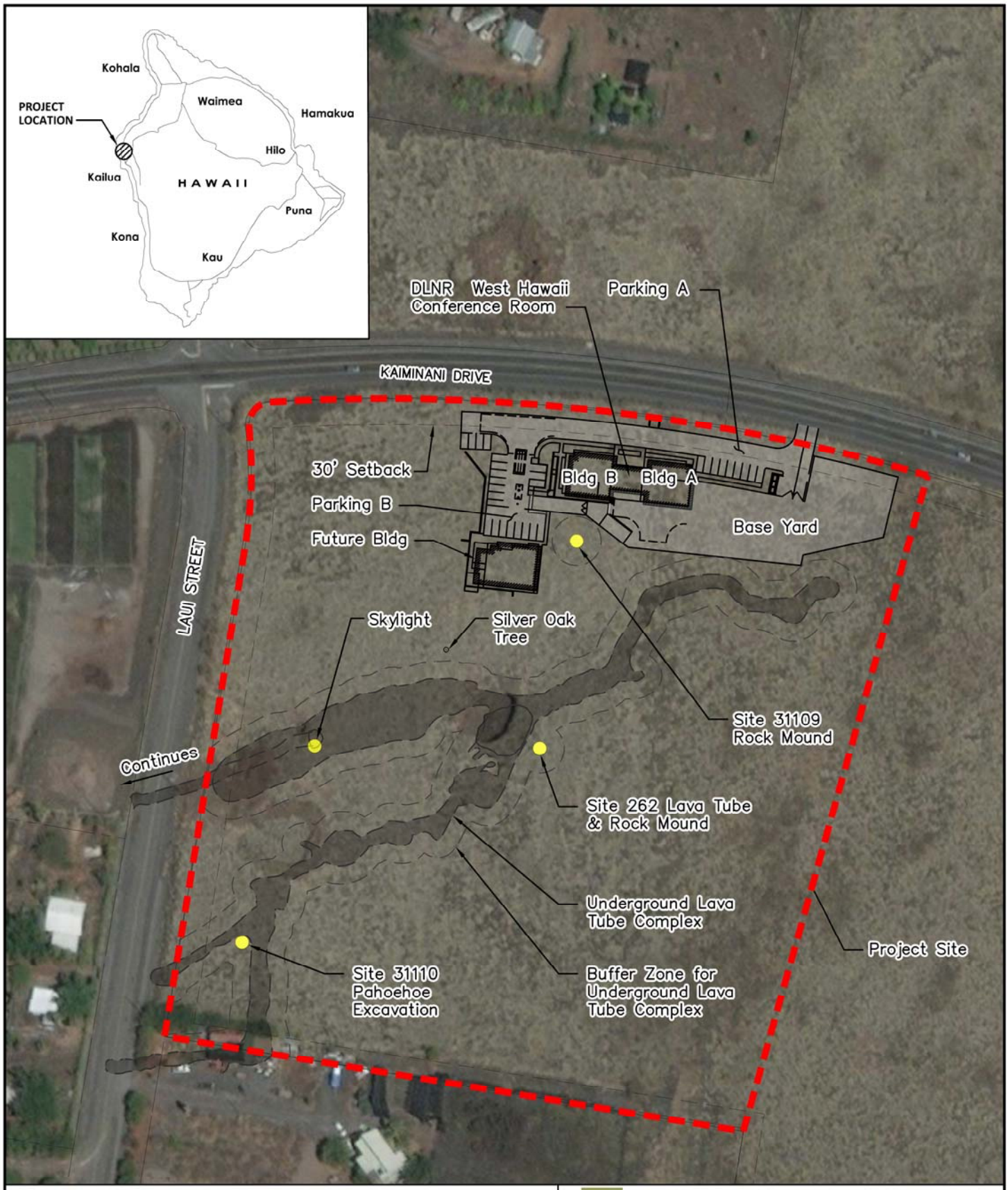
The larger project vicinity consisting of approximately 209-acres of state-owned land is described in the *Revised Environmental Impact Statement for Ke-ahole Agricultural Park, Island of Hawai'i* (M&E Pacific, Inc. 1977), which is hereby incorporated by reference. The agricultural park project included road construction and the installation of utility infrastructure for water, electricity and communication services. The vision for the Keāhole Agricultural Park was the creation of a farming environment for the cultivation of decorative plants, foliage, and other crops. The agricultural lots and utilities were adjusted to avoid disturbances to archaeological sites; the developed area consists of approximately 179 acres that have been subdivided into 34 leasehold lots. The project site is currently undeveloped and contains the archaeological sites previously mentioned in Section 1.3. Site Location and Description.

1.5. Technical Considerations

DLNR's proposed project provides the opportunity to house consolidated public services in a modern, energy efficient facility that conforms to the International Building Code (IBC), the applicable sections of the National Fire Protection Association (NFPA), the 2010 Americans with Disabilities Standards for Accessible Design, and related standards pertaining to life and safety. The undeveloped parcel requires on-site infrastructure and connections to existing utility systems that serve the project area.

The proposed facility will be generally oriented along Kaiminani Drive and includes internal circulation routes that connect the base yard and parking areas. A driveway along Kaiminani Drive will provide vehicular access to the proposed facility; no secondary access from Laui Street is proposed at this time. Approximately 30 personnel will have workspace in the proposed facility and occasional meetings may bring 10 additional people to the facility for a limited time. Field duties and different kinds of service-related interactions imply that staff and visitor numbers will most likely vary on a daily basis. Public areas within the proposed facility will be designed for interactions such as acquiring licenses and permits, consultations, bid openings, meetings and general inquiries. Figure 6 presents a conceptual site layout of the proposed facility, which includes the following elements and features:

- <u>Administration Buildings</u>. The office and administrative functions for DLNR's divisions will be housed within three, separate, but similar buildings that have the same structural system. The administration buildings will consist of less than 10,000 sf and contain offices, work areas, secure storage areas, a library for SHPD, and support spaces. A shared conference room will connect the first two administration buildings. The conference room may be utilized for agency functions such as regularly-scheduled board meetings, bid openings, consultations and staff training. SP will have warehouse space that is included within one administration building



NOTE:
The depiction of the underground lava tube complex includes information from a previous archaeological investigation by Hammatt and Folk (1988).

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DLNR Administration Facility in North Kona District
Site Plan of Proposed Improvements

FIGURE 6

SCALE: 1"=150'

DATE: January 2021

- Secured Base Yard. The proposed facility will have a secured base yard for government-owned property (e.g., equipment, tools, vehicles and vessels) and collected evidence including impounded vehicles. The base yard will include wash down stations equipped with hose bib, drainage systems and dry wells with filter media and oil/water separators. The public will not have access to the base yard for security and safety reasons. Site security will be achieved with chain-link fencing, gated access points and additional features (e.g., surveillance cameras).
- Parking Areas. Public parking areas will be aligned along the northern and western sides of the proposed facility. DLNR personnel are expected to utilize the parking areas located within secured access areas.

Three similar administration buildings will be sited at different elevations based on the topography of the project site. The proposed facility is expected to receive potable water service from the existing 20-inch municipal water line in Kaiminani Drive. Overhead power and communication lines are along Kaiminani Drive and across from the project site. The project includes the use of shading strategies, photo voltaic systems, and landscaping with native plants to the extent possible.

1.6. Environmental Considerations

The known pre-contact history of the West Hawaiʻi area includes numerous historic events pertaining to ruling chiefs and their extended families, and the Hawaiian Monarchy under Kamehameha I. DLNR's project will utilize undeveloped, state-owned land adjacent to the developed agricultural park and along Kaiminani Drive. The proposed facility discussed in this EA represents a public use on government land that does not affect population levels or the housing supply. DLNR's commitment with regards to the proposed facility is to balance the development of adequate facilities that support its operations and missions with environmental considerations.

Surveys of the project site were conducted in 2019 to identify biological resource considerations, historic properties, cultural practices and resources, and anticipated traffic impacts; these studies are appended to this EA. There are no concerns at the project site that pertain to biological resources. The conceptual layout of building elements incorporates intentional avoidance of a small silk oak tree (*Grevillea robusta*) that is growing within the project site. The conceptual site layout intentionally avoids historic properties including a rock mound, *pāhoehoe* excavations, and a lava tube habitation complex. Consultation with SHPD has occurred and will continue throughout the various phases of the project. Four (4) individuals shared accounts about activities in the project area such as travel and catching goats or donkeys. None of the respondents were aware of archaeological sites in the lava tubes because they did not visit or enter them. The project site is not utilized for ongoing cultural practices based on historical research and consultation responses (see Appendix D for the

cultural impact assessment). The results of the traffic impact analysis suggest that project-related traffic would not generate a need for off-site improvements.

The proposed facility will require connections to developed water, power and communications infrastructure in the project area. The proposed facility will utilize an on-site individual wastewater system (IWS) because municipal infrastructure and conveyance facilities in the vicinity of the project site are expected to remain limited for the foreseeable future. Construction activities associated with the proposed facility would generate short-term effects such as fugitive dust, noise, intermittent traffic, solid waste, and potential disruptions to utility services that would cease upon project completion. Anticipated short-term impacts will be mitigated to the extent practical with the use of appropriate construction techniques and Best Management Practices (BMPs). DLNR has designed its facility to reduce the overall visual impact to the landscape and to minimize anticipated impacts of development in the project area.

1.7. Project Schedule and Cost

The environmental review process, which includes publication and public review of the EA, may be concluded by in calendar year 2021. The final design phase and acquisition of necessary permits and approvals may be completed in 2022, whereby construction may be authorized to begin by the end of calendar year 2022. Funding opportunities and constraints may result in project completion through a phased multi-year approach for design and construction.

The estimated project cost is over $18 million; the timing and phasing of design and construction is expected to influence total costs. Design fees and the costs for anticipated permits and approvals are included in the estimate.

2. DESCRIPTION OF EXISTING ENVIRONMENT, PROJECT IMPACTS, AND MITIGATION

2.1. Climate, Air Quality and Airspace Considerations

The climate throughout the State of Hawaiʻi is generally characterized by mild temperatures with low daily and monthly variability, moderate humidity, persistent trade winds, and abundant sunshine. The Hawaiian climate is further characterized by a two-season year: the summer season from May through September is generally warmer and less wet than the cooler, winter season from October through April (Western Regional Climate Center, 2014). The project site is on the leeward side of the Island of Hawaiʻi, which is sunnier and drier than the windward side. The annual rainfall at the project site is less than 20 inches (Giambelluca, 2014). Average temperatures at the project site range from 70 degrees Fahrenheit in January to 77 degrees Fahrenheit in August (Ibid.). The apparent temperature is higher due to the combined effects of solar heating and high humidity. Strong winds are known to occur in connection with storm systems that disrupt climatic patterns.

Air pollutant sources in the project area include vehicular activity, industrial uses, aircraft operations, natural areas and/or agricultural sites. Ambient air quality at the project site may be influenced by non-stationary (or nonpoint) motor vehicle emissions along Kaiminani Drive and Laui Street. The Keāhole Power Plant that is approximately 0.5 miles north of the project site is a stationary source of industrial air pollutant emissions consisting primarily of sulfur dioxide and oxides of nitrogen. Aircraft operations have the potential to contribute emissions associated with fumes, smoke, odors, etc. Southwesterly winds bring volcanic haze (or vog) from Kīlauea, which had a major eruptive period from 1983 to 2018, into the project area on a periodic basis. Nighttime winds bring emissions to downslope areas whereas afternoon onshore winds carry emissions away and help to disperse airborne pollutants.

The letter dated February 21, 2020 from the State of Hawaiʻi Department of Transportation cites the requirement to submit Form 7460-1 Notice of Proposed Construction or Alteration to the Federal Aviation Administration (FAA) if construction or alteration is within 20,000 feet from a public use or military airport runway greater than 3,200 feet in length. Development and activities within five (5) miles from State of Hawaiʻi airports may require further review and permits pursuant to the guidance available from the Technical Assistance Memorandum.

<u>Impacts and Mitigation Measures</u>

The proposed facility incorporates energy conservation and sustainable design strategies, and includes landscaping that may help to reduce the heat-island effects from urban sites. No measurable adverse effect on climatic conditions is anticipated and no mitigation is proposed.

Ambient air quality at the project site will be temporarily affected by construction-related vehicles, equipment and activities that would generate fugitive dust and emissions. The construction contractor will be responsible for complying with HAR Title 11, Chapter 60, “Air Pollution Control.” The contractor will be responsible for the implementation of erosion and dust control measures as necessary for compliance with the above-mentioned rules. The dust control plan may incorporate but is not limited to the following measures:

- Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
- Providing an adequate water source at the site prior to start-up of construction activities;
- Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
- Minimizing dust from shoulders and access roads;
- Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
- Controlling dust from debris being hauled away from the project site. Also, controlling dust from daily operations of material being processed, stockpiled, and hauled to and from the facility.

Construction equipment and vehicles shall be properly maintained in order to control vehicular emissions. Said exhaust emissions are anticipated to have negligible impacts on air quality in the project vicinity since the carbon monoxide and nitrogen oxide emissions would be intermittent and readily dissipated.

Long-term, nonpoint air quality impacts will occur from motor vehicles driven by DLNR personnel from various locations in West Hawai‘i who would be relocated to the proposed facility. Since these people are already traveling in the project area, no significant impacts are anticipated from the project.

The proposed facility would not exceed the obstruction standards and would not pose a hazard to air navigation; thus, marking and lighting are not anticipated to be necessary for aviation safety. DLNR will file the required FAA Form 7460-1, which will result in a determination pertaining to the proposed facility.

2.3. Geology and Soils

The Island of Hawaiʻi is the largest and youngest island of the Hawaiian chain. The North Kona region encompasses basaltic lava flows from Hualālai, which is an active shield volcano that last erupted in 1801. The project site contains lava flows that emanated from Hualālai. The project site contains areas with organic material over lava that sustain grassland vegetation.

Soil classifications for the project area are shown in Figure 7. The predominant soil type at the project site is classified as Lava Flow - Honokōhau complex, 2 to 20 percent slopes according to the *Web Soil Survey* (U.S. Department of Agriculture, Natural Resources Conservation Service, n.d.). This map unit is characterized as well drained with low to moderately low permeability and high to very high runoff quality.

Impacts and Mitigation Measures

The proposed facility will be properly designed with respect to subsurface conditions and geotechnical concerns within the footprint of construction. Select areas of the project site will be improved for planned landscaping. Project actions are anticipated to have no adverse impacts on the underlying geology and soils at the project site such that no mitigation is proposed.

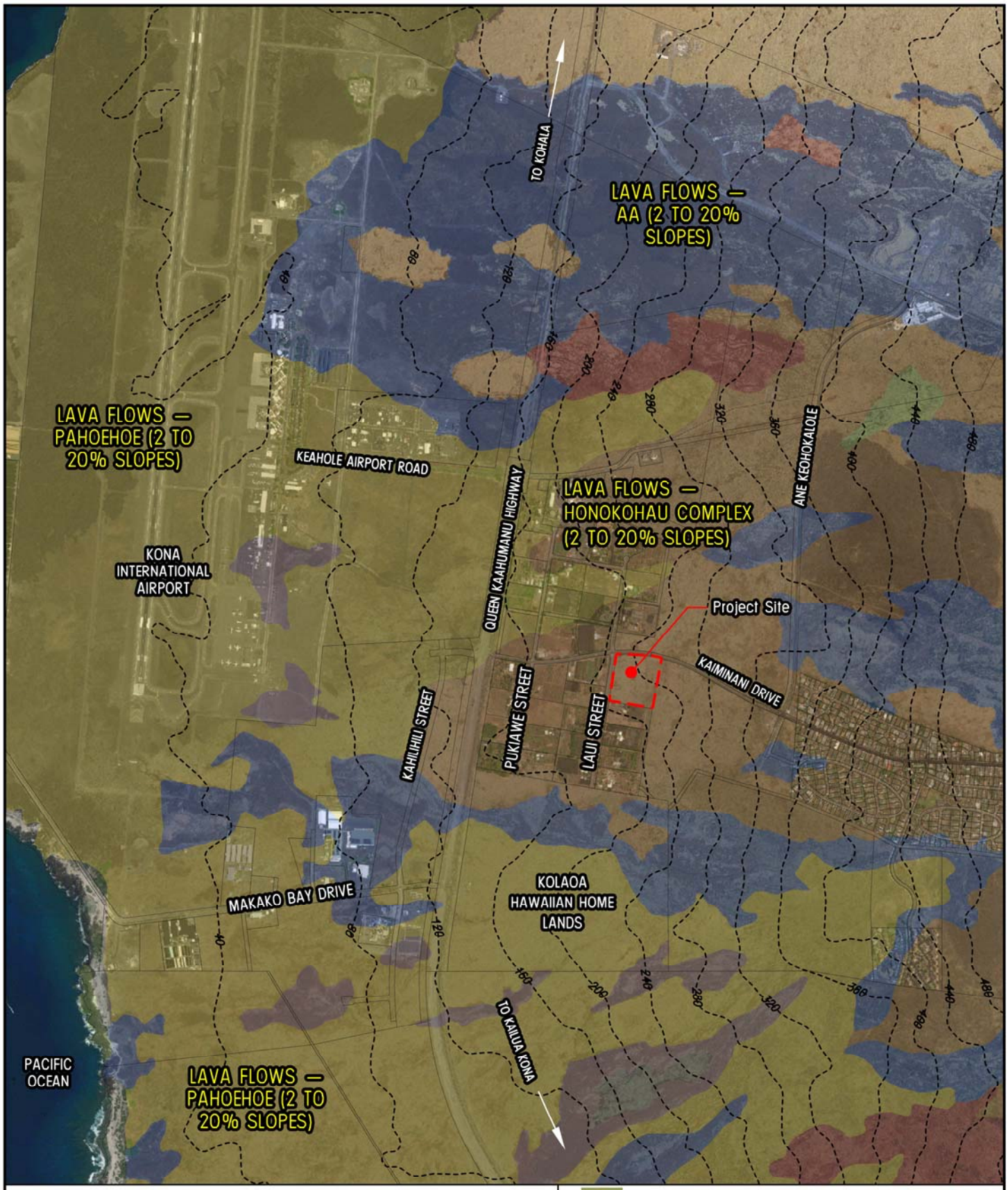
Earth disturbing activities may create exposed areas and surface-generated sediment that may enter the groundwater if significant rainfall occurs during grading. Mitigation that addresses drainage and sediment-laden runoff is discussed in Section 2.4, Water Resources. Areas affected by project actions will be stabilized and either paved or landscaped, which reduces the long-term potential for erosion and sediment transport. No graded areas will remain uncovered.

2.4. Topography

DLNR's parcel slopes west towards the Pacific Ocean and has reportedly experienced at least two distinct lava flow events from Hualālai. The project site is between approximately 200 to 245 feet above mean sea level (refer to Figure 7). Areas with organic material are present among the prehistoric lava flows, which allows for the growth of grassland vegetation within the project site.

Impacts and Mitigation Measures

DLNR's proposed project will transform an open area into a developed landscape of buildings, roads, utilities and other facilities that serve a public purpose. Project actions would generally retain the topographic profile for most of the site such that the proposed facility would consist of buildings located at



LEGEND

- LAVA FLOWS — PAHOEHOE (2 TO 20% SLOPES)
- LAVA FLOWS — AA (2 TO 20% SLOPES)
- LAVA FLOWS — HONOKOHAU COMPLEX (2 TO 20% SLOPES)
- LAVA FLOWS COMPLEX (2 TO 20% SLOPES)

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DLNR Administration Facility in North Kona District
SOILS AND TOPOGRAPHY

FIGURE 7

SCALE: 1"=2000'

DATE: January 2021

different elevations within the parcel. The conceptual design of structural elements intentionally avoids known features (e.g., the lava tube complex) and there are no obvious topographical obstructions within the design footprint. Areas that will be affected by project actions will be stabilized and either paved or landscaped. No graded areas will remain uncovered.

2.5. Water Resources

Four main categories of water resources are currently utilized on the Island of Hawaiʻi: ground water, surface water, rainwater catchment, and recycled water. The project site is located within the Keauhou Aquifer System Area (ASYA) that is part of the Hualālai Aquifer Sector Area (ASA). Current ground water withdrawals as calculated from actual pumpage data are below the *sustainable yield* for the Keauhou ASYA, which is 38 million gallons per day (MGD). *Sustainable yield* refers to "the quantity of water that can be extracted from an aquifer indefinitely without diminishing the quantity or quality of the water withdrawn" (State of Hawaiʻi, Department of Land and Natural Resources, Commission on Water Resource Management, 2008).

The Hawaiʻi County Department of Water Supply (DWS) revised the Keauhou section of its Water Use and Development Plan to update the allocation of water to land uses. The highest annual average yield for current ground water use data is calculated to be 14.86 MGD, which is 39.09 percent of the sustainable yield (Fukunaga and Associates, Inc., 2017). At this time, no land development projections to 2035 would produce ground water demand values that are 90 percent of the sustainable yield (Ibid.). DLNR will continue to consult with DWS about the water allocation and estimated daily water usage for the proposed facility.

Injection wells used for the subsurface disposal of wastewater, sewage effluent, or surface runoff are subject to State of Hawaiʻi, Department of Health (DOH) regulations and permitting under HAR Chapter 11-23 "Underground Injection Control." An Underground Injection Control (UIC) permit must be issued before any injection well operation occurs. The UIC line as determined by the DOH Safe Drinking Water Branch demarcates the boundary and associated restrictions that apply to areas with non-drinking water aquifers or underground sources of drinking water. Injection well activity is more restricted in areas above the UIC line to protect underground sources of drinking water from injected fluids that may contain chemical, physical, radioactive, and biological contamination. The project site is *makai* or below the UIC line, which indicates that the underlying groundwater is not considered a drinking water source. No injection wells are planned as part of DLNR's project at this time.

There are no freshwater streams, rivers, ponds or other open water bodies within the project site. Wetlands (or marshes, swamps, bogs, etc.) are also not present. Storm run-off from the project site flows in the direction of the existing grade and naturally percolates through the underlying lava flows.

The Kaloko-Honokōhau National Historical Park is roughly two miles south from the project site. The letter dated February 21, 2020 [Reference L7621 (2020-1)] from the U.S. Department of the Interior, National Park Service (NPS) states its commitment to protect Park resources and concern for the interconnected habitat and ecosystems in the area. Several specific concerns are mentioned since groundwater-dependent park resources (e.g., fishponds, anchialine pools, marine waters and coral reefs) provide habitat for culturally important and rare native aquatic species:

> *While the proposed project is not immediately adjacent to the Park, contaminants, water, air, fish, birds, insects, etc. move; and our coastal natural, biocultural and cultural resources in West Hawai'i are fragile.*
>
> *The proposed project is located in highly permeable lava with few accumulated soils. Rain and runoff carry pollutants quickly to groundwater, to coastal anchialine pools, and into the nearshore waters. Although average rainfall is ~20 inches per year, rainfall accumulation is typically concentrated in a few intense events that cause a pulse of pollution flushing to drainage systems, to the water table and into nearshore waters.*
>
> *For over a decade, Hawai'i County and the Hawai'i Land Use Commission have recognized the need to implement additional measures to control nonpoint source pollution flowing into the Park's inland and nearshore waters and surrounding areas (LUC Docket A00-732; COH Ord 02-114 and 04-110). Standard county, state and federal regulations for drainage wells (i.e., dry wells) are designed to address flood control but not to prevent polluted surface water runoff from impacting the inland and coastal waters.*

Coastal waters along the Kona shoreline have a marine water quality classification of Class AA. The DOH objective for Class AA waters is that these waters "remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from human-caused source or actions."

Nonpoint sources of pollution in the project area that are a recognized threat to coastal ecosystems include agricultural and urban activities that contribute runoff containing nitrogen, phosphorus, and/or sediments. Discharges of sediments and pollutants from industrial areas, sewage injection wells and defunct septic tanks may further contribute to harmful impacts including the growth of macroalgal blooms.

Impacts and Mitigation Measures

DLNR will continue to consult with DWS about the availability of water for the proposed facility. No significant impacts to surface water quality would occur because the project site is devoid of such resources including wetlands, perennial streams, or other sensitive riparian habitats. On-site water catchment

and the use of water efficient fixtures throughout the proposed facility may help to reduce the projected water demand. Dry wells with filter media and oil/water separators will be installed for the washdown area and all other paved areas to catch and treat runoff. The long-term use of the project site is not anticipated to result in contamination of the underlying aquifer and groundwater sources in the Keauhou ASYA.

A short-term and temporary impact of the project may occur from the generation of sediment-laden surface runoff during earth-disturbing activities, especially if heavy rains coincide with the activity. The construction contractor will be responsible for implementing a storm water management plan that prevents a concentration of runoff from flowing into neighboring areas. A National Pollutant Discharge Elimination System (NPDES) permit for discharges of pollutants, including storm water runoff (e.g., construction dewatering effluent) is required for the disturbance of one acre or more of total land area pursuant to HAR Title 11, Chapter 55, “Water Pollution Control” effective February 9, 2019. Earthwork and grading shall conform to Chapter 10 (Erosion and Sedimentation Control) of the Hawaiʻi County Code.

The proposed facility is intentionally sited away from the lava tube complex and associated cultural resources such that on-site discharges of runoff are expected to avoid these resources. The project will incorporate Low-Impact Development design practices and structural BMPs to control storm water, which may further reduce nonpoint source pollution concerns. No adverse impacts to water resources are anticipated after construction is completed.

2.6. Solid Waste and Hazardous Materials

The Puʻuanahulu West Hawaiʻi Sanitary Landfill in Waikōloa is approximately 17 miles northeast of the project site; recyclers divert recoverable material from the waste stream. The Solid Waste Recycling and Transfer Station in Kailua-Kona (Kealakehe) accepts household generated solid waste but no commercial or farm waste. Hawaiʻi County continues to explore waste reduction strategies including a waste-to-energy facility to avoid further landfill development. No solid waste is generated at the undeveloped project site while it is not utilized for any activities and there are no known threats pertaining to hazardous materials at the project site.

Impacts and Mitigation Measures

Construction activities at the project site would temporarily increase the volume of solid waste including construction debris that must be transported off-site for proper disposal. DLNR is expected to ensure that appropriate waste management and disposal practices are implemented by the construction contractor.

The proposed facility will require solid waste disposal service similar to what is available for similar kinds of developed facilities. The onsite trash collection dumpster will be accessible by the service vehicle. Waste material from normal operations will be collected and transported off-site by a service provider for proper disposal. No adverse impacts are anticipated.

2.7. Natural Hazards

Natural hazards that may threaten life and property on the Island of Hawaiʻi include tsunami inundation, tropical cyclones, earthquakes, volcanic activity, floods, drought, sea level rise, sustained high winds or strong wind gusts, landslides, rockfalls and wildfires. Recent earthquakes and wind damage from storms have resulted in power outages for extended periods in localized areas. Recent lava flows from the active Kīlauea volcano have destroyed built structures and covered roads, which jeopardized access for affected communities. The entire area of West Hawaiʻi is subject to varying degrees of natural hazards.

Tsunami Evacuation Zone maps for the State of Hawaiʻi identify low lying areas where excavation is recommended since extensive damage to life and property may occur from seismic sea waves. The Tsunami Evacuation Zone in the project area is *makai* or seaward of the Kona International Airport runways.

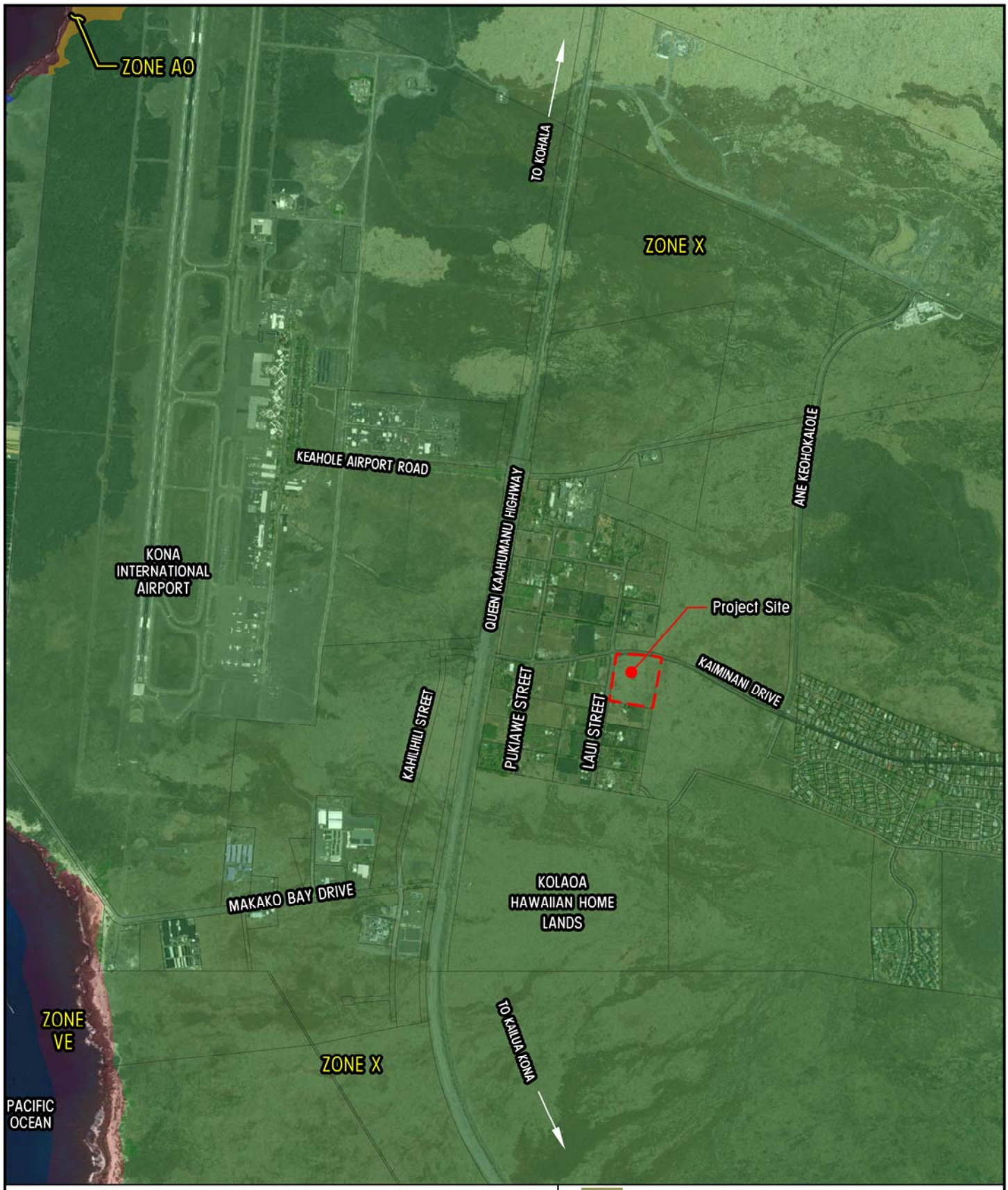
The project site is within Zone X according to the Flood Insurance Rate Map Panel No. 1551660707F for Hawaiʻi (effective date September 29, 2017) prepared by the Federal Emergency Management Agency. The Zone X designation refers to inundation areas of low-to-moderate risk that are outside the 0.2 percent annual chance (or 500-year) floods. Flood zone designations are shown in Figure 8.

Climate change and sea level rise may increase the dangers from flooding and storms. As depicted in the Hawaiʻi Sea Level Rise Viewer (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2021), no areas of the project site are within the sea level rise vulnerability zone (areas impacted by 3.2 feet of sea level rise).

There are no apparent rockfall hazards in the project vicinity. Threats from wildfires are unlikely but possible since the project site and nearby areas contain grassland. Drought conditions and high winds could exacerbate the fire hazard. Many wildfires are caused by human actions of an intentional nature or as a result of negligence.

Impacts and Mitigation Measures

The threats to humans and property from unpredictable natural events will always be present. Proposed activities at the project site would not affect the occurrence of naturally occurring hazards. DLNR's project is not expected to significantly increase the risks to human health or property.



LEGEND

- ZONE VE
- ZONE AO
- ZONE X

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DLNR Administration Facility in North Kona District
FLOOD ZONE

FIGURE 8

SCALE: 1"=2000'

DATE: January 2021

The proposed facility would not be subject to evacuation during a tsunami alert since it is outside of the tsunami zone. DLNR's personnel are expected to respond to man-made and natural disasters in accordance with the agency's disaster preparedness strategies, which include but are not limited to evacuation plans that consider the safety of staff and visitors in its facilities.

2.8. Floral and Faunal Resources

The undeveloped project site is within a geographic region that is noticeably changing due to urban growth. The West Hawaiʻi region contains vast natural resources including habitat for federal or State of Hawaiʻi listed species; however, the natural resources in the general project vicinity are sparse and there is no proposed or federally delineated critical habitat within or near DLNR's parcel at this time. No later than February 29, 2024, the U.S. Fish and Wildlife Service must issue its final determination concerning the designation of critical habitat for 14 endangered species on Hawaiʻi Island (Caulfield, 2020).

AECOS, Inc. conducted biological surveys of the project site in May 2019 and a separate survey of arthropods in September 2019. The survey area extended beyond the conceptualized footprint of the proposed facility and encompassed approximately 11 acres of DLNR's 79-acre parcel. No federal or State of Hawaiʻi listed species were detected at the project site. The report by AECOS, Inc. is included in Appendix B.

The moderate to dense cover of vegetation on old lava flows within the project site is described as grassland dominated by invasive fountain grass (*Cenchrus setaceus*, formerly *Pennisetum setaceum*). Fountain grass is a designated noxious weed that is reportedly pervasive on more than 200,000 acres of land on the Kona side of Hawaiʻi Island (State of Hawaiʻi, Hawaiʻi Invasive Species Council, 2020). The definition of a noxious weed from Chapter 152, HRS is "any plant species which is, or which may be likely to become, injurious, harmful, or deleterious to the agricultural, horticultural, aquacultural, or livestock industry of the State and to forest and recreational areas and conservation districts of the State, as determined and designated by the department from time to time." Several governmental agencies and partner organizations provide species information such as the following excerpt about fountain grass, which is from the Hawaiʻi Invasive Species Council website (Ibid.):

> *Originally introduced as an ornamental plant, fountain grass has become an aggressive habitat-invader. It degrades the quality of pasture lands, particularly in drier areas. Fountain grass is also fire-adapted and can sustain fires that spread quickly into adjacent areas. Its dried leaves increase the intensity of wildfires. After a fire it sprouts faster than native plants.*

Two species of plants considered to be native to and commonly found in the Hawaiian Islands were recorded: *‘uhaloa* (*Waltheria indica*) and *pili* (*Heteropogon contortus*). The *‘uhaloa* and *pili* represent 10 percent of the 20 flowering plant species identified by AECOS, Inc. Weedy, ruderal plants are mostly in the disturbed areas and along road edges, and the project site contains one small silk oak tree (*Grevillea robusta*).

No native invertebrates were observed in the lava tube system. Organic debris, which can provide important habitat for cave invertebrates, was observed to be sparse in the accessible segments of the lava tube complex. Root systems from existing vegetation do not extend into the caves and there is insufficient moisture to support a robust cave ecosystem. An endemic moth (*Tamsica hyacinthine*), which is not a cave species, flew into the cave entrance during the survey. *Tamsica* will feed on grass foliage such as *pili*. Existing *pili* and other grasses within the project site provide food resources and breeding habitat for *Tamsica* and a native moth (*Omiodes continuatalis*) that was not observed during the survey. The native moth was once common and widespread in the Hawaiian Islands; its dramatic decline over the last century is reportedly due to introduced parasitic wasps that attack the moth during its caterpillar stage.

The avian survey results include 14 alien species of birds and one endangered species of seabird. The biologists recorded no seabird resources within the surveyed area and two specimens of Black-necked Stilts (*Himantopus mexicanus knudseni*) that flew over the project site. The Black-necked Stilt is listed as endangered under both federal and State of Hawai‘i statutes.

The project site appears to be utilized or traversed by three species of terrestrial mammals: dogs (*Canis lupus familiaris*), mongoose (*Herpestes javanicus auropunctatus*) and goats (*Capra hircus*). Hawaiian hoary bats (*Lasiurus cinereus semotus*) were not detected during the biological surveys and there are no suitable roost trees within the project site. Based on available resources, the potential usage of the project site by Hawaiian hoary bats would be for incidental foraging.

Impacts and Mitigation Measures

DLNR’s project is not expected to displace any federal or State of Hawai‘i listed plants, birds or mammals since the project site is generally devoid of the important resources utilized by protected species. The conceptual site configuration of the proposed facility avoids the lone silk oak tree. The landscaping plan avoids the use of turf grass and will include drought-tolerant plants and other native plants found in the project area.

Site preparation work such as clearing and grubbing is expected to involve the necessary removal of onsite vegetation consisting primarily of invasive fountain grass. Centipedes, scorpions and black or brown widow spiders were not detected by the biologists from AECOS, Inc.; however, the project site contains

the habitat for these medically important species that will hide in dry grass or under rocks. The use of gloves, covered shoes, long sleeves and long pants to intentionally limit exposure area (e.g., pull socks up over pant cuffs, cover gaps between gloves openings and shirt cuffs) will greatly reduce the potential of accidental contact and bites. Supervisors should be aware of the anaphylactic reactions to venom that can pose a serious risk for some individuals. A suggested reference for additional information is *What Bit Me?* (Nishida and Tenorio, 1993).

People who are allergic to bee stings should inform their supervisor and carry their response kit since three (3) colonies of honey bees were breeding at the project site in deep pocket voids or bubbles in sinkhole walls. Bee colonies can be a potential hazard for people who traverse their flight path or engage in nearby activities that rouse the bees.

The project does not involve night work that would require artificial illumination. DLNR will consider suggested recommendations for site lighting to avoid or minimize adverse impacts to seabirds, including the endangered Black-necked Stilt (*Himantopus mexicanus knudseni*). Seabirds that were not detected during the biological field survey but are known to frequent the general project area include the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered Band-rumped Storm-Petrel (*Oceanaodroma castro*), and the threatened Newell's shearwater (*Puffinus newelli*). Permanent exterior lighting for the proposed facility will utilize shielded bulbs "to reduce the potential for interactions of nocturnally flying seabirds with man-made structures" and comply with Hawaiʻi County Code §14-50 *et seq*., which is about lowering ambient glare that is perceptible by the Mauna Kea observatories. The NPS recommends nighttime lighting that minimizes the impacts to nocturnal species and the natural visual character of the night. The following six principles of sustainable lighting were identified by the NPS:

- *Light only where it is needed*
- *Light only when it is needed*
- *Shield lights and direct them downward*
- *Use the minimum amount of light necessary*
- *Select lamps with warmer colors (less blue light)*
- *Select the most energy efficient lamps and fixtures*

2.9. Archaeological Resources

An archaeological inventory survey was conducted by SCS from May to June 2019; fieldwork included a pedestrian survey of a 10-acre portion of the project site according to the methodology described in the report by SCS (see Appendix C). The survey by SCS included investigations of one previously recorded refuge cave feature (Site #50-10-27-262) and two newly documented features (Site #50-10-27-31109, a rectangular rock mound and #50-10-27-31110, a group of pāhoehoe excavations). Written comments provided on April 12, 2020 mention petroglyph drawings in the project area and a lava tube that reportedly extends to the airport; however, it is not clear whether or not the comments refer to resources within DLNR's parcel. The summarized information from SCS's report (2020) pertains to the project area.

> The large area of West Hawai'i once contained small coastal villages during the pre-contact (before 1778) period. Abundant marine resources may have helped these villages thrive; however, the initial habitation sites appear to have been utilized on a seasonal basis and may have been associated with fishing and some limited horticulture. Permanent habitation in shoreline areas may have been possible among inhabitants who had kinship within the *ahupua'a* that allowed for an exchange system with the inhabitants of permanent communities in fertile upland areas.
>
> The project site is located below 300 feet above mean sea level (amsl) and within an arid barren zone that was not utilized for permanent habitation according to available archaeological evidence. Archival research conducted prior to the commencement of fieldwork suggested that the project area would likely contain a few, if any, rock mound markers, pāhoehoe excavations, cave and sink temporary habitation features, petroglyphs and temporary habitation enclosure features.
>
> SCS's archaeologists re-examined previous detailed documentation such as the Hammatt and Folk (1980) plan view maps of the lava tube habitation complex and refuge cave that contains two burials (Site 262). There is a sink, which is a collapsed portion of a lava tube, located near the center of the project site at an elevation between 200 and 220 feet amsl; this sink provides access to three lava tubes that extend outward to the north, south and west. A wall of large boulders restricts the openings to the south and west lava tubes. Along the west lava tube, the documented skylight is the result of a partial collapse that has blocked the passageway. There is evidence at Site 262 of three distinct phases of use: (1) the petroglyph phase, (2) the domestic occupation phase, and (3) the refuge phase. The field investigation by SCS's archaeologists contributes further details about Site 262 such as the entire lengths of the north and south tubes and ceiling heights.
>
> Two new archaeological sites were recorded by SCS: a rectangular rock mound located in the northeast quadrant of the project site at an elevation of

> 225 feet amsl (Site 31109); and a group of pāhoehoe excavations located in the southwest quadrant at 205 feet amsl (Site 31110). No artifacts were found in the excavated test unit of Site 31109, and the feature may have served as a location marker based on its form and construction. Site 31110 consists of three areas where excavations in the level pāhoehoe lava surface occurred. There are pieces of slabby pāhoehoe on the ground surface and within the excavation pits.

All of the historic properties are considered to be significant based on Hawai‘i Register criterion d (it must have yielded or may be likely to yield, information important in prehistory or history). Site 262 is also significant based on criterion a (it must be associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property) and criterion e (have important value to native Hawaiian people or other ethnicities in the state, due to associations with cultural practices and traditional beliefs that were, or still are, carried out). The following excerpts from SCS's report (2020) pertain to the assessed significance of Sites 31109, 31110 and 262:

> *Sites 31109 and 31110 are significant under criterion d as they contain information important to pre-history and history. Site 31109 is significant as it contains information important to either pre-Contact era refuge cave transportation markers or Historic era survey methods.*
>
> *Site 262 contains information important to the construction and use refuge caves during periods of increased warfare (criterion a and d). The habitation component, the petroglyphs and the burials at Site 262 are significant for their importance to the Hawaiian people (criterion e).*

Data collected by SCS resulted in the documentation and determinations pertaining to the function and age of Sites 262, 31109 and 31110. No further work is recommended for Sites 31109 and 31110. Site 262 is recommended for preservation in-place, which would be accomplished through avoidance and protection.

Impacts and Mitigation Measures

DLNR's proposed facility, which will serve a public purpose, is intentionally sited to avoid Sites 31109, 31110 and Site 262. Potential impacts to the known archaeological features within the project site would be indirect. The determination for DLNR's project is "effect, with proposed mitigation commitments" pursuant to HAR §13-275-7. An Archaeological Preservation Plan for the archaeological features at Site 262 and a Burial Treatment Plan for the burials at Site 262 will provide more specificity with regards to mitigation

measures. Consultation with SHPD has occurred and will continue as the project proceeds through the various stages of design and construction. For example, SHPD was consulted since DLNR's archeologists with SP will provide archaeological monitoring during the anticipated cave survey and geotechnical exploration that will provide necessary data and information for project design and mitigation.

In the event of an inadvertent discovery of historic remains or other potentially significant subsurface resources during the various phases of construction (e.g., excavation and trenching), the contractor will be required to halt construction activities in the vicinity of the find and to immediately notify SHPD of the discovery.

2.10. Cultural Practices and Resources

The information about cultural practices from archival and documentary research, and the findings from previous archaeological investigations suggests that the barren zone where the project site is located was not utilized as a permanent habitation zone at any time in history. The known history of Hawaiian burial practices includes interment in lava tubes, in graves constructed in the ground, under the stone foundation of homes, or under rock-paved terraces. Burial locations may be kept secret to honor a sacred responsibility by family members to protect *iwi kupuna*. A modern practice involves making burial locations known to the Hawaiʻi Island Burial Council (HIBC) to allow HIBC and SHPD to assist cultural and lineal descendants with preservation.

The cultural impact assessment conducted by SCS for the proposed project is included in Appendix D. Summarized information from SCS's report (2020) was previously discussed in Section 1.4 Historical Setting. SCS consulted the Office of Hawaiian Affairs (OHA), SHPD, families associated with Kalaoa Ahupuaʻa and long-time Kona residents who have considerable knowledge of Kona history and cultural practices; public notices were published in OHA's Ka Wai Ola, the Honolulu StarAdvertiser and the Hawaiʻi Tribune Herald. The effort by SCS resulted in responses from four (4) individuals. The following characterization of the project area, which is not currently utilized for ongoing cultural practices based on historical research and consultation responses, is stated by SCS in its report: "the project area was used for travel, resource extraction, as a refuge cave area in times of warfare, and for habitation in the pre-Contact to early post-Contact eras."

SCS noted in its report that respondents including a *kūpuna* (elder) from Kona did not know of any past or ongoing cultural practices conducted in the project area. The respondents shared accounts of catching goats or donkeys that would rest in the lava tube sinks. According to the stories told to respondents by older members of their *ʻohana*, the history and use of project area lands includes travel through the area to reach upland homes and gardens or coastal fish ponds, fishing areas and temporary

residences. No respondents were aware of archaeological sites in the lava tubes because they did not visit or enter them.

Impacts and Mitigation Measures

The lava tube habitation complex and refuge cave (Site 262) will be preserved in place, which is intended to provide impact avoidance and resource protection. The conceptual design of the proposed facility intentionally avoids known resources to achieve the preservation of historic sites and features that were identified in the archaeological inventory survey. The following excerpt is from SCS's cultural impact assessment report (2020):

> *Based on the results of an archaeological inventory survey (Escott 2019) of the project area, the results of previous archaeological studies, as well as organizational response, individual cultural informant responses, and archival research, cultural practices identified within the project area and wider region are associated with burials, refuge during times of warfare and the petroglyphs, all located within the Site #50-10-27-262 lava tube. The entire lava tube site will be preserved in place (avoidance and protection) in accordance with an archaeological preservation plan and a burial treatment plan to be written. The burial treatment plan preservation treatments will be determined through consultation with the Hawai'i Island Burial Council (HIBC) and recognized descendants.*
>
> *Whereas SHPD will preserve and protect the Site #50-10-27-262 lava tube and will not restrict access to recognized descendants, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by proposed development activities on this parcel. The proposed undertaking will not produce adverse effects to any native Hawaiian cultural practices within the project area or in the broader region.*

DLNR's project represents a long-term commitment to provide facilities for several divisions tasked with protecting natural and cultural resources. The presence of DLNR at its proposed facility in West Hawai'i helps to ensure that resource protection activities in the area will continue to be supported for the foreseeable future.

2.11. Visual Resources

The vast expanse of barren lava flows and long natural grade in the project area contributes to a characteristic sense of openness and space. Landform alterations in

the project area are in concentrated locations such as at the Kona International Airport and in developed areas along primary travel routes. Existing agricultural park development is adjacent to the project site and generally extends from the parcels along Laui Street to Queen Ka‘ahumanu Highway. Public views of the coastline from the project vicinity are mostly unobstructed. Invasive fountain grass on the lava flows within the project site contribute to the visual characteristics of a featureless expanse of grassland. Photographs of the project site are included in Appendix A.

Impacts and Mitigation Measures

The proposed facility will contribute building elements and landforms along Kaiminani Drive that are generally in keeping with existing development patterns and building elements in the surrounding area. Landscaping within the project site will buffer or soften the visual impact of the proposed facility, which is designed to have a reduced development footprint. Views of the completed project from Kaiminani Drive will consist primarily of the low-sloped roof. Visual impacts will be further mitigated by design choices such as the use of earth tone finishes and the siting of buildings that utilize the different elevations within the parcel. Conceptual renderings of the proposed facility are provided in Appendix A.

2.12. Noise

The project site is located within a developing urban area that contains vital facilities (e.g., Kona International Airport) and important natural and cultural resource areas (e.g., Kaloko-Honokōhau National Historic Park). The primary noise sources that characterize the soundscape at the project site include vehicular traffic along Kaiminani Drive and Laui Street. Low background noise in the vicinity of the project site is generally influenced by natural sounds from undeveloped areas and the sounds associated with human activities that emanate from developed areas and established travel routes. Existing agricultural endeavors near the project site also contribute to ambient noise levels. The letter dated February 21, 2020 from the State of Hawai‘i Department of Transportation (DOT), Airports Division indicates that the project site lies outside the commonly utilized flight paths to and from Kona International Airport and is “outside the 55 DNL (Day-Night Average Noise Level) noise contour, however, the area of the proposed development may be subject to single occurrence noise events from flight operations at the airport.” The activities of DLNR’s divisions currently contribute to the soundscape in the project area since traveling personnel contribute human activity along established vehicular routes as part of normal operations.

Impacts and Mitigation Measures

Audible noise from demolition and construction activity is expected to be intermittent and unavoidable since construction vehicles, heavy equipment and

impact tools generate noise as part of normal operations. The mitigation of noisy activities to inaudible levels will not be practical in all cases due to the intensity and exterior nature of the work. Ambient noise levels in the vicinity of the project site will therefore increase during construction periods. Quieter construction activities, such as building erection and equipment installation, may not be audible. Construction noise is temporary in nature and will cease upon completion of the project.

Project activities shall comply with the provisions of HAR Title 11, Chapter 46, "Community Noise Control." The noise regulations require a noise permit if the noise level from construction activity is expected to exceed allowable levels stated in the Chapter 11-46 rules. It shall be the contractor's responsibility to minimize noise by properly maintaining noise mufflers and other noise-attenuating equipment and to maintain noise levels within regulatory limits. If construction activities occur outside of the allowable timeframes designated for the noise permit (i.e., nighttime, Sunday, holiday) and exceed allowable noise levels, a noise variance must be obtained prior to commencement of construction activities, as required. The construction contractor will obtain the appropriate permit or approvals (e.g., Notice of Intent to Construct, Community Noise Permit, or Noise Variance). DLNR will ensure that the contractor complies with all permit conditions. Potential noise impacts will also be mitigated by performing the majority of construction work during daytime hours (as opposed to night work), thereby avoiding the creation of construction noise impacts during the quieter nighttime hours.

The activities of DLNR's divisions will continue to contribute to the soundscape of the project area. The proposed facility is not expected to be a significant source of new background noise since normal operational activities are generally associated with low volumes of local vehicle movement at various times. Landscaping within the project site may help to reduce or buffer the sounds from human activities.

2.13. Site Access, Circulation and Traffic

The roadway network in the project vicinity was expanded during the development of the Keahole agricultural lots. There are no planned regional centers, neighborhoods, transit hubs or transit stations near the project site according to Figure 4-2a Official Transportation Network Map: Proposed Roads and Transit Facilities in the *Kona Community Development Plan*. The project site is located near the unsignalized Laui Street and Kaiminani Drive intersection. Laui Street is a two-lane local roadway less than one mile in length that intersects Kaiminani Drive, which is a 3.6-mile, undivided, two-lane, connector roadway between Mamalahoa Highway (State Route 190) and Queen Ka'ahumanu Highway (State Route 19). Kaiminani Drive serves as a primary corridor between Kona International Airport and the Kalaoa residential neighborhood

that spans the area between Ane Keohokālole Highway and Mamalahoa Highway. The posted speed limit for Kaiminani Drive is 45 miles per hour (mph) in the project vicinity and is 35 mph through most of the Kalaoa residential neighborhood. Both Kaiminani Drive and Laui Street are under the jurisdiction of the County of Hawaiʻi.

The County of Hawaiʻi provides bus services along Queen Kaʻahumanu Highway including routes identified as "North Kohala/Waimea/Kailua-Kona," "Intra-Kona" and "Pahala/Kona/South Kohala." There are no bus routes that utilize Kaiminani Drive and there are no designated sidewalks or bike lanes along Kaiminani Drive. There is bicycle traffic along the wide shoulders of Queen Kaʻahumanu Highway, which serves as a training route and race route for the annual Iron Man Triathalon. The Kaiminani Drive and Queen Kaʻahumanu Highway intersection is signalized and there are dedicated left turns for all approaches. The posted speed limit for Queen Kaʻahumanu Highway varies between 45 to 55 mph.

Appendix E contains the traffic impact assessment report (TIAR) that was prepared by SSFM International to evaluate existing (2019) and future (2026) conditions. The level-of-service (LOS) for signalized and unsignalized intersections in the project area were deemed to be appropriate, although some turning movements operated poorly during the morning peak hour of 6:30 a.m. to 7:30 a.m. DLNR personnel traverse roadways in the project area as part of normal operations since several divisions have existing offices, base yards, enforcement functions or other responsibilities in West Hawaiʻi locations.

The TIAR considered modest growth and further master planned development in the immediately surrounding area (e.g., the mixed-use community of Palamanui). Future conditions without DLNR's project are projected to result in appropriate intersection LOS, although some turning movements are anticipated to continue to operate poorly. The volume to capacity ratios remained low, which reflects sufficient capacity in the analysis of future scenarios.

Impacts and Mitigation Measures

The proposed facility is designed for primary vehicular access and egress from Kaiminani Drive. The primary driveway off of Kaiminani Drive will be approximately 420 feet east of the intersection with Laui Street. Internal circulation routes will connect the parking areas and the base yard, which will be secured with gates and fencing to prevent unauthorized entry. Written comments provided on April 12, 2020 mention concerns about the proposed access and egress from Kaiminani Drive:

> *Kaiminani Drive is a busy road in the morning with vehicles speeding down that road. At certain times of the year the sun is very bright going*

> *up and in driver's eyes. There are several landscaping business [sic] that use the road way for their employee vehicle parking causing addition [sic] traffic entering Kaiminani from the south side.*

Queen Ka'ahumanu Highway and Kaiminani Drive will be utilized for the transportation of equipment and material to the project site. Disruptions to vehicular, bicycle and pedestrian traffic during the various phases of construction will be intermittent and temporary in nature. Bus routes and bus stops along Queen Ka'ahumanu Highway are not expected to be impacted by DLNR's project. The transport of oversized and/or overweight materials and equipment on State highway facilities requires a permit from DOT. It will be determined during the design phase whether the operation or transportation of any oversized and/or overweight vehicles and loads will be required during construction.

Traffic control along Kaiminani Drive and Laui Street in the vicinity of the project site will be directed by construction personnel or by law enforcement personnel, when necessary. The majority of construction work and the moving of heavy equipment or construction-related supplies will be scheduled during daytime hours (as opposed to night work). At night and when work is not occurring, all associated construction equipment will be secured and appropriately sited to prevent obstructions to traffic. The temporary increase in traffic due to construction vehicles and equipment accessing the project site will cease upon project completion.

A new driveway for the project site must be approved by the County of Hawai'i. All work within the County right-of-way shall conform to Chapter 22 (County Streets) of the Hawai'i County Code. Coordination and consultation with DOT and the County of Hawai'i will be conducted by the project representative and/or the construction contractor as a requirement for acquiring the necessary project approvals and permits. DLNR personnel will continue to traverse roadways in the project area in the foreseeable future as part of normal operations. Vehicular travel by DLNR personnel will occur at various times due to the nature of operational activities, which includes responding to unplanned situations involving protected resources.

The TIAR evaluated future (2026) conditions with DLNR's proposed facility and determined that some turning movements would continue to operate poorly. The findings in the TIAR indicate that there would be a negligible change to the LOS and volume to capacity ratios as a result of project-related traffic; therefore, no mitigation is recommended or considered to be warranted.

2.14. Utilities (Water, Wastewater, Drainage)

The Keahole Agricultural Park development resulted in the installation of water system infrastructure to County standards. The undeveloped project site receives no utility service at this time but is located within an area served by the existing municipal water system. Potable water service to the existing agricultural lots is from an existing 20-inch waterline along Kaiminani Drive and a 12-inch waterline along Laui Street. DLNR's water allocation requires an approval from the Hawaiʻi County Department of Water Supply (DWS) since it administers and operates the potable water system. The letter from DWS dated February 18, 2020 indicates that the parcel is allocated one (1) unit of water from the previous subdivision action (SUB-06-000301), which is equal to an average daily water usage of 400 gallons per day (gpd). A recommendation from DWS is to utilize rainwater catchment, reclaimed or reuse water instead of potable water for landscape irrigation purposes at the proposed facility.

Hawaiʻi County's domestic wastewater collection and treatment facilities are administered by the Department of Environmental Management (DEM). There are no municipal sewer facilities in the vicinity of the project site; the nearest municipal infrastructure that collects and conveys wastewater to the Kealakehe WWTP is located along Queen Kaʻahumanu Highway.

No storm drain system was installed during the development of the agricultural lots subdivision. Currently, there is no storm drain system in the vicinity of the project site.

Impacts and Mitigation Measures

Project actions require the installation of on-site utility distribution systems, fire protection infrastructure (e.g., hydrants, fire sprinkler laterals) and irrigation systems for on-site landscaping. Utility services may be disrupted during periods of work; however, this impact is expected to be short-term and temporary. There are no long-term impacts associated with establishing new utility connections to the proposed facility that may house DLNR personnel including some staff who have various field duties that will require them to be away from the facility at undetermined intervals. There will be various kinds of interactions with constituents, contractors and the public whereby staff and visitor numbers at the proposed facility may vary on a daily basis.

The projected water demand for the proposed facility with an assumption of once-per-day or twice-per-day irrigation of landscape plants is between 4,170 to 4,720 gpd, respectively. The water allocation for the parcel (1 unit or an average daily water usage of 400 gpd) is expected to be sufficient for the initial phase of development. DLNR will explore options to reduce the demand for potable water such as utilizing trucks to transport non-potable water from underutilized state-owned wells to supply on-site water reservoirs for

landscape irrigation and fire protection purposes. On-site water catchment and the use of water efficient fixtures may further help to reduce the potable water demand for the proposed facility. All necessary improvements for potable water service will be coordinated with DWS. The final decision by DWS with regards to the availability of water will be confirmed when the building permit application is submitted for approval. The civil drawings will be reviewed by the Hawai‘i County Fire Department when the building permit application is submitted for approval to ensure that fire department access, water supply for on-site fire protection, and life safety requirements are met. The project site is not connected to recycled water infrastructure and there are no plans to transport recycled water to the project site for non-potable uses at this time. Various stakeholders including DOH and DWS will be consulted if recycled water is considered feasible for non-potable uses at the proposed facility.

Proposed wastewater plans and systems shall conform to applicable provisions of HAR, Title 11, Chapter 62, “Wastewater Systems.” The proposed facility will utilize an on-site IWS because municipal infrastructure and conveyance facilities are expected to remain limited in the project area for the foreseeable future. An on-site IWS consisting of a septic tank system with aerobic treatment is a decentralized wastewater system that provides treatment close to the generating source. Adequately managed on-site wastewater treatment systems can be designed to achieve public health and safety objectives for small volumes of domestic wastewater. All necessary improvements for municipal wastewater service will be coordinated with DEM prior to the building permit application process. The average day sewer demand is estimated at 5,280 gpd.

DLNR’s project is expected to increase drainage flows due to the addition of impervious surfaces such as paved roadways, parking lots, and other built areas at the project site. The proposed facility will include passive landscaping, and drain inlets with drywells to enhance stormwater retention and minimize runoff. Dry wells with filter media and oil/water separators will be installed for the washdown area and all other paved areas to catch and treat runoff. The site drainage plan will comply with applicable Hawai‘i County Department of Public Works (DPW) drainage standards. The resulting drainage flows leaving the site must not exceed pre-development drainage flows per DPW’s requirements.

A short-term and temporary impact of the project would occur from the generation of sediment-laden surface runoff during construction work. BMPs will be incorporated into a storm water management plan. Appropriate erosion control BMPs will be used to minimize the amount of sediment transported in stormwater runoff during construction activities. All construction activities will

comply with applicable Federal, State and County regulations and rules for erosion control as previously discussed in Section 2.4, Water Resources. DLNR's completed facility will increase impervious surfaces associated with paved roadways, parking lots and buildings within the project site; however, this anticipated impact will be offset by incorporating design methods that reduce storm water runoff from the site. Passive landscaping, drain inlets and drywells for roof runoff and AC condensation will be utilized to keep drainage flows that leave the site at pre-development volumes. All drainage features will comply with applicable DPW drainage standards.

2.15. Power and Communications

The project area receives electrical power and communications service via overhead lines along Kaiminani Drive and Laui Street. The undeveloped project site does not require or receive power or communications service. The Hawaiian Electric Light Company, Inc. (HELCO) is the electrical power service provider for the project area. Hawaiian Telcom and Spectrum provide communications services in the project area.

Impacts and Mitigation Measures

Proposed construction activity has the potential to disrupt power and communication systems in the vicinity of the project site but these effects are expected to be short-term and temporary. DLNR's project will be coordinated with HELCO, Hawaiian Telcom and other service providers as needed. There are no long-term impacts associated with establishing new service connections. The project will incorporate sustainable building design concepts and energy efficient features.

2.16. Socio-Economic Characteristics

The County of Hawaiʻi has identified the West Hawaiʻi planning region as an area that can support directed urban growth. For the foreseeable future, additional public facilities and infrastructure improvements are expected to foster transit-oriented development within existing urban areas between Kona International Airport to Keauhou on the *makai* side of Mamalahoa Highway. The project site is located within the North Kona area of West Hawaiʻi, which is expected to continue to grow because there is ample potential for expansion of the housing stock and commercial centers in this area.

In 2010, the North Kona region had a resident population of 37,875 inhabitants, which represented approximately 20 percent of the Hawaiʻi Island population of 185,079 inhabitants (State of Hawaiʻi Department of Business, Economic Development and Tourism, 2019). The resident population projection for Hawaiʻi County for 2016 was 198,449 and the annual growth rate for 2010 to 2016 was 1.1 percent; the growth of

the resident population is due to natural increase (birth less death), net in-migration from international locations and Puerto Rico, and net in-migration from other states or other counties in the State of Hawaiʻi (Ibid.).

The public schools that are closest to the project site are Kealakehe Elementary School, Kealakehe Intermediate School, West Hawaiʻi Explorations Academy Public Charter School (for sixth through twelfth grade) and Kealakehe High School. Kealakehe Elementary School is the furthest school and is located more than 8 miles away from the project site.

Impacts and Mitigation Measures

The proposed project is intended to enhance the service capabilities of DLNR and is not expected to affect population levels, housing or schools. The various phases of construction will create short-term jobs for people in design and construction. DLNR's project is expected to be a relatively insignificant source of new full-time employment opportunities in West Hawaiʻi for the foreseeable future.

2.17. Emergency Service Facilities and Shelters

Law enforcement is provided by the County of Hawaiʻi Police Department. The Kona Station is located south of Honokōhau Harbor and near the Solid Waste Recycling and Transfer Station. The police station in Kona, which serves the Kona District, is approximately 5 miles from the project site. A mini police station is located in Kailua Village, which is approximately 8 miles from the project site.

Fire protection services are provided by the County of Hawaiʻi Fire Department. The Kailua-Kona Fire Station near the intersection of Palani Road and Queen Kaʻahumanu Highway is approximately 8 miles from the project site. A volunteer fire station near the intersection of Kaiminani Drive and Ane Keohokālole Highway is roughly 0.5 miles from the project site. There are fire hydrants on Kaiminani Drive and Laui Street in the vicinity of the project site.

Emergency service providers include critical care providers such as hospitals and clinics. The Kona Community Hospital, which is a full-service acute care provider with 24-hour emergency services, is approximately 18 miles south of the project site. No emergency services are available from the Kaiser Permanente Kona Medical Office, the Queen's Health Care Center in Kona, and the West Hawaiʻi Community Health Center, which are approximately 5 miles, 7 miles, and 10 miles south of the project site, respectively.

The Kealakehe Elementary, Intermediate and High Schools are the pre-identified public hurricane shelters in the North Kona District that are closest to the project site.

During past emergency events, Hawaiʻi County indicated that its designated shelters could provide limited support to persons with special health needs.

Impacts and Mitigation Measures

No significant adverse impacts to police, fire, medical or emergency shelter services will occur from the completion of the proposed facility. The installation of new fire hydrants will be coordinated with DWS. The civil drawings will be reviewed when the building permit application is submitted for approval to ensure that fire department access, water supply for on-site fire protection, and life safety requirements are met. The proposed facility is located far from the Tsunami Evacuation Zone and would not need to be evacuated during an emergency event.

2.18. Recreational Resources

DLNR has jurisdiction over state parks; historical sites; forests and forest reserves; aquatic sanctuaries; public fishing areas; boating, ocean recreation, and coastal programs; wildlife sanctuaries; game management areas; public hunting areas; and natural area reserves. The County of Hawaiʻi Department of Parks and Recreation operates and maintains County park facilities. Notable recreational resources in the project area include the Kaloko-Honokōhau National Historic Park, Honokōhau Bay and Honokōhau Harbor.

Other public parks in the project area include the Old Kona Airport State Recreation Area. The County of Hawaiʻi manages the facilities at this park including the baseball and soccer fields, the Kona Community Aquatic Center, and Kekuaokalani Gym.

Impacts and Mitigation Measures

The proposed project creates no additional demand for recreational facilities such that no mitigation is warranted. Project actions are expected to have no adverse impact on recreational resources. The proposed project represents the continued presence of DLNR in the West Hawaiʻi region.

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3. RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

3.1. State Land Use District

The State Land Use Law (Chapter 205, HRS) is intended to preserve, protect, and encourage the development of lands in the State for uses which are best suited to the public health and welfare for Hawaiʻi's people. All lands in the State are classified into four land use districts by the State of Hawaiʻi, Land Use Commission: Urban, Agricultural, Conservation, and Rural. Residential neighborhoods, commercial enterprises, industrial development, and community facilities such as public buildings are typically found in Urban Districts, which may include reserve areas for foreseeable urban growth. DLNR's parcel is entirely within the Urban District. The proposed facility is a permitted use within the Urban District.

3.2. Hawaiʻi State Plan

The Hawaiʻi State Plan (Chapter 226, HRS) outlines broad goals, policies and objectives to serve as guidelines for the future growth and development of the State. The excerpts below are pertinent Hawaiʻi State Plan objectives, policies, and priority guidelines that pertain to the proposed project in West Hawaiʻi.

> *§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.*
>
> *(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:*
>
> *(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.*
>
> *(2) Effective protection of Hawaii's unique and fragile environmental resources.*
>
> *(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:*
>
> *(3) Take into account the physical attributes of areas when planning and designing activities and facilities.*
>
> *(8) Pursue compatible relationships among activities, facilities, and natural resources.*
>
> *§226-13 Objectives and policies for the physical environment--land, air, and water quality.*
>
> *(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:*
>
> *(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.*
>
> *(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:*
>
> *(2) Promote the proper management of Hawaii's land and water resources.*

(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.
(7) Encourage urban developments in close proximity to existing services and facilities.

§226-14 Objective and policies for facility systems--in general.
(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.
(b) To achieve the general facility systems objective, it shall be the policy of this State to:
(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.
(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.

§226-25 Objectives and policies for socio cultural advancement--culture.
(a) Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawaii's people.
(b) To achieve the culture objective, it shall be the policy of this State to:
(1) Foster increased knowledge and understanding of Hawaii's ethnic and cultural heritages and the history of Hawaii.

§226-27 Objectives and policies for socio cultural advancement – government.
(a) Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:
(1) Efficient, effective, and responsive government services at all levels in the State.
(b) To achieve the government objectives, it shall be the policy of this State to:
(1) Provide for necessary public goods and services not assumed by the private sector.
(5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.

The project as described in this EA will utilize limited government resources in support of the identified objectives and policies from the Hawaiʻi State Plan that pertain to physical environment, facility systems and socio-cultural advancement. The proposed facility will be utilized by the various divisions of DLNR that provide government services such as resource management, protection and conservation that are not provided by the private sector.

3.3. County of Hawaiʻi General Plan

The *County of Hawaiʻi General Plan* (2005 edition, amended in 2014) is the policy document that encompasses the long-range goals, policies, standards, and courses of action for comprehensive physical development on the island of Hawaiʻi. DLNR's project is the construction of an administration facility for its divisions that have responsibilities pertaining to the protection of natural or cultural resources. The proposed facility would support DLNR's resource protection programs and services. DLNR is proposing a project that supports the goals and policies listed below.

General Plan - Historic Sites

Goals:

Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawaii.

Policies:

Agencies and organizations, either public or private, pursuing knowledge about historic sites should keep the public apprised of projects.

Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.

General Plan - Natural Beauty

Goals:

Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.

Protect scenic vistas and view planes from becoming obstructed.

Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

Policies:

Protect the views of areas endowed with natural beauty by carefully considering the effects of proposed construction during all land use reviews.

General Plan - Natural Resources and Shoreline

Goals:

Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.

Ensure that alterations to existing land forms, vegetation, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.

Policies:

Coordinate programs to protect natural resources with other government agencies.

Encourage the use of native plants for screening and landscaping.

General Plan - Public Facilities

Goals:

Encourage the provision of public facilities that effectively service community and visitor needs and seek ways of improving public service through better and more functional facilities in keeping with the environmental and aesthetic concerns of the community.

Policies:

Continue to seek ways of improving public service through the coordination of service and maximizing the use of personnel and facilities.

Coordinate with appropriate State agencies for the provision of public facilities to serve the needs of the community.

The General Plan LUPAG map serves as a guide that directs future developments and indicates the general location of various land uses in relation to each other. DLNR's parcel is entirely within the Important Agricultural Land designation, which generally indicates a better potential for sustained high agricultural yields due to soil type, climate, topography, or other factors. As discussed in other sections of this EA, the project site was investigated as part of the larger Keahole Agricultural Park development; however, the buffer areas intended to prevent encroachment on known historic sites and features create challenges for agricultural-related endeavors.

3.4. Kona Community Development Plan

The *Kona Community Development Plan* (2008 edition, amended in 2019, adopted and effective as of September 18, 2019) encompasses the districts of North and South Kona. The project site is within the Kona Urban Area that is delineated in Figure 4-2a Official Transportation Network Map: Proposed Roads and Transit Facilities in the

Kona Community Development Plan. There are no planned regional centers, neighborhoods, transit hubs or transit stations near the project site. The proposed facility will be adjacent to developed agricultural lots that are under the purview of the State of Hawai‘i, Department of Agriculture (DOA). The project site was previously considered for development and the proposed facility is consistent with the guiding principle of providing infrastructure and essential facilities concurrent with growth.

The proposed facility will have a secured base yard due to the resource management responsibilities and program support activities of DLNR’s divisions. A proposed new driveway from Kaiminani Drive will require approval from the County of Hawai‘i. From DLNR’s perspective, the project site is strategically located in West Hawai‘i with regards to the services, programs and responsibilities of its divisions. Some of DLNR’s personnel will travel as needed between the proposed facility and the existing Honokōhau Small Boat Harbor Facility. Lastly, the proposed facility along Kaiminani Drive is not likely to be disrupted by future urban development around planned regional centers, neighborhoods, transit hubs or transit stations that are identified in the *Kona Community Development Plan*.

3.5. County of Hawai‘i Land Use Ordinance

Hawai‘i County’s Land Use Ordinance (LUO) regulates land use in accordance with adopted land use policies, including the General Plan and Community Development Plans. The zoning for the project site is O - Open District. There are no setbacks or height restrictions per the Hawai‘i County’s LUO. DLNR’s project is a public use on state-owned property in accordance with the following description from the LUO:

> *Public uses, structures and buildings and community buildings are permitted uses in any district, provided that the director has issued plan approval for such use.*

3.6. State Coastal Zone Management Program

Hawai‘i’s Coastal Zone Management (CZM) program, established pursuant to the Hawai‘i Coastal Zone Management Act (Chapter 205A, HRS, as amended), is administered by the State of Hawai‘i, Office of Planning and provides for the beneficial use, protection, and development of the State’s coastal zone. The CZM area consists of the entire State of Hawai‘i since there is no point of land more than 30 miles from the ocean. The CZM Act involves a system of permits, including the Special Management Area (SMA) permit, to manage development within the coastal areas and encourage public participation. Any significant development within the SMA requires permit approval from the appropriate County. Any significant development within the SMA requires permit approval from the appropriate County. On the Island of Hawai‘i, the SMA permit process is administered by the Department of Planning.

The project site is located outside the SMA and approximately 1.9 miles from the shoreline. No SMA permit is required for the project, which supports several policies and objectives of the CZM from HRS Section 205A-2.

1. *Recreational Resources*

<u>Objectives</u>. Provide coastal recreational opportunities accessible to the public.

<u>Policies</u>. Improve coordination and funding of coastal recreational planning and management; and

Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.

The proposed facility will be sited away from shoreline recreational resources. Appropriate erosion control BMPs will be used to minimize the amount of soil transported in stormwater runoff during construction activities.

2. *Historic Resources*

Objectives. Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies. Identify and analyze significant archaeological resources;

Maximize information retention through preservation of remains and artifacts or salvage operations; and

Support state goals for protection, restoration, interpretation, and display of historic resources.

The known historic resources described in the AIS will be protected. Consultation with SHPD is ongoing. DLNR shall require its contractor to comply with all State and County rules and laws pertaining to historic preservation. Construction activities will be halted and SHPD will be notified in the event any unanticipated archaeological or historic sites are encountered.

3. *Scenic and Open Space Resources*

Objectives. Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies. Identify valued scenic resources in the coastal zone management area;

Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

Encourage those developments that are not coastal dependent to locate in inland areas.

The proposed facility will be located inland and is not expected to diminish coastal scenic views or open space resources.

4. *Coastal Ecosystems*

Objectives. Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies. Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

Improve the technical basis for natural resource management;

Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

The proposed facility will be sited away from the shoreline and is not expected to disrupt or degrade coastal water ecosystems. No stream diversions or channelization would occur from the project. DLNR's construction contractor will be responsible for implementing a storm water management plan and controlling runoff that can transport loose soil, excess nutrients and other pollutants. A NPDES permit will be required to ensure compliance with BMPs during construction.

5. *Economic Uses*

Objectives. Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies. Concentrate coastal dependent development in appropriate areas;

Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;
(ii) Adverse environmental effects are minimized; and
(iii) The development is important to the State's economy.

DLNR's project does not involve coastal development; therefore, the policies pertaining to coastal economic development do not apply.

6. *Coastal Hazards*

Objectives. Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policies. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

Prevent coastal flooding from inland projects.

Coastal hazards will not be exacerbated by the project, which is located inland and away from the coastline. The proposed facility will include new on-site drainage systems that address the quality and quantity of stormwater leaving the site, which would help to reduce nonpoint source pollution.

7. *Managing Development*

Objectives. Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

The project does not impact or influence the development review process. The environmental review process provides opportunities for public participation and comments on many issues including coastal resources and hazards.

8. *Public Participation*

Objectives. Stimulate public awareness, education, and participation in coastal management.

Policies. Promote public involvement in coastal zone management processes;

Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

The environmental review process provides opportunities for public participation. DLNR has sought public input and will continue to address comments as part of the environmental review process.

9. *Beach Protection*

Objectives. Protect beaches for public use and recreation.

Policies. Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

Minimize the construction of public erosion-protection structures seaward of the shoreline.

Public access to beach areas will not be affected by the proposed facility, which is located inland and away from beaches and the shoreline. The project does not propose any erosion-protection structures seaward of the shoreline.

10. *Marine Resources*

Objectives. Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies. Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

The project is located inland and does not involve the use or development of marine and coastal resources.

3.7. Other Considered Plans

DLNR's project does not appear to conflict with the objectives of DHHL's General Plan. As discussed in Section 2.9. Archaeological Resources and Section 2.10. Cultural Practices and Resources, the proposed facility will be designed to avoid important resources including Site #50-10-27-262. This lava tube site will be

preserved in place (avoidance and protection) in accordance with an archaeological preservation plan and a burial treatment plan to be written. The burial treatment plan preservation treatments will be determined through consultation with the Hawai‘i Island Burial Council and recognized descendants.

The project site is closest to DHHL’s Kalaoa parcels located at southern terminus of Laui Street. Two of DHHL’s parcels, which are designated for general agriculture and industrial uses, are located at least 0.4 miles south from DLNR’s proposed facility. DHHL land that is at least one (1) mile from DLNR’s proposed facility and beyond the northern terminus of Laui Street is designated for commercial and residential use. DHHL also has land designated for residential use that is at least 1.2 miles from DLNR’s proposed facility and within the Kalaoa residential neighborhood that spans the area between Ane Keohokālole and Mamalahoa Highways. According to the Hawai‘i Island Plan (2002), the Kalaoa developments are included in DHHL’s high priority - phase two for the West Hawai‘i region, which is described as the longer-term 7 to 20-year planning period. According to the Kealakehe - La‘i ‘Ōpua Regional Plan (2020), DHHL would need to develop additional potable water sources after the buildout of high priority - phase one projects in Kealakehe such as La‘i ‘Ōpua Village 4 Phase I ‘Ākau and Phase II Hema.

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4. POSSIBLE ALTERNATIVES

The West Hawaiʻi region is expected to be more disturbed by the footprint of human activities as new development transforms vacant land designated for future growth. Urban expansion along with associated infrastructure effectively reduces the resource areas that contribute to the natural, open setting of the North Kona district in West Hawaiʻi. DLNR is aware that facility development upon vacant land will generate direct and indirect impacts; it is the responsibility of the land management agency to decide what level of impact is acceptable and what actions are needed to maintain resource conditions. DLNR is committed to a continued presence in West Hawaiʻi as it strives to effectively respond to the effects of urban growth and increased use of natural resources for recreational and cultural purposes.

4.1. No Action

The “No Action” alternative implies that all of the functions of DAR and DOCARE would remain in their current spaces at the Honokōhau Small Boat Harbor Facility along with DOBOR whereas other divisions (e.g., CWRM, SHPD and SP) would continue to operate from leased spaces in West Hawaiʻi. No construction-related activities would occur as a result of maintaining status quo. No action implies that there would be no commitment of funding or capital improvement costs and no effort to construct the proposed facility for DLNR’s operational needs in the West Hawaiʻi area. As a result of no action at this time, state-owned land along Kaiminani Drive would remain undeveloped for the foreseeable future.

DLNR’s existing harbor facility will continue to age such that improvements in the future will be necessary. The resulting effect of said improvements is likely to reduce the available space at the harbor facility such that more divisions may need to operate from leased space in West Hawaiʻi. The long-term funding considerations for future lease agreements are unknown because there are uncertainties associated with inflation and the latent demand for available space in West Hawaiʻi. DLNR’s programs and services may become vulnerable if spaces for lease in West Hawaiʻi become scarce or difficult to obtain as the region experiences anticipated future long-term growth.

An increase in the commitment of state funds for rent implies that less funding would be available for programs and services, which may ultimately hamper DLNR’s efforts to improve and provide its services and programs while the natural and cultural setting of West Hawaiʻi becomes more heavily disturbed by the footprint of human activities. No action is therefore an unacceptable alternative from the perspective of DLNR.

4.2. Delayed Action

A delayed action implies that a project of similar scope and size to the proposed action would occur at an unspecified future date. The environmental impacts resulting from a delayed action are generally expected to be the same as the proposed action so long as environmental conditions remain similar to the evaluated conditions described in this EA.

Project delay may subject DLNR to a potential increase in construction costs due to inflation, changes in economic conditions or the labor supply. Building materials and labor costs in general tend to increase with time. A delayed action may necessitate a greater funding commitment for improvements or a reduction in the scope and size of the project.

4.3. Proposed Facility on Another Site

The *Final Environmental Assessment for the Department of Land and Natural Resources Community Conference Center and Administration Building in Kealakehe, North Kona, Hawai‘i* (The Limtiaco Consulting Group, 2017), which includes the analysis of several alternate sites in Kealakehe, is hereby incorporated by reference. As indicated in Section 1.1. Introduction and Background, the site near the existing Honokōhau Small Boat Harbor Facility and makai (or seaward) of the Queen Ka‘ahumanu Highway was determined to be infeasible during the design phase of the project. Close proximity to the Honokōhau Small Boat Harbor Facility was more desirable for divisions such as DAR and DOCARE that would need to regularly transport state-owned or impounded watercraft, equipment, vehicles and vessels between the harbor facility and another site. The considered sites on the *mauka* and *makai* sides of Queen Ka‘ahumanu Highway (see Appendix F) have challenges associated with the known environmental conditions, future use dedications, lack of nearby utility connections, and the need for roadway improvements.

Landform alterations associated with construction of proposed building elements on another site have the potential to disturb protected biological resources and/or critical habitat; site development may also be constrained if *in-situ* preservation, buffer zones or other conservation measures are required due to presence of important historic or cultural resources. Construction of the proposed facility at a different state-owned or privately-owned site in West Hawai‘i would likely require further delay to investigate existing environmental conditions in greater detail. The selection of another site implies that construction of the proposed facility would occur at a later date after further investigation and there would be similar concerns as the delayed action described above. A multitude of factors beyond the purview of DLNR would need to occur for another site that requires a successful land transfer, land swap, acquisition or lease negotiation process for its use. The option to site the proposed facility at another

location is therefore possible but less desirable than the proposed action, which utilizes a site that has been more thoroughly evaluated for environmental concerns.

4.4. Proposed Facility Along Laui Street

The project site was previously evaluated in the *Environmental Assessment for the Ke-ahole Agriculture Product Marshalling and Processing Center, Ke-ahole Agricultural Park, North Kona, Hawai‘i* (Hilo Engineering, Inc., 1990), which is hereby incorporated by reference. The DOA proposed the utilization of 3.86 acres along Laui Street for an agriculture product marshalling and processing center. The conceptual design of the DOA's project included a 6,000 square foot pre-fabricated steel building, paved areas for parking and loading, and a buffer area to avoid encroachment on known archaeological resources (see Appendix F). The DOA's project included an IWS with a design capacity of 5,000 to 20,000 gallons per month, which is reportedly similar to the wastewater discharge volume for a single-family dwelling. The physical and environmental impact of the agriculture product marshalling and processing center was determined to be minor.

The area proposed for the agriculture product marshalling and processing center is directly over the south fork of the lava tube complex and near Site 31110 (*pāhoehoe* excavations), which was recorded during the 2019 investigation by SCS, Inc. The intentional siting of proposed building elements for DLNR's project in a manner that avoids the historic resources would therefore be more challenging if this same area along Laui Street is utilized. The remaining area along Laui Street between the west fork of the lava tube complex to Kaiminani Drive is considerably steeper and more difficult to develop as compared to other areas of the project site. The option to site the proposed facility along Laui Street is therefore possible but less desirable than siting the proposed facility along Kaiminani Drive from DLNR's perspective.

4.5. Proposed Facility Along Kaiminani Drive (the Preferred Alternative)

The project site is approximately 5 miles away from the Honokōhau Small Boat Harbor, which is less practical and more inconvenient for the divisions that have ocean-related missions; however, both DAR and DOCARE would have administrative functions at the proposed facility and regular resource management and enforcement responsibilities would continue to operate from the harbor facility. The proposed facility along Kaiminani Drive would be built near existing infrastructure (e.g., roadways, transmission lines for utility services) and would augment DLNR's existing capabilities. DLNR's project is consistent with the objective of encouraging new development near existing development and in close proximity to existing services and facilities.

The proposed facility would be located along Kaiminani Drive in an area with gently sloping topography. The utilization of this area along Kaiminani Drive would allow for the intentional siting of building elements in a manner that avoids known historic

features and the lone silk oak tree within the proposed site. The visual impact of the new buildings is expected to be consistent with nearby agricultural park endeavors such as plant nurseries, farms and allowed residential structures. The construction of the proposed facility would involve landform alterations and site work relative to the development footprint. Construction activities are expected to generate short-term environmental impacts such as fugitive dust, noise, intermittent traffic, solid waste, and potential disruptions to utility services that would cease upon project completion. Proposed mitigation that addresses anticipated project impacts is identified in this EA.

Green building practices and low-impact development principles have been incorporated in the conceptual site design. Dry wells with filter media will be utilized to catch and treat site runoff. The natural slope towards the ocean, and landscaping within developed areas and around buildings will minimize the visual impact of the proposed facility. The landscaping plan will incorporate native plants. The conceptual layout for the proposed facility considers site security for State-owned assets. There will be approved dark sky site lighting around the buildings and base yard along with enhanced security features such as fencing and surveillance cameras.

DLNR is not proposing the development of new ground water wells for the project while it explores possible water reduction strategies. DLNR will continue to consult with DWS about the availability of water for the proposed facility and has considered several options (such as transporting water from elsewhere, utilizing on-site water catchment and water efficient features) to reduce the projected demand for potable water. The proposed facility will have an approved on-site IWS that complies with applicable regulations. The NPS has stated that wastewater disposal at the Kealakehe WWTP is preferred from a resource protection perspective; however, it is not known when municipal infrastructure and conveyance facilities will be available in the project vicinity. The DOH also commented that considerations pertaining to the wastewater system should include the impacts of discharges to public trust, Native Hawaiian resources or the exercise of traditional cultural practices. There are inherent benefits associated with locating conservation specialists close to the known historic resources within the project site. For all of these reasons, the proposed facility along Kaiminani Drive is considered by DLNR to be the preferred alternative that addresses project objectives with minimal effect on historic and biological resources.

Cumulative Impacts

Cumulative impacts are the combined effect of incremental changes from past, present and reasonably foreseeable future actions that may affect the same resources in the same area and within the same period as the proposed action. Environmental impacts caused by the actions of various agencies, individuals or private entities may be individually minor but collectively substantial when considered together.

Past actions include the development and improvement of public infrastructure and facilities intended to support the regional needs of West Hawai‘i. Desired urban expansion has been sustained by periodic improvements to existing infrastructure (e.g., Queen Ka‘ahumanu Highway and Kaiminani Drive) and public facilities (e.g., Kona International Airport and the Kealakehe WWTP). Advancements in technology or the utilization of better methods can help with resource conservation goals. For instance, the use of reclaimed water from the Kealakehe WWTP for non-potable purposes such as irrigation is intended to help conserve potable groundwater resources in West Hawai‘i.

New urban development typically includes practical measures that help to avoid or minimize potential environmental effects to the extent possible. For example, runoff concerns from the creation of more impervious surfaces must be addressed with on-site controls in accordance with construction permits. Wastewater disposal systems must meet DOH requirements that strive to prevent unintended effects to affected water bodies and water resources. Demands for public services and facilities such as water, wastewater, solid waste disposal, electrical power and communications systems must be coordinated with utility providers to ensure adequate service. Compliance with and adherence to established controls are expected to help lessen the impact on natural resources, and achieve lasting effects in resource protection and conservation.

Incremental environmental change in the project area will continue as proposed development projects are fully realized and new projects begin. Foreseeable projects that add housing units may affect population levels, schools and employment opportunities. DLNR’s project, which will alter state land for the development of a public facility, is not a pre-requisite for and does not overlap the geographic scope of other planned governmental or private actions.

No potential cumulative impacts to population levels, housing units, or schools are expected from DLNR’s project. The incremental effect of the proposed action on air quality, soils, water resources, flora and faunal resources, the soundscape and traffic is expected to be small or difficult to discern in proportion to the overall cumulative impact. A minor to moderate cumulative impact on visual resources is anticipated since the proposed action will add urban landforms that are generally in keeping with development patterns in the project area that create visual change. Consultation with SHPD has occurred for DLNR’s project whereby cumulative effects to archaeological and cultural resources have been evaluated and considered. The cumulative impacts of long-term preservation

and protection of archaeological and cultural resources are expected to be beneficial. The continued presence of DLNR's conservation and management personnel in West Hawai‘i represents an important commitment of state resources within an area that is expected to have more people exploring and enjoying the natural and cultural environment. DLNR's project is expected to enhance its service capabilities and the cumulative impacts may be negligible to beneficial.

Completion of the proposed facility along Kaiminani Drive, which DLNR has selected as its preferred alternative, would allow DLNR to utilize undeveloped state-owned land near existing development. The proposed facility represents the commitment by DLNR to maintain its operations and provide services and programs in West Hawai‘i as the region experiences the effects of urban growth.

5. PERMITS AND APPROVALS

Although exact permitting and approval requirements will be determined during the design phase, the following list contains permits and approvals that may be required for the proposed project:

State of Hawai‘i

- National Pollutant Discharge Elimination System Permit
- Community Noise Permit
- Community Noise Variance
- Non-Covered and/or Covered Source Permit (Air Quality)
- Lane Use Permit for Construction Work
- Oversized and Overweight Vehicles on State Highways Permit

County of Hawai‘i

- Building Permit
- Grubbing, Grading, and Stockpiling Permit
- Erosion Control Plan/Best Management Practices
- Permit to Work Within County Right-of-Way

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6. DETERMINATION

A Finding of No Significant Impact (FONSI) determination is anticipated for the proposed project, which is not expected to have a significant impact on the physical or human environment. The supporting rationale for this finding as set forth in HAR Title 11, Chapter 200.1, Section 12 is discussed below.

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

The construction of the proposed facility is not expected to endanger any natural or cultural resources. Completion of the new facility would allow the various divisions of DLNR to fulfill their respective resource protection missions. The conceptual site plan incorporates buffer zones around biological resources and historic features. The construction contractor shall stop work and contact SHPD immediately in the event any unanticipated buried archaeological or cultural resources are encountered.

(2) *Curtails the range of beneficial uses of the environment;*

No beneficial uses of the environment will be curtailed as a result of the proposed project, which represents the continued presence of DLNR in the West Hawaiʻi region. Completion of the proposed facility ensures the beneficial use of the state-owned land for a public purpose.

(3) Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;

The proposed project would be in conformance with State Environmental Policy, inclusive of its individual policies, goals, and guidelines for population growth; natural resources; biological resources; transportation; energy; and culture, as discussed in the individual resource categories throughout this EA.

(4) Substantially affects the economic welfare, social welfare, and cultural practices of the community or State;

The proposed project does not substantially or negatively affect the economic or social welfare and cultural practices of the community or State. The project creates short-term jobs for people in design and construction. Completion of the new facility would allow the various divisions of DLNR to fulfill their respective missions.

(5) Substantially affects public health;

Public health will not be adversely affected during the construction phases of the proposed project. Short-term and temporary effects such as surface runoff, fugitive dust, noise, intermittent traffic, solid waste, and potential disruptions to utility services are expected to cease upon project completion. The implementation of construction BMPs will minimize temporary impacts. Completion of the project would improve onsite infrastructure and provide the various divisions of DLNR with functional office spaces and support areas in a modern, energy efficient facility.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;

No secondary impacts such as population shifts are anticipated from the proposed project, which represents a continuation of DLNR's current functions in West Hawai‘i. Utility demands for potable water, wastewater disposal, solid waste disposal and power are expected to be insignificant since personnel at the proposed facility currently receive utility services at other locations in West Hawai‘i.

(7) Involves a substantial degradation of environmental quality;

The proposed project is not expected to degrade environmental quality. Environmental impacts that may occur during the various phases of construction will be mitigated through the implementation of construction BMPs, as appropriate. Appropriate mitigation measures have been identified throughout this EA.

(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

The proposed facility represents a long-term commitment by DLNR to provide its programs and services in West Hawai‘i. The proposed project is not part of or associated with a supplemental future action.

(9) Substantially affects a rare, threatened, or endangered species, or its habitat;

No species listed by the U.S. Fish and Wildlife Service or in the Endangered Species Act are expected to be significantly impacted by the proposed project. The project site does not contain habitat for proposed, candidate, or listed threatened or endangered species.

(10) Detrimentally affects air or water quality or ambient noise levels;

Short-term impacts to air quality, water quality or ambient noise levels may occur during construction. No State or Federal air quality or water quality standards should be violated during or after construction. Environmental impacts will be mitigated through proper construction techniques and compliance with applicable DOH rules and regulations. The proposed facility is not expected to negatively impact ambient air quality and background noise levels.

(11) 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 project site is not situated within an environmentally sensitive area and is not anticipated to affect such areas.

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies; or

New buildings within the project site will not obstruct or affect scenic vistas and view planes. Landscaping may further reduce the visual impact of the proposed facility.

(13) Requires substantial energy consumption.

The proposed project is the construction of modern, energy efficient buildings and is not anticipated to cause a substantial increase in energy consumption. The proposed facility represents a continuation of current operations in West Hawai‘i that already receive power and communications service in separate locations where these divisions currently operate.

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7. PUBLIC AGENCY REVIEW AND CONSULTATION

7.1. Pre-Assessment Consultation

The consulted agencies, organizations, and individuals are listed below. There were eighteen (18) formal responses to the pre-assessment consultation letter, as indicated by the ✓ below. Comments and responses are included in Appendix G.

Federal Agencies

U.S. Fish and Wildlife Service
U.S. Department of the Interior, National Park Service
✓ Kaloko-Honokōhau National Historical Park

State of Hawai‘i

Department of Accounting and General Services
- Public Works Division
- Hawai‘i District Office

Department of Agriculture
Department of Land and Natural Resources
- ✓ Commission on Water Resource Management
- State Historic Preservation Division - Hawai‘i Island
- Hawai‘i Island Burial Council
- Division of Aquatic Resources
- Division of Boating and Ocean Recreation - Hawai‘i District Branch
- Division of Conservation and Resource Enforcement
- ✓ Division of Forestry and Wildlife
- Division of Forestry and Wildlife - Hawai‘i Branch
- Land Division
- ✓ Land Division - Hawai‘i District
- ✓ Engineering Division
- State Parks

Department of Transportation
- ✓ Airports Division
- ✓ Highways Division
- Highways Division - Hawai‘i District Office
- Harbors Division - Hawai‘i District Office
- Statewide Transportation Planning Office

Department of Health, Environmental Health Administration
- Clean Air Branch
- Clean Water Branch
- Clean Water Branch - Kona

State of Hawai‘i (continued)

- Environmental Management Division
  - Hawai‘i District Health Office
  - ✓ Indoor and Radiological Health Branch
  - Safe Drinking Water Branch
  - Solid and Hazardous Waste Branch
  - ✓ Wastewater Branch
- Department of Business, Economic Development and Tourism - Office of Planning
- Office of Hawaiian Affairs
  - West Hawai‘i (Kona)
- ✓ Department of Hawaiian Home Lands
  - Planning Office
- Department of Education
  - Hawai‘i District
- Senator Dru Kanuha (District 3)
- Representative Nicole Lowen (District 6)

County of Hawai‘i

- Office of the Mayor
- Civil Defense Agency
- Department of Environmental Management
  - ✓ Wastewater Division
  - ✓ Solid Waste Division
- ✓ Fire Department
  - Fire Prevention Bureau
- Planning Department
- ✓ Department of Public Works
- Department of Transportation
- ✓ Department of Water Supply
- ✓ Police Department
- Councilmember Karen Eoff (District 8)

Organizations, Associations and Interested Parties

- Ala Kahakai Trail Association
- ✓ Gentry's Kona Marina Honokōhau Harbor
- Kailua Village Business Improvement District
- Hawai‘i Electric Light Company, Inc.
- Hawai‘i Fishing and Boating Association
- Hawai‘i Telecom

Organizations, Associations and Interested Parties (continued)

Hawai‘i Tribune Herald
Kona Kohala Chamber of Commerce
Oceanic Time Warner Cable
Queen Liliuokalani Trust
Sierra Club of Hawaii
The Gas Company (dba Hawai‘i Gas)
West Hawai‘i Today

Neighboring or Nearby Property Owners and Recorded Lessees

7-3-049:010 (Castillo Orchids)
7-3-049:011 (Pualani Landscape Plants)
7-3-049:018 (Nursery Solutions, Inc.)
✓ 7-3-049:019 (Jo Ma Farms)

7-3-049:020
7-3-049:025 (Landscape Planning Services)
7-3-049:026 (Southern Turf Hawaii Kona)
7-3-049:027 (Southern Turf Hawaii Kona)
7-3-049:028 (The Orchid Farm Inc.)

7-3-049:033

7.2. Draft EA Consultation

DLNR and TLCG will continue to coordinate and consult with governmental agencies that will review the Draft EA. Agency review comments and responses will be published in the Final EA. Public comments received from organizations and interested parties during the 30-day statutorily-mandated comment period will also be responded to and published in the Final EA.

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APPENDIX A

Site Photographs and Conceptual Renderings by Erskine Architects, Inc.

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Photo #1 from Erskine Architects, Inc.
View of the undeveloped project site from Laui Street, looking northeast towards Kaiminani Drive. The area along Kaiminani Drive and directly across from the project site is also undeveloped.

Photo #2 from Erskine Architects, Inc.
View from within the project site, which slopes gently west towards the coastline. The Pacific Ocean is visible in the distance.

Photo #3 from Erskine Architects, Inc.
View from within the project site, looking north with a cave opening in the foreground. A visible change in vegetation in the distance is from another cave opening.

Streetview #1 from Google Maps
View of the project site looking southeast from Kaiminani Drive at its intersection with Laui Street. The posted speed limit in this area is 45 miles per hour.

Streetview #2 from Google Maps
View of the project site looking south from Kaiminani Drive. The landscape of the undeveloped site is dominated by invasive fountain grass and has the visual characteristics of a featureless expanse of grassland.

Rendering of Phase 1 from Erskine Architects, Inc.
Building A, a Conference Room and a parking area are generally oriented along Kaiminani Drive. The base yard area is behind the buildings and secured with fencing.

Rendering of Phase 2 from Erskine Architects, Inc.
This phase includes Building B and additional parking. The administration buildings are intentionally designed to be similar in appearance and to have the same structural system.

Rendering of Phase 3 from Erskine Architects, Inc.
Building C may be sited away from Buildings A and B. The overall topographic profile of the project site will be retained with buildings that are situated at different elevations.

APPENDIX B

Natural Resources Survey by AECOS, Inc.

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Natural resources survey for a HDLNR Administration Building in West Hawai'i, Hawai'i Island

Photo credit: R. David

Prepared by:

AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāne'ohe, Hawai'i 96744-3221

October 9, 2019

Natural resources survey for a HDLNR Administration Building in West Hawai'i, Hawai'i Island

October 9, 2019 **DRAFT** *AECOS* No. 1400B

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Introduction

The State of Hawai'i, Department of Land and Natural Resources (HDLNR) is proposing to construct a new administrative facility on vacant land in the North Kona District of the Island of Hawai'i. The primary purpose of the proposal is to consolidate various HDLNR Divisions located throughout Hawai'i County into a single modern facility to include staff administrative offices, meeting rooms, storage and support areas, parking, and base yards ("Project"). The state-owned parcel (TMK: 7-3-010:061) is 79 ac (32 ha). However, the proposed facility would occupy only about 3 to 4 ac (1.2–1.6 ha) of the parcel corner bordering on Kaiminani Drive and Laui Street (a short distance *mauka* of Queen Ka'ahumanu Highway; see Figure 1). This report presents the results of biological field surveys of the Project area.

Site description

The survey area is a Hualālai volcano lava flow, 3000 and 5000 years old (Qh1y; Sherrod et al., 2007; Wolf and Morris, 1996) and covered by grasses. The land slopes gently down to the southeast. One or more lava tubes with two areas of collapsed roof cross the middle of the site roughly from east to west (Figure 2). A small area of graded ground and a horseshoe-shaped enclosure of stacked rough boulders are found on the west side off Laui Street.

[1] Rana Biological Consulting, Inc., Kailua-Kona, Hawai'i.
[2] Montane Matters, Waipahu. Report by S. Montgomery (2019) folded into the present report.

Figure 1. Aerial view of Project vicinity in North Kona showing survey area outlined in red.

Methods

The botanical and vertebrate biological biological surveys were conducted during the morning of May 22, 2019. A separate survey of arthropods focused on the underground lava tubes was undertaken in September 15-17, 2019. For completeness, and to accommodate any future changes in project layout, our survey area was expanded beyond the currently proposed actual development site of 3 to 4 ac to encompass an area of 11.5 ac (4.7 ha), covering all of that part of the parcel bordering on Laui Street (Fig. 1).

Botanical Survey

The plant survey was conducted by wandering transect laid out across the survey area in real time utilizing a hand-held GNSS [GPS] device (Trimble 6000 Series GeoXH) for a complete visual coverage of the area. This standard survey approach offers the best method for discovering rare plants in a survey area. Position locations of items of interest (for example, lava tubes) were recorded on the GNSS unit as these were encountered. Although this ability allows for recording locations of any plant species considered sensitive or worthy of preservation, nothing meeting this criterion was encountered. For all plants encountered, both native and non-native, identification was made and relative abundance (e.g., abundant, common, rare, etc.) within the overall survey area estimated as the survey progressed. Plant names follow *Manual of the Flowering Plants of Hawai'i* (1999) for native and naturalized flowering plants. More recent name changes for naturalized plants follow Imada (2012).

Figure 2. The Project site is a mostly featureless field of grass on relatively recent lava flow with two collapsed lava tubes and disturbed ground on the west side.

Figure 3A (upper). Opening to lava tube located close to the west side of the survey area. Figure 3B (lower). Larger lava tube looking into upslope opening.

Fauna Surveys

Cave Fauna Survey –Two lava tube cross and branch extensively below the surface within the site, openings of which are shown in Figures 3A and 3B. The lava tubes were mapped by the archaeology survey team (Escott, 2019; shown in Figure 4). Since other nearby caves have important native fauna, the lava tubes on the Project site were explored carefully. At all times while moving through the cave, the biologist was vigilant for any evidence of arthropod presence or activity. Visual observations provide valuable evidence and are a cross check that extends the reach of all sampling techniques. Visual observations include turning over rocks and examining ceilings and organic debris. However, organic debris, an important habitat for cave invertebrates, was sparse in this system.

Figure 4. Lava tube system on the project site (after Escott, 2019).

Baiting is a recognized method of conducting a census of lava tubes for cave-adapted fauna. Baits are used to attract insects to specific smells. For example, some flies come to decaying plants giving off a specific odor. Insects are enticed by the bait's advertisement when placed at likely locations or inserted in bottle traps and checked periodically. Insects at the bait are then observed and collected if appropriate. This approach is more efficient than only roaming the survey area seeking scarce, cryptic insects. Lava tubes on the Project site were baited in the innermost dark zones, where, experience has shown, offer an environment suitable for native cave fauna. Baits that have a strong, pungent and durable smell are best as attractants in lava tube surveys. Our traps used rotting shrimp and cheese baits. Baited traps were placed (see Figure 5) in two lava tubes at 9 sites on September 15 and retrieved on September 17, 2019

Figure 5. Bated bottle trap being placed in dark zone of Kalaoa 3 cave.

Weather and seasonal patterns in vegetation play an important role in any survey of invertebrates. Nearby Kailua-Kona records show most rain falls during the 31 days centered around March 24. Host plant presence/absence and seasonal changes affect the species collected. The predominance of grass cover above the lava tubes at the site and the absence of any woody roots in the lava tubes supplying food and habitats for cave fauna is an even stronger factor

in determining the invertebrates encountered than is time of year. Invertebrate names used herein follow: *Common Names of Insects & Related Organisms* (HES, 1990) and *Hawaiian Terrestrial Arthropod Checklist* (Nishida, 2002).

Avian Survey - Two avian count stations were sited roughly equidistant from each other within the survey area. A single eight-minute avian point count was made at each of the count stations. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. The avian counts were conducted in the early morning hours. Time not spent counting at point-count stations was used to search the site for any species and habitats not detected during the point-counts. Weather conditions were excellent with unlimited visibility and winds of between 5 and 15 kilometers per hour, and no precipitation. The avian phylogenetic order and nomenclature used in this report follows the *AOS Check-List of North and Middle American Birds 2018* (Chesser et al., 2018).

Mammalian Survey - The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the survey area. Mammal scientific names follow *Mammal Species of the World: a Taxonomic and Geographic Reference* (Wilson and Reeder, 2005).

Results

Vegetation

The vegetation over the property is grassland dominated by fountain grass (*Cenchrus setaceus*; see Cover photo and Figure 6). Weedy, ruderal plants characterize a verge along Laui Street. As noted above, most of the mixed *'a'a* and *pāhoehoe* lava flow is moderately to densely covered by grasses. Vegetation is sparse in the steep-sided depressions representing collapses of one or more lava tubes (Figures 3A and 3B, above). The only tree growing on the site is a small silk oak (*Grevillea robusta*) growing roughly 1000 ft northwest of the larger of the two collapsed lava tubes.

Flora

A listing (flora) of all the vascular plants observed in the survey area is presented as Table 1. A total of 20 flowering plant species was recorded. Of these, two (10%) are considered to be native to the Hawaiian Islands: *'uhaloa*

Table 1. Flora listing for a proposed DLNR administration facility site in North Kona.

Family *Species*	Common name	Status	Abund.	Notes
FLOWERING PLANTS				
DICOTYLEDONES				
ASTERACEAE (COMPOSITAE)				
indet.	---	?Orn	Uc	<2>
Tridax procumbens L.	coat buttons	Nat	R	<1>
CRASSULACEAE				
Kananchoë pinnata (Lam.) Pers.	air plant	Nat	R	<2>
EUPHORBIACEAE				
Euphorbia hirta L.	garden spurge	Nat	U	<1>
FABACEAE				
Chamaecrista nictitans (L.) Moench	*lauki,* partridge pea	Nat	U	
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	Nat	--	<1>
Indigofera suffruticosa Mill.	*'inikō*, indigo	Nat	R	
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	O	<1>
Macroptilium lathyroides (L.) Urb.	---	Nat	R	<2>
MALVACEAE				
Waltheria indica L.	*'uhaloa*	**Ind**	C	
NYCTAGINACEAE				
Boerhavia coccinea Mill.	false *alena*	Nat	U	<1>
PORTULACACEAE				
Portulaca pilosa L.	---	Nat	U	
Talinum fruticosum (L.) Juss.	---	Nat	--	<1>
PROTEACEAE				
Grevillea robusta A. Cunn. ex R. Br.	silk oak	Nat	R	
RUBIACEAE				
Spermacoce assurgensata Ruiz & Pav.	buttonweed	Nat	--	<1>
MONOCOTYLEDONES				
POACEAE (GRAMINEAE)				
Cenchrus ciliaris L.	bufflegrass	Nat	U	
Chloris barbata (L.) Sw.	swollen fingergrass	Nat	--	<1>
Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.	*pili*	**Ind**	C	
Melinus repens (Willd.) Zizka	Natal redtop	Nat	U	<1>
Cenchrus setaceus (Forssk.) Morrone	fountain grass	Nat	AA	

Table 1 (continued).

Legend to Table 1:

Status = distributional status
- **Ind** - indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
- Nat - naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
- Orn?- Ornamental species (possibly escaping from cultivation).

Abundance = occurrence ratings for plants by area A, B, C, D, E, F, and G on June 16, 2011.
- R – Rare; only one or two plants seen.
- U – Uncommon; several to a dozen plants observed.
- Uc – uncommon, but common within a limited area.
- O – Occasional; found regularly, but not abundant anywhere.
- C – Common; considered an important part of the vegetation and observed numerous times.
- A – Abundant; found in large numbers; may be locally dominant.
- AA - Abundant; abundant and dominant; defining species in the vegetation.

Notes:
- <1> Species more abundant or seen only along the roadway verge.
- <2> Plant(s) lacking flowers or fruit; identification not confirmed.

Figure 6. Dominance of fountain grass across the site is clearly evident in this photo.

(*Waltheria indica*) and *pili* (*Heteropogon contortus*). Both are generally common species in the Islands. Unidentified is a species of Asteraceae growing in the disturbed area and possibly an escaped ornamental (numerous nursuries occur in the vicinity). Flower heads appear to have only ray flowers; mature, the achenes (seeds) bear a feathery pappus like that of a dandelion.

Although the number of species is small number considering the size of the survey area, the dryness of the area and dominance of fountain grass across the mostly undisturbed lava flows limits successful establishment by most other species of plants. Indeed, 11 of the species (55%) are limited in their distribution to the verges of Kaiminani and Laui roadways (NOTE <1>) or the disturbed area on the west side of the site.

Lava Tube Fauna

Several accessible segments of lava tubes are present on the property (Figs. 2, 3 and 4) crossing from northeast to southwest below the surface. These lava tubes are at low elevation in typically dry Kona and, importantly, contain no root systems—the basis of the more diverse lava tube arthropod communities—reaching into the void space and insufficient moisture to support a robust cave ecosystem. Many of the lava tube sections have skylights or cracks that dry them, and these lack any shady covering of woody vegetation. Thus, the tubes have short dark zones. The relatively dry conditions found within the lava tube complexes, coupled with the young age of the flow and the lack of a native vegetation root system within the lava tubes, make unlikely the existence of subterranean habitats that might support endangered or unique native arthropod species.

The lava tube survey did not yield any native invertebrates despite the use of baits known to be attractive to these critters. The few species drawn to the smell of the bait appear to be stranded visitors and are alien species: American cockroaches (*Periplaneta americana*), plus a dozen Saussure's scaly crickets (*Cycloptiloides americanus*). This cricket is widespread and locally common in the twilight zones of lowland caves (Howarth, pers. comm., 2019).

The most common insect in the lava tubes was the American cockroach. Other observed insects include: *Tamsica hyacinthina* (Meyrick, 1899) and cocoons of the Household casebearer moth (also called the Plaster bagworm) seen on the vertical sinkhole walls (where they feed on spider silk and dead insects; adults were not seen). *Tamsica* is not a cave species; this endemic moth flew from the twilight zone to the lamp some 300 ft from entrance of the *mauka* lava tube. This native pili grass feeding micro-moth breeds among the surface tussocks and is widely known in the dry lowlands.

Although not seen in this survey, a native insect that might well occur on the Pili grass foliage is the native moth, *Omiodes continuatalis,* which feeds on many other grasses as well. This moth was one of the most common native moths in Hawai'i during the early 1900s, being widespread across all the main Islands. Over the last century, populations have declined dramatically, but it is still found from Moloka'i to the Big Island. Introduced parasitic wasps attack the caterpillar stage and are blamed for the declines of this and many other native caterpillars (King, 2009).

At the cave entrances, we were alert for native rock crickets of the species discovered by Dr. Dan Otte on barren lava 1 km from 'Anaeho'omalu Bay, Hawai'i Island. In his major revision of Hawaiian crickets he writes: "[this species] may be widespread along the western slopes of Hawaii Island" (Otte, 1994). It is found on the extremely barren lavas at 'O'oma, but the fountain grass makes the Project site unsuitable. There are two distinct populations of mute rock crickets inhabiting the Big Island's younger unvegetated lava flows: *Caconemobius fori* on Kilauea and *Caconemobius anahulu* on Hualalai. Neither was observed in our survey.

The Flightless field cricket (*Gryllodes*) was expected at the entrances, but not seen. This world-wide traveler was first recorded in the Hawaiian Islands in 1895 (Zimmerman, 1948) and has spread up and down the Island chain. Although superficially similar in appearance, *Gryllodes* males can 'sing' by rubbing vestigial wings together, while *C. anahulu* is mute (Otte, 1994).

One claw—part of the exoskeleton of an extinct native land crab (*Geograpsus* sp.)—was encountered in the north arm of the lava tube. Crab parts have been seen by other cave biologists in Kona lava tubes (F. G. Howarth, pers. comm., 2008; J. G. Giffin, 2003) and their biology has been described (Paulay et al., 2011). For example, land crab remains were recorded in surveys in nearby Kaloko and Kohanaiki *ahupua'a* (Figure 7; Montgomery, 2009, 2010). The claw at the Project site was left in place and recovery is not recommended if the lava tube will not be disturbed by planned activity on the property.

Figure 7. Kaloko lava tube Crab claw seen in 2009 is similar to one seen on site.

Table 2. Invertebrate lava tube species recorded for a proposed HDLNR administration facility site in North Kona.

Family *Species*	Common name	Status	Abundance	Notes
INSECTA	INSECTS			
BLATTARIA				
(BLATTIDAE)				
Periplaneta americana (Linnaeus, 1758)	American cockroach	Nat	C	not collected
ORTHOPTERA				
GRYLLIDAE				
Cycloptiloides americanus (Saussure, 1870)	Saussure's scaly cricket	Nat	C	
HYMENOPTERA				
APIDAE				
Apis mellifera Linnaeus, 1758	Honey bee	Pur	C	
LEPIDOPTERA				
CRAMBIDAE				
Tamsica hyacinthina (Meyrick 1899)		**End**	C	Flew in near entrance; not collected
TINEIDAE				
Phereocera allutella	Household casebearer moth	Nat	C	cocoons only; not collected
CRUSTACEA	CRUSTACEANS			
DECAPODA:				
GRAPSIDAE				
Geograpsus sp.	Land crab	Ext	R	claw of native land crab exoskeleton; not collected

Legend to Table 2:

Status = distributional status
- **End** – Endemic; native to Hawaii, not found elsewhere;
- Ext – Extinct;
- Nat - naturalized, exotic, introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established;
- Pur – Purposefully introduced.

Abundance
- R – Rare;
- U – Uncommon;
- O – Occasional; found regularly, but not abundant anywhere;
- C – Common; observed numerous times.

Birds

A total of 68 individual birds of 15 species and representing 11 separate families, were recorded during station counts (Table 3). One species, Black-necked Stilt (*Himantopus mexicanus knudseni*), was recorded flying over the site and is a species listed under both federal and State of Hawaii as endangered (HDLNR 2015; USFWS, n.d.). The remaining 14 species recorded are all established alien species.

Avian diversity and densities were very low but in keeping with the fountain grass dominated grassland present across the bulk of the area surveyed. Three species—House Finch (*Haemorhous mexicanus*), House Sparrow (*Passer domesticus*), and Zebra Dove (*Geopelia striata*)—accounted for 53% of all birds recorded during station counts. The most frequently recorded species was House Finch, which accounted for 22% of the total number of individual birds recorded during station point-counts.

Table 3. Avian species recorded for a proposed HDLNR administration facility site in North Kona.

Common Name	Scientific Name	***ST***	***RA***
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Gray Francolin	*Francolinus pondicerianus*	A	1.00
Black Francolin	*Francolinus francolinus*	A	2.00
Chicken	*Gallus sp.*	A	0.50
	COLUMBIFORMES		
	COLUMBIDAE – Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	1.00
Zebra Dove	*Geopelia striata*	A	4.50
	CHARADRIIFORMES		
	RECURVIROSTRIDAE – Stilts & Avocets		
Black-necked Stilt	*Himantopus mexicanus knudseni*	**EE**	1.00
	PSITTACIFORMES		
	PSITTACIDAE – African and New World Parrots		
	Arinae – New World Parakeets, Macaws & Parrots		
Red-masked Parakeet	*Psittacara erythrogenys*	A	2.50
	PASSERIFORMES		
	ZOSTEROPIDAE – White-eyes		
Japanese White-eye	*Zosterops japonicas*	A	0.50

Table 3 (continued).

Common Name	Scientific Name	***ST***	***RA***
	STURNIDAE – Starlings		
Common Myna	*Acridotheres tristis*	A	4.00
	FRINGILLIDAE – Fringilline and Carduline Finches & Allies		
	Carduelinae – Carduline Finches and Hawaiian Honeycreepers		
House Finch	*Haemorhous mexicanus*	A	7.50
Yellow-fronted Canary	*Ceithagra mozambica*	A	1.00
	PASSERIDAE – Old World Sparrows		
House Sparrow	*Passer domesticus*	A	6.00
	CARDINALIDAE – Cardinals & Allies		
Northern Cardinal	*Cardinalis cardinalis*	A	1.50
	THRAUPIDAE – Tanagers		
	Thraupinae – Core Tanagers		
Yellow-billed Cardinal	*Paroaria capitata*	A	0.50
	ESTRILDIDAE – Estrildid Finches		
African Silverbill	*Euodice cantans*	A	0.50

Legend to Table 3:

ST Status
- A Alien – Introduced to the Hawaiian Islands by humans
- **EE** Endangered Endemic – native and unique to the Hawaiian Islands, listed as an endangered species

RA Relative Abundance – Number of birds detected divided by the number of count stations (2)

Mammals

With the exception of the endangered Hawaiian hoary bat or *'ōpe'ape'a* (*Lasiurus cinereus semotus*), all terrestrial mammals currently found on the Island of Hawai'i are alien species; and most are ubiquitous. Three terrestrial mammalian species were detected: several dogs (*Canis lupus familiaris*) were heard barking from plant nurseries located west of the site; one small mongoose (*Herpestes javanicus auropunctatus*) was seen on the west side of the site. We encountered significant amounts of feral goat (*Capra hircus*) scat and sign throughout the site, and numerous goat trails traverse the site. Additionally, we encountered two goat skeletons.

Discussion

Flora Resources

The site contains no plants of any conservation concern. The presence of *pili* grass was somewhat surprising and it occurs in small number over much of the survey area and has not been completely eradicated by the invasive fountain grass.

Lava Tube Resources

Alien predatory ants are a major cause of low numbers of native arthropods in elevations below 1500 ft in Hawai'i. Especially destructive are the big-headed ant (*Pheidole megacephala*) and the pharaoh ant (*Monomorium pharaonis*; Zimmerman, 1948-80). Neither was observed in the Project site lava tubes.

Due to insufficient moisture from low rainfall and the lack of larger woody plants above the tubes resulting in an absence of internal roots (so, minimal organic matter accumulation and food sources), HDLNR plans would not directly impact the lava tubes. Any adverse impacts would be indirect ones. Thus, preservation would be sufficient mitigation. No arthropod species protected under either State of Hawaii or federal statutes were detected on the property (HDLNR, 1998, 2015; USFWS, no date).

Avian Resources

The findings of the avian survey are consistent with the location of the site, and the fountain grass dominated vegetation on the site. One of species recorded, Black-necked Stilt, is listed as endangered under both federal and State of Hawai'i endangered species statutes; two birds were seen flying over the site heading north. No habitat exists in the survey area suitable for use by this water obligate species. All of the other 14 species recorded are alien, and most of these were seen or heard flying over the site, coming from the nurseries located to the south and west, areas that are watered, have trees and shrubs, and present attractive habitats to passerine birds.

Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property and habitats present on the site. Although no rodents were recorded, it is likely that some of the four established alien Muridae found on Hawai'i—roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), Polynesian rat (*Rattus exulans hawaiiensis*), and European house mouse (*Mus musculus domesticus*)—use

resources found within the general Project area on a seasonal basis. These human commensal species are drawn to areas of human habitation and activity. All of these introduced rodents are deleterious to native flora and fauna.

No Hawaiian hoary bats were detected during the course of this survey. Given the lack of suitable roosting trees, any usage of the area by this species would be of incidental foraging.

Potential Impacts to Protected Species

The federal and State of Hawai'i listed species status follows species identified in Department of Natural Resources (HDLNR, 1998, 2015) and U. S. Fish & Wildlife Service (USFWS, undated).

No plant, avian, or mammalian species currently protected or proposed for protection under either the federal or State of Hawai'i endangered species programs (DLNR, 1998; USFWS; 2005a, 2014) were detected during the course of this survey with the exception of Black-necked stilt seen over-flying the site.

Seabirds - Although not detected during this survey, the Hawaiian Petrel (*Pterodroma sandwichensis*), the endemic Newell's Shearwater (*Puffinus newelli*), and possibly the Band-rumped Storm-Petrel (*Oceanaodroma castro*) may over-fly the general Project area between April and the end of November each year. The petrel and storm-petrel are listed as endangered, and the shearwater as threatened, under both federal and State of Hawai'i endangered species statutes. The primary cause of mortality in nesting seabirds in the Hawaiian Islands is thought to be predation by alien mammalian species at the nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is considered the second-most significant cause of mortality of these seabirds in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds may collide with man-made structures and, if not killed outright, dazed or injured birds become prey to feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003). Neither nesting colonies nor appropriate nesting habitat for either of these listed seabird species occur within or close to the Project site.

Potential for impact on protected seabirds that the Project poses is an increased threat to transiting birds disoriented by lights associated with the Project during the seabird nesting season from September 15 through December 1 each year. If, during construction, it is deemed expedient to conduct night-time

construction activities, or if outdoor lights are installed as part of the proposed facility, these must be shielded (Reed et al. 1985, Telfer et al. 1987). Shielding of lights would serve the dual purpose of minimizing disorientation and downing of petrels and shearwaters, and complying with Hawai'i County Code §14 – 50 *et seq*., which requires shielding of exterior lights to lower ambient glare reaching the astronomical observatories located on Mauna Kea.

Hoary Bat - The principal potential impact that the construction and operation of the proposed base-yard poses to Hawaiian hoary bats is associated with clearing and grubbing phases of construction as vegetation is removed, roosting bats can be disturbed. The trimming or removal of foliage and/or trees may temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season female carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared, additionally adult female bats sometimes leave their pups in the roost tree while they themselves forage, very small pups may be unable to flee a tree that is being felled. No suitable roost trees occur on the subject property.

Critical Habitat

Currently no federally delineated Critical Habitat incorporates the property or occurs nearby.

Recommendations

- If night-time construction activity or equipment maintenance is proposed during the construction phases of the Project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

- If streetlights or exterior facility lighting is installed in conjunction with the Project, it is recommended that the lights be shielded to reduce the potential for interactions of nocturnally flying seabirds with man-made structures (Reed et al., 1985; Telfer et al., 1987).

- Three colonies of honey bees are breeding in meter deep pocket voids or bubbles in sinkhole walls and present some hazard to persons walking close by or through their flight path. Workers on site with an allergy to stings should inform their supervisor and carry their response kit.

- The property includes classic habitat for centipedes, scorpions, and black or brown widow spiders. Although these medically important species were not seen in this focused survey, they may be hiding in dry grass or under rocks in the area. Surveyors and crews conducting clearing should be alert for all these species which may pose a serious risk to some. When moving stones or clearing grass clumps, wearing gloves, covered shoes, long sleeves, and long pants will greatly reduce the risk of accidental contact and bites (for example: pull socks up over pant cuffs to deter disturbed critters from crawling up pants; use cut off socks to slide over connect between gloves and long sleeve shirt cuff). Supervisors should be aware of any allergy by employees. Some individuals can experience anaphylactic reactions to venom of any of the mentioned arthropods, not just bees. Please see *What Bit Me?* (Nishida and Tenorio, 1993) for additional information.

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APPENDIX C

Archaeological Inventory Survey by Scientific Consultant Services, Inc.

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SCS Report 2348-1

AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR PROPOSED DLNR OFFICES & BASE YARD IN KALAOA 5TH AHUPUA'A, NORTH KONA DISTRICT, ISLAND OF HAWAI'I, HAWAI'I

[TMK: (3) (3) 7-3-010:061 (por.)**]**

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FEBRUARY 2020

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INTRODUCTION

Under contract to Limtiaco Consulting Group and at the request of the Department of Land and Natural Resources (DLNR), Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey (AIS) study on a 10-acre portion of TMK: (3) 7-3-010:061 in Kalaoa 5th Ahupua‘a, North Kohala District, Island of Hawai‘i (Figure 1 through 4). Parcel 061 is 79.098 acres of undeveloped land consisting of open pāhoehoe lava with scattered fountain grass. The property is owned by the State of Hawai‘i.

The project area is located along the west coast of Hawai‘i Island, 1.5 km east of Kona International airport, and is situated between 200 and 225 feet (61 to 69 m) above mean sea level (amsl). The project area is bounded by Kaiminani Street to the north, by Laui Street to the west, by a privately owned commercial nursery and residential dwelling to the south, and by undeveloped open pāhoehoe grassland to the east. The property is accessible from both Kaiminani Street and Laui Street.

DLNR is proposing to build administration offices and a base yard on a roughly 5.0-acre portion of Parcel 061. The AIS study was conducted for ten acres, though the proposed project will only affect five acres or less. The point of contact for the project is Ms. Claire Oshiro of Limtiaco Group. The mailing address for Limtiaco Group is 1622 Kanakanui Street Honolulu, HI 96817. Ms. Oshiro can be contacted by email at claire@tlcghawaii.com or by phone at 808-687-8750.

The Overall Site Plan shows the development footprint of the project on the site (Figure 5). The Overall Site Plan also indicates the location of the Platform Site and Cave System and their proximity to the development. The development footprint has been pushed close to Kaiminani Drive, away from the archaeological sites in order to maintain a buffer zone. The scope of the geotechnical exploratory work is illustrated on the Site Plan (Figure 6). The yellow-green path indicates the approximate area to be cleared to provide site access for the drill rig, water truck, and other equipment required to complete the geotechnical work. The test sites are designated by a ‘B’ or ‘P’ with ‘B’ representing a Boring Site and ‘P’ representing a Percolation Test Site. These test sites were planned and aligned to reduce the amount of required site clearing. The geotechnical exploratory work is a minimum of 50’ from any documented archaeological sites.

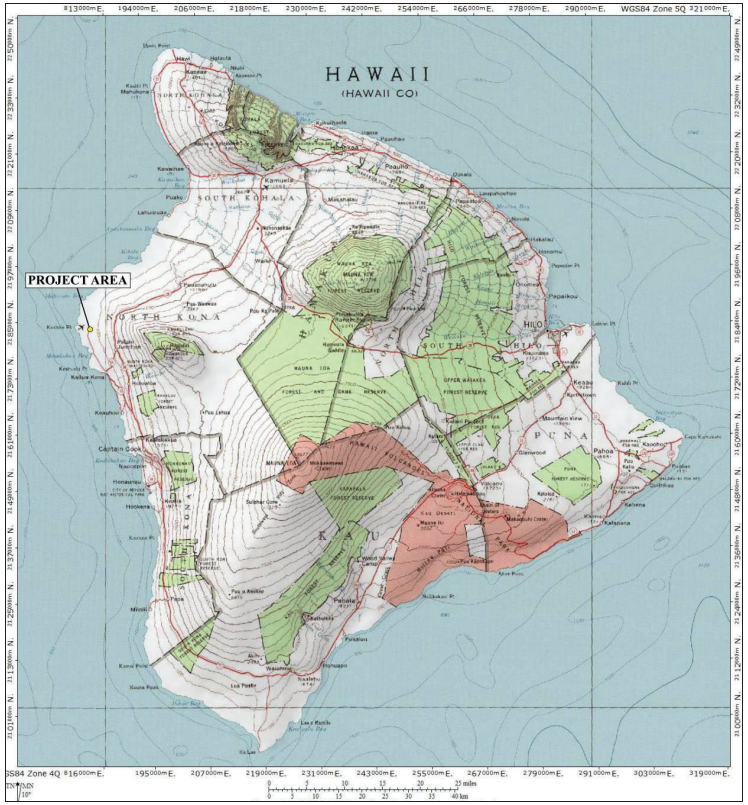

Figure 1: 5,500 K-Series Map of Hawai‘i Showing Location of Project Area (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

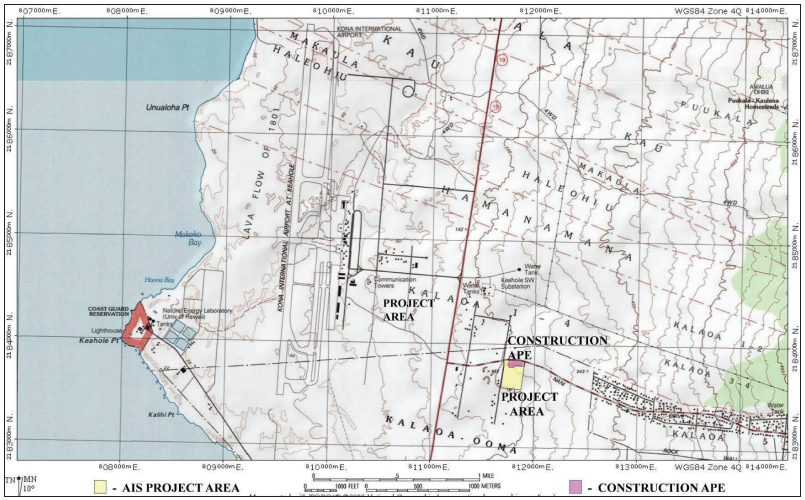

Figure 2: 7.5-Minute Series USGS Topographic Map Showing Location of Project Area (Keahole Point Quad) (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

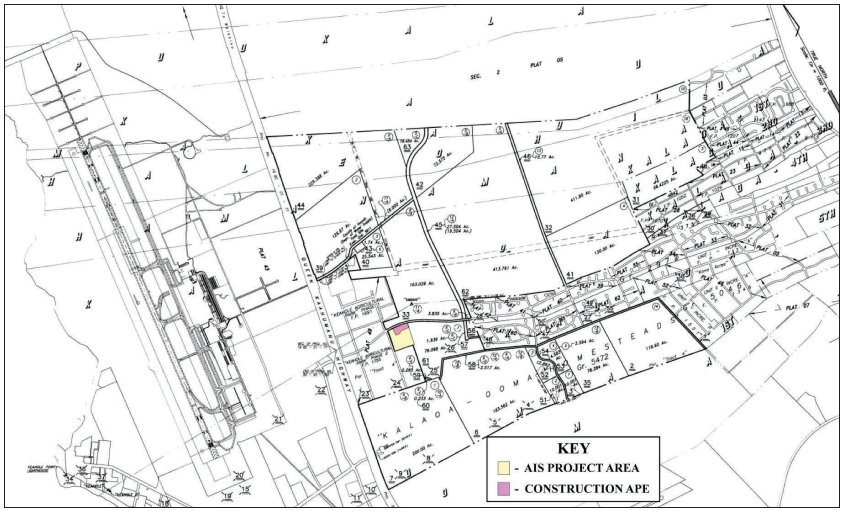

Figure 3: TMK: (3) 7-3-010 Map Showing Location of Project Area (Hawai‘i County Planning Department, 2019).

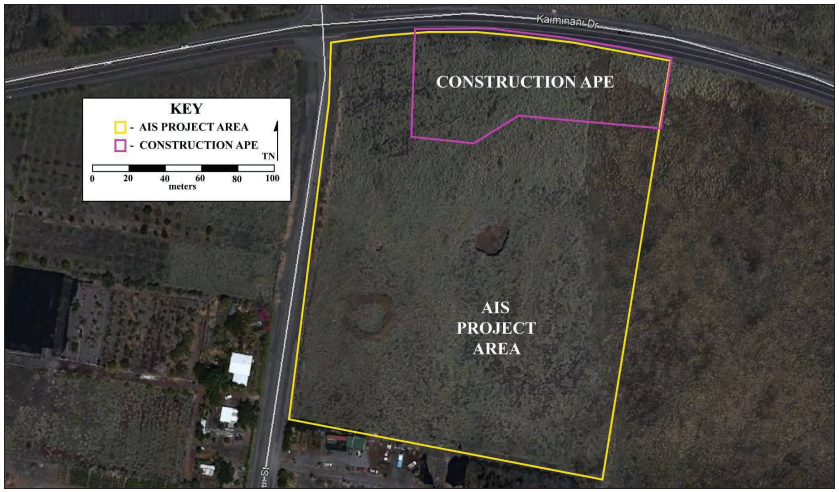

Figure 4: Aerial Photograph Showing Project Area, Kalaoa, HI, Zone 4 North, 911795 m E, 2183705 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

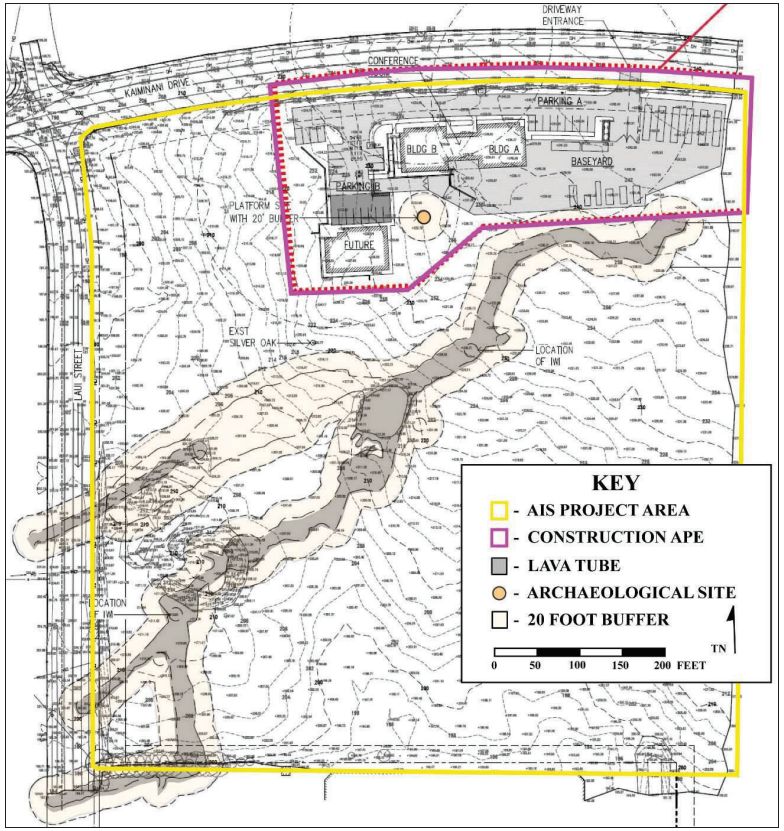

Figure 5: Preliminary DLNR Facilities Site Plan.

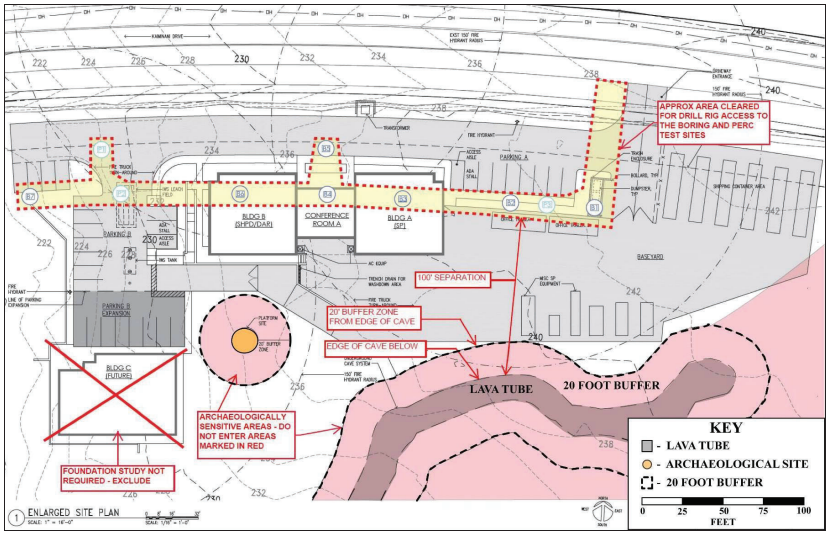

Figure 6: Large Preliminary DLNR Facilities Site Plan.

ENVIRONMENTAL SETTING

The project area is located in the arid coastal region of leeward Hawai‘i. The coastal region ground surface is characterized by bare pāhoehoe lava flows with extremely shallow rocky soil. There is sparse vegetation in the region due to lack of rainfall and lack of soil. The project area substrate is a Hualālai pāhoehoe lava flow (h1y series flow) dated to between 3,000 to 5,000 years before present (ybp) (Wolfe and Morris 1996:2).

The Soil Survey of Hawai‘i characterizes the project area ground surface as bare pāhoehoe (rLW Series) without soil cover and with minimal vegetation (Sato et al. 1973:34). Average annual rainfall at the project area ranges from 10 to 20 inches (DLNR 1986). Vegetation in the project area is dominated by *kiawe* (*Prosopis pallida*) and sparse fountain grass (*Cenchrus setaceus*) and a single small silver oak tree (*Grevillea robusta*) (Starr Environmental, 2013). The silver oak is an introduced invasive now commonly found growing in Kona.

METHODS

The archaeological inventory survey (AIS) was undertaken in accordance with Hawai‘i Administrative Rules 13§13- 275, and was performed in compliance with the Rules Governing Standards for Archaeological Inventory Surveys and Reports contained in Hawai‘i Administrative Rules 13§13-276.

ARCHIVAL RESEARCH

Prior to the commencement of field work, SCS conducted historical, ethnographic, and archaeological archival research at the Hawai‘i State Historic Preservation Division (SHPD) offices, Hawai‘i County Planning and Tax Records offices, the University of Hawai‘i at Hilo Library, the Waihona ‘Āina database, the Papakilo Database, and the Ulukau Hawaiian Library. The background research was used to determine the types and distribution of archaeological sites and features likely to be identified within the project area during fieldwork. The background research also provided a context for understanding and evaluating the significance of sites and features identified in the project area.

CONSULTATION

SCS Archaeologist Glenn Escott, M.A. consulted with the Office of Hawaiian Affairs (OHA) West Hawai‘i Island Representative, Shane Nelson. Mr. Nelson recommended consulting with additional families for the Cultural Impact Assessment (CIA) study conducted for the property.

FIELD WORK

The archaeological pedestrian survey included: 100% pedestrian survey of the 10-acre project area, plotting archaeological sites on USGS and TMK maps with Global Position System (GPS) Universal Transverse Mercator (UTM) units (Zone 4 North) using NAD83/WSGS84; individual site mapping, photographing and recording; and subsurface excavation and recording.

The pedestrian survey and site recording were conducted from May to June 2019 by Senior Archaeologists Glenn Escott M.A. and Suzan Escott, B.A. A total of 160-peron hours were required for the survey and site recording. The pedestrian survey extended 10.0 meters beyond the east boundary of the project area to search for nearby archaeological sites outside of the project area. A series of east/west transects spaced 2.0 meters apart were walked across the entire project area. Ground cover was open ground with areas of sparse grass. Ground visibility was excellent.

A single site datum was recorded for each site using a Garmin GPSmap 62 hand-held GPS unit. Site datum locations were drafted on site plan view maps. Site boundaries were determined by the extent of their features. Features in close proximity to each other that had similar construction methods and similar function and age interpretations were grouped together into sites.

Photographs were taken of sites and features using a 25 cm north arrow scale. Representative plan view maps showing the location and morphology of identified sites and features were drafted using tape-and compass mapping techniques. Site documentation included site and feature type, function, construction method, and age. Feature type, function, and age were determined by observing environmental context and topographic location, feature size and shape, construction material, construction methods, and associated artifacts if present. Feature types and functions were selected from a set of recognized formal archaeological types and functions developed within Hawaiian archaeology over many decades of research. Age determinations were expressed in terms of recognized formal eras including pre-Contact era

(before 1778), post-Contact era (1778-1850) Historic era (1851-1965), and Modern era (post-1965).

A single 1.0 by 1.0 m excavation unit was excavated in a surface platform (Site 31109) to record function and to ascertain its function and age. Subsurface test excavations were not conducted at other features for several reasons. Subsurface testing of pāhoehoe excavations (Site 31110) is not possible due to the lack of soil deposits.

Subsurface testing is conducted to determine the function and age of archaeological features. The function and age of the refuge cave features (Site #50-10-27-262) relocated during the current study were documented in a previous archaeological report (Hammatt and Folk 1988). Twelve trenches were excavated in the cave sink and within the lava tubes during that study. Based on artifact analysis and the results of seven basalt glass dating samples and one radiocarbon date (A.D. 1680-1712), Site 262 was determined to have been occupied during the late pre-Contact era. The age of the refuge cave is associated with a late pre-Contact era increase in warring in North Kona, South Kohala, and on Hawai‘i Island in general, as is well documented in several published historical accounts.

The refuge cave features that have deposits deep enough to excavate are composed of deep layers of basalt cobbles. Midden often falls through the rocks and settles near the bottom of the rocks. There is substantial mixing of early and late use artifacts in the process of settling, making it hard to provenience charcoal samples for radiocarbon dating. For example, a small artifact scatter was identified between one of the paved use areas within the open sink and the narrow overhang of the collapsed lava tube. The artifacts had sifted down through 1.5 m of cobbles from the surface of the paved use area and had collected on the tube floor. The artifact scatter contained fragments of charcoal, coconut shell, gourd fragments, marine shell, and fragments of plastic bags, clear evidence of the mixing of artifacts from different time periods.

Finally, it is recommended in this report that the refuge cave be preserved and that only non-intrusive data recovery might be conducted to minimize disturbance to the site during any future studies to record the lava tube features and artifacts in more depth. Limited testing in the use areas within the collapsed lava tube skylight and radiocarbon dating of samples within the shallow deposits on the lava tube floors could be conducted at that time.

PROJECT DOCUMENTATION

This AIS report contains all data generated during the AIS study and includes USGS and TMK maps, a summary of the project area environmental background, cultural and historical research background, consultation documentation, archaeological expectations, an inventory of all sites documented during the pedestrian survey, photographs and plan view maps of archaeological features, a summary synthesizing results, and significance assessments and recommendations for the archaeological sites.

CULTURAL AND HISTORICAL BACKGROUND

EARLY SETTLEMENT AND EXPANSION

Many archaeologists believe that Hawai‘i Island was first settled around A.D 1,000 by people sailing from the Marquesas (Athens et al. 2014; Dye 2011; Kahn et al. 2014; Kirch 2011; Kirch and McCoy 2007; McCoy 2005 and 2007; Mulrooney et al. 2011; Reith et al. 2011; Wilmhurst et al. 2011a and 2011b). An article published in the Journal of Archaeological Science reviewing radiocarbon dates recovered at archaeological sites on the Island of Hawai‘i suggests that, by relying on only carbon samples from short-lived plant remains, the most reliable dates point to initial Polynesian colonization of Hawai‘i Island occurring between AD 1220 and 1261 (Rieth et al. 2011:2747).

Initial settlement of Hawai‘i Island is believed to have occurred along the wetter and more fertile windward (*ko‘olau*) shores where conditions were optimal for marine and terrestrial exploitation (Maly and Maly 2006:7). This exploitation involved inshore and pelagic fishing, gathering shellfish from the shore, horticulture and animal husbandry, and the utilization of natural terrestrial flora and fauna (Kirch 1985; Kirch and Kelly 1975; Pearson et al. 1971; Maly and Maly 2006). The pattern of early windward settlement is thought to have consisted of widely spaced, permanent home bases that gradually expanded to form a nearly continuous zone of permanent settlement along the windward coasts as local populations grew.

The dry leeward shores of Hawai‘i Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the motives that lead to the establishment and spread of settlements on the leeward side of Hawai‘i, but archaeological evidence suggests the process was underway by the 1100s (Cordy 2000). Early radiocarbon dates have been obtained from coastal sites in Kona, South Kohala, at Kalāhuipua‘a and ‘Anaeho‘omalu, and from inland sites in the *ahupua‘a* of Waimea (Kirch 1979: 198, Cordy 2000: 130).

The early coastal settlements are located on, or adjacent to, the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jenson 1989a, 1989b, 1990a, and 1990b). The earlier phases of occupation were likely temporary habitations used when fishing, and later permanent habitations associated with fishpond production. Cordy suggests people who lived inland occasionally frequented the Kalāhuipua‘a and ‘Anaeho‘omalu area for its anchialine pond and marine resources (Cordy 2000:131). The implication is that, along the barren leeward coast,

inland settlements and agriculture may have developed first, perhaps spreading from nearby Waimanu and Waipi‘o. Maly suggests that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Maly and Maly 2002).

The fertile plain of Waimea and the area of Kona receive roughly 40 to 80 inches of rainfall annually and Waimea is watered by streams from the Kohala Mountains (the Waikōloa, Wai‘aka, and Keanu‘i‘omanō streams). Inhabitants of these areas planted taro and sweet potato for subsistence. Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000: 135). Leeward expansion away from the coastline, at least on a permanent basis, is believed to have occurred only with the development or improvement of dry-land cultivation methods, possibly spurred by the introduction of sweet potato. Current evidence suggests that significant inland leeward settlement did not occur until 600 to 900 years after initial settlement, *i.e.*, between AD 1100 and 1400 (Green 1980; Hommon 1976; Cordy 2000). At lower elevations in North Kona and South Kohala Districts, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. It is possible that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of sandy soil.

In South Kona, Waimea, and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s. Permanent communities were developing at Kona, Lapakahi, and along the coastal region from ‘Upolu Point to Kawaihae (Cordy 2000: 140). Temporary residences and an agricultural field system were also established in the mid-elevations of Kona and the uplands of the Waikōloa-Waimea area (Moffat and Fitzpatrick 1995, Maly and Maly 2002: 4). As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000: 142). Cordy notes that just north of the project area “two different settlement and political zones seem to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to ‘Upolu Point” (Cordy 2000:385, footnote 15). Kona also became an important political center south of the current project area.

By the late 1700s extensive permanent field systems were well established in the Kona area, North Kohala, Waimea, and Lālāmilo (Clark 1981, Clark and Kirch 1983, Cordy 2000). Lands of the current project area remained barren and unoccupied except for small fishing villages located at some distance along the coast.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai'a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

Current archaeological, linguistic, and ethnological data suggest that Hawaiian social organization initially followed a Polynesian conical clan-pattern in which individual status was based upon genealogical ranking (Green 1980:72). Kinship formed the basis for regional and island-wide societal integration; however, the most important social subsistence unit was the localized, territorial community-based, corporate kin group. Leadership within this group fell to the "highest ranking individual of the locally dominant, socially ranked lineage" (*ibid*:73). This individual acted as the local chief, overseeing the social, political, and economic functioning of the community.

The subsequent development of a uniquely Hawaiian institution, the *ahupua`a*, resulted in a more complex level of social and political integration (Cordy 1978; Hommon 1976; Green 1980; Kirch 1985). The *ahupua`a* was the fundamental land division in late pre-contact Hawai`i. Ideally this land extended from the coast to the mountains–often corresponding with a valley drainage–and thus theoretically crosscut all primary resource zones, allowing each *ahupua`a* relative economic self-sufficiency. With the emergence of the *ahupua`a*, however, production shifted from the kinship-based relationship between chief and community to an incipient state-structured hierarchy. On his succession, the paramount chief chose the best lands for himself, and allocated the rest to his…

> warrior chiefs who had assisted in his conquests…[who], after retaining…land for themselves, reallotted the remaining lands to the inferior chiefs, who in turn reallotted portions of their lands to their own followers [and so on] down the scale to the lowest tenants, the common farmers who actually tilled the soil [Chinen 1961:7].

The chief (*konohiki*) responsible for the *ahupua'a* was now a member of a non-localized ruling elite (*ali'i*) and extracted rents or tribute from the common people (*maka`ainana)* working the land. "All of these allotments to lands, from warrior chiefs down to the commoners, were on a revocable basis," and Chinen wryly notes that, "what the superior gave, he was able to take away at pleasure" (*ibid*).

***WAHI PANA* (LEGENDARY PLACES)**

The most informative *mo'olelo* describing events that took place in the barren lands of North Kona District is The Heart Stirring Story of Ka-Miki (*Ka'ao Ho'oniua Pu'uwai no Ka-Maiki*) recorded and published between 1914 and 1917 in the weekly Hawaiian Newspaper *Ko Hōkū o Hawai'i* and translated by Maly (excerpts cited in Maly 1992). The *mo'olelo* is set in the 1300s, though it is an early 20th Century collection of narratives about local traditions, tales, and family histories. The tales do have some time depth as they have been handed down through generations. They contain a mixture of "ancient" and 20th Century descriptions of the areas through which Ka-Miki and his brother Maka-'iole traveled. Descriptions of three places related to the current project area, Hale'ohi'u, Kalaoa, and 'O'oma, are described in the story.

The lands of Kalaoa was named after Chiefess Kalaoa Pu'umoi (Pukui et al. 1976:75) who was well known for her expertise in competitive riddling. Hale-'ohi'u is translated as "house made with a thatching shuttle". Kalua'ōlapa was the priest of Hale'ohi'u and Kamāhoe, also referred to as Nā-Kalaoa-wai'ole, translated as "the waterless Kalaoa lands" (Maly 1992:220). Kalua'ōlapa dwelt along the *'ilima (Sidafallax)* covered upland plain of Māulukua. Ka'elehuluhulu is the name of the land, Hale'ohi'u is the sub-district, Kanāhāhā is the fishing ground, and Keawehala is the landing (ibid: 220). 'O'oma is also only mentioned for its famous fishermen (ibid: 386).

EARLY ACCOUNTS OF PREHISTORIC EVENTS IN NORTH KONA

There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands. Cordy notes that the "oral traditions are silent" for the years of early settlement of and expansion along the leeward shores of Hawai'i (Cordy 2000: 130). The little

information that does exist concerns the activities of *ali'i* and was collected and published by Fornander, I'i, and Kamakau.

Hale'ohi'u is the only area within the project area to be mentioned in these early accounts. Hale'ohi'u was a well-known fishing village at the time of 'Umi-a-liloa (Kamakau 1992:216) and is a well-known place to catch "sweet-tasting *aku* fish" up through the time of Kamehameha (*ibid*:185). During the fourth year of Kamehameha's reign, he was advised by a *kaula* (a seer devoted to Pele) to go to Kekaha to make sacrifices to Pele in order to stop the lava flow threatening his fishponds and the homes of the people in the area. The lava had already flowed through the adjacent lands of Mahai'ula, Ka'ūpūlehu, and Kīholo. It was believed that Pele desired *awa* from the fishponds of Ka'ūpūlehu, the *'ahi* of Kīholo, and the *aku* from Hale'ohi'u and Ka'elehuluhulu. The flow stopped soon after Kamehameha made sacrifices to Pele.

Descriptions of lands both north and south of the project area are brief. 'Ōhiki is a stretch of sand and Kaloko has a large walled fishpond (*ibid*:56). 'O'oma is also mentioned by Kamamkau, but only as an out of way place, where the prince Ke-aweawe'ula was raised until he was five years old. (*ibid*:264).

HISTORICAL NARRATIVES, THE *ALI'I*, AND WARFARE IN THE REGION

Historical narratives set near the project area describe battles between warring *ali'i*, land traversed by warriors, and the place names where battles were fought. There are three accounts of historical events that took place near the project area between the 14th and 18th centuries. The events are documented by Fornander (1996), Kalākaua (1990), Kamakau (1961), and Malo (1951), and are treated in detail by Maly and Maly (2002).

The first event is the 14th century battle between Kamiole, a Ka'ū chief and Kalapana, the son of Kanipahu the sixth *mō'ī* of the Pili line. Kamiole and his warriors, reinforced by warriors from Kona, Hilo, and Puna had previously defeated Kanipahu at Kohala. Kalapana, with the aid of chiefs from Kohala and Hāmākua met Kamiole at 'Anaeho'omalu and defeated him.

The second historical event that took place near the project area is the battle between Lonoikamakahiki (ruler, A.D. 1640-1660) and rebel chiefs (most notably his elder brother Kanaloa-kua'ana) encamped along the shore at 'Anaeho'omalu. Lonoikamakahiki and his Kona warriors were joined by forces from Ka'ū at the border of Kohala and Kona, on inland 'Anaeho'omalu.

> The next day Lono marched down and met the rebels at the place called Wailea, not far from Wainanalii, where in those days a watercourse appears to have been flowing. Lono won the battle, and the rebel chiefs fled northward with their forces. At Kaunooa, between Puakō and Kawaihae, they made another stand, but were again routed by Lono, and retreated to Nakikiaianihau, where they fell in with reinforcements from Kohala and Hamakua. Two other engagements were fought at Puupa and Puukohola, near the Heiau of that name, in both of which Lono was victorious (Fornander 1996:120-121).

A third battle was fought at Waimea during the reign of Lonoikamakahiki. The king of Maui (Kamalālāwalu), desiring to take over the Island of Hawai'i, sent spies to discover the best place from which to launch an attack (Kamakau 1961:56). They returned after investigating the shores of Hawai'i and reported that Kohala would be easy to capture as the inhabitants lived only on the coast and were few in number (*ibid.*).

Kamalālāwalu and his forces captured Puakō, and mislead by two old men of Kawaihae, marched to the dry grassy plain of Waimea (Waikoloa), and the hills of Hōkū'ula and Pu'u 'Oa'oaka to await the warriors of Hawai'i. The warriors of Hawai'i took several routes to Waikoloa and stationed themselves around the forces of Maui. Fornander records:

> After Kama-lala-walu's warriors reached the grassy plain, they looked seaward on the left and beheld the men of Kona advancing toward them. The lava bed of Kaniku and all the land up to Hu'ehu'e was covered with the men of Kona. Those of Ka'u and Puna were coming down from Mauna Kea, and those of Waimea and Kohala were on the level plain of Waimea. The men covered the whole of the grassy plain of Waimea like locusts. Kamalalawalu with his warriors dared to fight. The battlefield of Pu'oa'oaka was outside of the grassy plain of Waimea, but the men of Hawaii were afraid of being taken captive by Kama, so they led (Kamalalawalu's forces) to the waterless plain lest Maui's warriors find water and hard, waterworn pebbles (Kamakau: 1961:58).

The two armies only skirmished in the beginning, soon turning to full battle, and a final route of the forces of Maui (Kamakau 1961). Almost all of the chiefs and warriors of Maui were slain either on the field of battle or at the Kawaihae shoreline.

The altar (*Ke Ahu a Lono*) at the coastal boundary between Kona and Kohala is often described as an alter for "the warrior leaders and warriors of Lonoikamakahiki, built at the time he went to battle with Kamalalawalu" (Kihe in *Ka Hoku o Hawaii* Jan. 31-Feb. 14, 1924, translated by Maly and Maly (2002: 15). A second account ascribes *Ke Ahu a Lono* to the restoration of friendship between Lonoikamakahiki and Kapaihiahilina. Lonoikamakahiki built the *ahu* for offerings made to consecrate their reconciliation. The *Ahu a Lono* was also the place where offerings were gathered during the *Makahiki*.

Kamehameha also built (or rebuilt) Puʻukoholā *heiau*, possibly completed by 1791, *mauka* of Mailekini *heiau* above Kawaihae (Kamakau 1961:154-155, Cordy 2000:338). It has been suggested the *heiau* construction undertaken by Kamehameha was a reconstruction of a previously built *heiau* that was re-consecrated to his god Kūkāʻilimoku (Kinney 1913: 43 and Kamakau 1961: 154). Kamehameha and his chiefs resided in Kawaihae during the construction and after, from 1792 to 1796 (Maly and Maly 2002: 16). Lonoikamakahiki, Alapaʻinui, Keaweʻāpala, and numerous lesser chiefs often visited and stayed at Kawaihae, Puakō, and Waimea (Kamakau 1961: 182-183).

EARLY HISTORIC ERA LAND USE

William Ellis described two trips he made between Kawaihae and Kailua. He traveled by boat during the first trip and only remarked on the coast to say it was "a rugged and barren shore of lava" (Ellis 2004:83). During his second trip, Ellis traveled by canoe from Kawaihae to Kailua. He left the former at six in the morning, stopped at Kapalaoa around 9:00am, and arrived in Kīholo around 4:00pm. He described Kīholo as "a straggling village, inhabited principally by fishermen" (Ellis 2004:418). He also described the large fishpond created by order of Kamehameha at that village. He left Kīholo just before sunset and arrived at Kaʻūpūlehu between 7:00 and 8:00pm. He records little about the village except that everyone was asleep. When the moon had risen, by 11:00pm, he continued his journey by moonlight, arriving in Kailua an hour before sunrise. In all Ellis makes little description of the coastal area of North Kona District, perhaps because he was traveling at night.

Isabella Bird, who traveled from Kailua to Kawaihae some fifty years later described the coastal region by writing, "We sailed for some hours along a lava coast, streamless, rainless, verdureless, blazing under the fierce light of a tropical sun and some time after noon anchored in the scorching bay of Kawaihae" (Bird 2007:144).

THE MĀHELE (1845-1850)

With the Māhele of 1848 and the two Acts of 1850, authorizing the sale of land in fee simple to resident aliens and the award of *kuleana* lands to native tenants, land tenure in Hawaii arrived at a significant turning point (Chinen 1961:13). Article IV of the Board of Commissioners to Quiet Land Titles was passed in December 1845 and began the legal process of private land ownership. Through the Māhele of 1847-48 and the Kuleana Act of 1850, land was made available for private ownership.

The Māhele established a board of five commissioners to oversee land claims and to issue patents and leases for valid claims. Many scholars believe that Kauikeaouli (Kamehameha III) was forced to establish laws in order to protect Hawaiian sovereignty and crown lands from foreigners who had already begun claiming ownership of land they were granted permission to use for homes and business interests (Daws 1968:111; Kameʻeleihiwa 1992: 169-70, 176; Kelly 1983: 45; Kuykendall 1938(1): 145 footnote 47, 152, 165-6, 170;). Among other things, the foreigners were demanding private ownership of land to secure their island investments (Kameʻeleihiwa 1992: 178; Kuykendall 1938(1): 138, 145, 178, 184, 202, 206, 271).

As legal statutes defining the Māhele continued to evolve (up to 1850), the lands of the kingdom of Hawaiʻi were divided among the king (crown lands), the *aliʻi* and *konohiki*, and the government. Once lands were thus divided and private ownership was instituted, the *makaʻāinana* (commoners), if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living as stipulated in the Kuleana Act (1850). These claims, however, could not include any previously cultivated or presently fallow land, *okipuʻu*, stream fisheries, or many other resources traditionally necessary for survival (Kameʻeleihiwa 1992:295; Kelly 1983:45-76; Kirch and Sahlins 1992 vol.1:3, 135-137, and vol.2:2).

The right of claimants to land was based on the written testimony of at least two witnesses who could corroborate the claimant's long-standing occupation and use of the parcel(s) in question. The claimant might have been awarded a patent for the property, subsequently called Land Commission Awards (LCAs) (Chinen 1961:16).

It appears that the vast majority of Kalaoa 5th Ahupaʻa became government lands during the Māhele. There were only two LCAs awarded in Kalaoa 5th Ahupaʻa (Maly 1993:32-33). There are no maps showing the location or boundaries of the two LCAs, but they both appear to have been in the uplands near to Māmalahoa trail and *mauka* of it (above 1,800 ft amsl).

LCA 7899, an area of land 60 fathoms (360 ft) in circumference, was awarded to Kupae (Kupuae or Kupuoe). Testimony given in support of LCA 7899, describes it as mauka Kalaoa 5th in the *'ili* of Kamo or Kaweo or Kawao. The claim included a house lot with one house and 12 partially cultivated garden plots. There were also eight garden plots claimed in Kalaoa 4th as part of LCA 7899.

LCA 7937, an unspecified area of land, was awarded to Kukaaui. Testimony given in support of LCA 7937, describes it as in the *'ili* of Kahuku, in the corner of Kalaoa 5th Ahupa'a. There were nine garden plots, eight of which were partially cultivated. The testimony suggests that some of the gardens were in Kalaoa 4th Ahupua'a.

In the early1900s, the *makai* lands of Kalaoa 5th, 'O'oma 1st and 'O'oma 2nd Ahupua'a were surveyed and mapped as part of a plan to sell homestead lots. The current 10-acre project area appears to be a portion of 55.60-acre Lot 9B. It does not appear that Lot 9B and surrounding lots were sold, as much of the property remained government lands.

MODERN LAND USE

The introduction of fee simple land ownership and commercial ventures in cattle ranching, sandalwood collection, supplying whaling vessels, and the cultivation of coffee, sugarcane, and other food crops greatly changed land-use patterns, settlement patterns, and cultural practices. The introduction of commercial economic practices further spurred on these rapid changes. Cattle ranching in particular either restricted or limited the use of entire *ahupua'a* from the traditional land tenure and horticultural regimes.

The dry barren lands of the current project area had limited use from the time of settlement on the leeward side of the Island of Hawai'i up to the modern era. Land use was restricted to small coastal settlements focused on fishing, and trail systems situated between these coastal villages and larger, socio-politically important populations centered in Kawaihae to the north and Kona to the south. During the post-Contact era, the wetter upland regions on either side of the Māmalahoa trail were settled as homesteads with home gardens. The Māmalahoa trail and associated features (*ahu* and two habitation sites) are the only major cultural resources located in the general vicinity of the current project area, and none of these will be impacted by the proposed improvements documented in this report.

The following interview conducted February 12, 2009 with Aunty Josephine Palacat Barney of Kona documents her knowledge of the coastal area from Kohanaiki to Kailua-Kona during the period from 1925 to 1935. The interview was part of a cultural impact assessment (Escott and Spear 2009) for lands of the Kona International Airport. The information she provided paints a vivid image of life along the arid coastal region of North Kona.

Josephine is the daughter of Palacat Catalino (father) and Pararat Philipa (mother) of the Philippines. Palacat Catalino arrived in Hawai'i in 1912 at the age of 15. Pararat Philipa was brought to Hawaii by her adoptive father. Palacat Catalino and Pararat Philipa met in Onomea when she was 14. He was a field supervisor for Hamakua Sugar. They later married and moved to Kona.

Josephine is one of fifteen children. She is fifth born and the oldest girl. They lived in Kaloko, Honokohau, and Kohanaiki between 1925 and 1935 during which time her father was the supervisor of the *opae* ponds. He was hired to care for and maintain the ponds and was responsible for keeping them in pristine condition, for all people had the privilege of using the shrimp without permission. The fish in those ponds such as *awa* and mullet were the property of the person leasing the ponds, and only they had access to them. Most land in the area belonged to Greenwell's HueHue Ranch, so the ponds were probably leased through them. Other individuals would help clean the ponds, removing algae and debris. The algae was burned so it didn't make its way back into the pond.

The Palacats first beach house was just south of the Kaloko fish pond. They also lived in homes along the beach in Honokohau and Kohanaiki. They used the tax trail (Mamalahoa Trail) and traveled by donkey up and down the coast. By that time the trail was no longer used for collecting taxes. That ended after Kamehamehas death. They traveled north on the trail to Kalaoa to gather taro and breadfruit, and south to Kailua.

The house they lived in at Kohanaiki was already standing when they arrived (Figure 7). It was a ranch house that Josephine's father proceeded to repair and enlarge. They began their stay there in 1930 and continued on there until 1935. The house belonged to the Greenwell's, and was probably obtained through payment of unpaid taxes. The Keanaaina family claimed that land. At one time they lived there because they have two family members buried there. This was before the Palacats lived there.

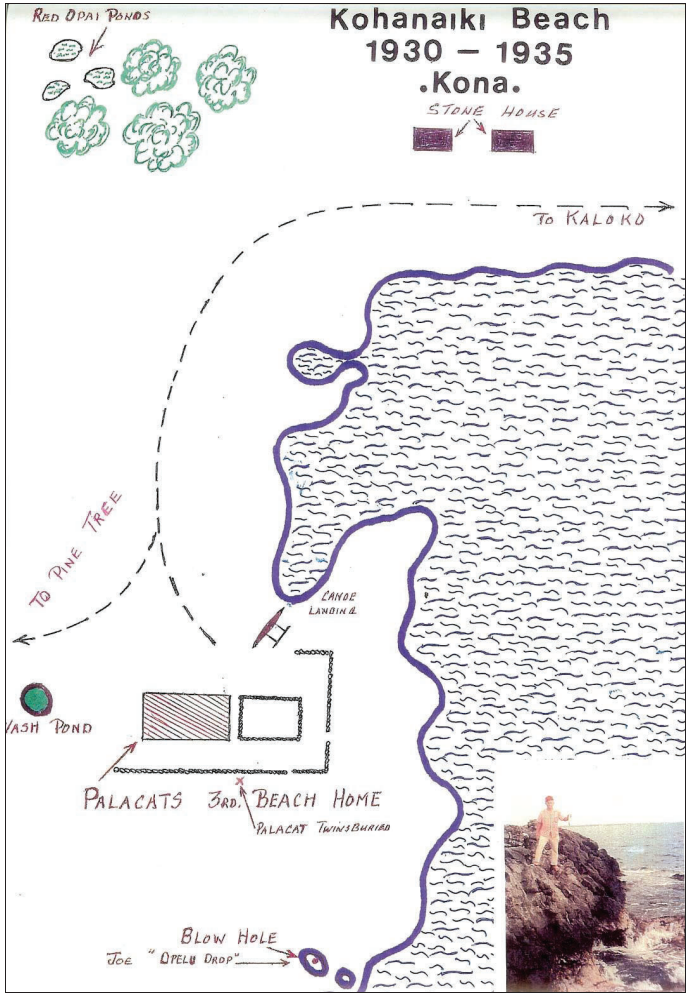

Figure 7: Palacat House at Kohanaiki Drawn by Mr. Joseph Palacat (in photo).

There was once a village near there prior to the 1801 lava flow. The flow stopped before it got to the ocean. The legend is that Kamehameha was concerned about the village taken by Pele, and feared that she was headed for Kailua. Kamehameha went to Hualalai but forgot *ho'okupu* (gifts). All the Kahuna were with him, and he asked them to make peace with Pele. As he had forgotten the gifts, he grasped his hair and cut it off as he was chanting and the lava stopped flowing.

During the Palacats stay at Kohanaiki, only one other family lived in the area. Pedro Espigata was from the same province in the Philippines as Josephine's father, so they were good friends, and he and his family moved wherever the Palacats happened to be.

When the Palacats moved to Kaloko, the Espigatas moved to Kaloko. When the Palacats moved to Kohanaiki, the Espigatas moved to Kohanaiki. And when the Palacats moved to Kailua, the Espigatas moved there, too. He was married to Sarah Pai. She was very dedicated to her name because she was a descendent of an old Hawaiian Chief named Pai from ancient times. She was part Hawaiian, but also had ancestors from the Philippines, China and Portugal. She and Pedro had several children. There were no other individuals living near there during that time.

People at that time had respect for one another and for the *'aina*, and fishermen had respect for the ocean, as well. If a person used something, they were compelled to give something back in return. There were fishing traditions like the *Opelu Koa*. There were several on the west side of the island. The tradition was to fish one, then skip one. Then fish the next, and skip the one after that. Later, on there way back down the coast, they would feed the ones that they skipped. The next time they went fishing they would fish the ones that were skipped the last time.

There was a tradition that was practiced so that the shrimp were not depleted. *Kauna'oa* flower (*Cuscuta sandwichiana*), which is also called the flower of Lāna'i is orange in color. It used to be plentiful along the coast, but the only place that it still exists is Makalawena. To chum the fish, it was customary to use a piece of cloth the size of a men's handkerchief.

Josephine used soil from the base of the *kiawe* tree (*Prosopis pallida*) made into mud, a pinch of shrimp and the orange *kauna'oa* flower. The handkerchief was closed up and thrown out into the water. The handkerchief opens, the dirt forms a cloud, then the fish feed on the *kauna'oa* because it's the same color as the shrimp. There was no need to deplete the shrimp population. This is not practiced by fishermen today, because there's not a fisherman alive today

that has learned or even knows about this technique. Josephine and her brother remember this. Her sister doesn't because she wasn't involved.

Fish *imu* at Honokohau. Depending on the currents, Josephine's brother would go out and make fish *imu*. He would take rocks and depending on the way the waves were breaking, he would construct a mound, setting the rocks in such a way so that the waves wouldn't disturb them. Once the fish made a home there, inhabiting the rocks, a net could be thrown over it to catch the fish. In those days, those who fished using this method were free to use any *imu*, but were obligated to rebuild it for the next person to use. People at that time were respectful of others and of their efforts. There were strong notions concerning keeping things the way they were and putting things back, and not being disruptive.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

More than 50 archaeological studies have been conducted in the region of the current project area (Figure 8). Archaeological evidence suggests the broad *ahupuaʻa* settlement pattern for the area is one of small coastal villages established from A.D. 1000s through A.D. 1400. Initial habitation sites were seasonal and were associated with fishing. Limited horticulture may have been practiced at coastal sites at this time. From the 1400s to the early historic period, there appears to be a limited expansion in the middle to upper reaches of the upland forest zone. Expansion in the upland zone is associated with dryland swidden agriculture (Henry *et al*. 1993:56). Likely dryland crops consisted of taro, sweet potatoes, gourds, breadfruit, bananas, paper mulberry, *ti*, and sugar cane. During the historic era, there was increased population growth in the upland forest zone associated with the development of homesteads involved in the growing of coffee and sheep and cattle ranching. The barren zone does not appear to be a permanent habitation zone at any time in history.

Barren zone archeological features include pāhoehoe excavations, trail segments, *ahu*, and small rock pavements, small temporary habitation c-shape enclosures, and lava tubes (refuge caves and temporary habitation along trail segments). Sites suggesting resource extraction include excavated lava blisters, likely for the production of abraders. Other blister excavations appear to have been created while hunting nesting birds, or collecting eggs and chicks. Feature distribution is extremely sparse in this zone.

There are three previous archaeology reports that include portions of the current AIS project area. Davis (1977) conducted an archaeological reconnaissance survey of the Keahole Agricultural Park, just *mauka* of Queen Kaʻahumanu Highway across from Kona International Airport (Figure 9). Hammatt and Folk (1980) conducted additional reconnaissance survey and excavations in the Keahole Agricultural Park (Figure 10). The study included reconnaissance survey of land north of the Davis (1977) project area and Phase II inventory survey-level recording, excavations, artifact analysis, and basalt glass dating at sites previously identified during the Davis (1977) reconnaissance survey. PHRI, Inc. conducted an archaeological assessment study (Henry et al. 1993) of a large project area adjacent to the current AIS study (Figure 11). The study included aerial helicopter survey and pedestrian survey of 11.5% of the 2,640-acre State-owned land.

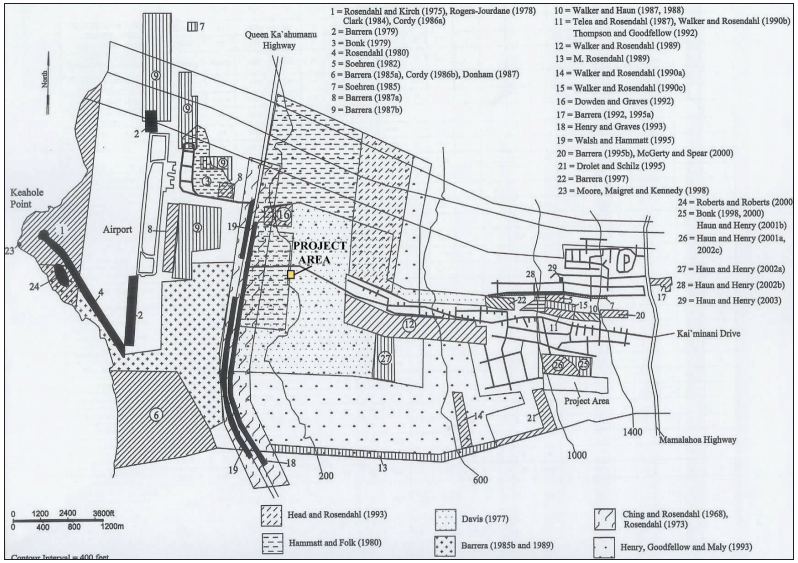

Figure 8: Map of Previous Archaeology Showing Current AIS Project Area (Adapted from Haun and Henry 2004).

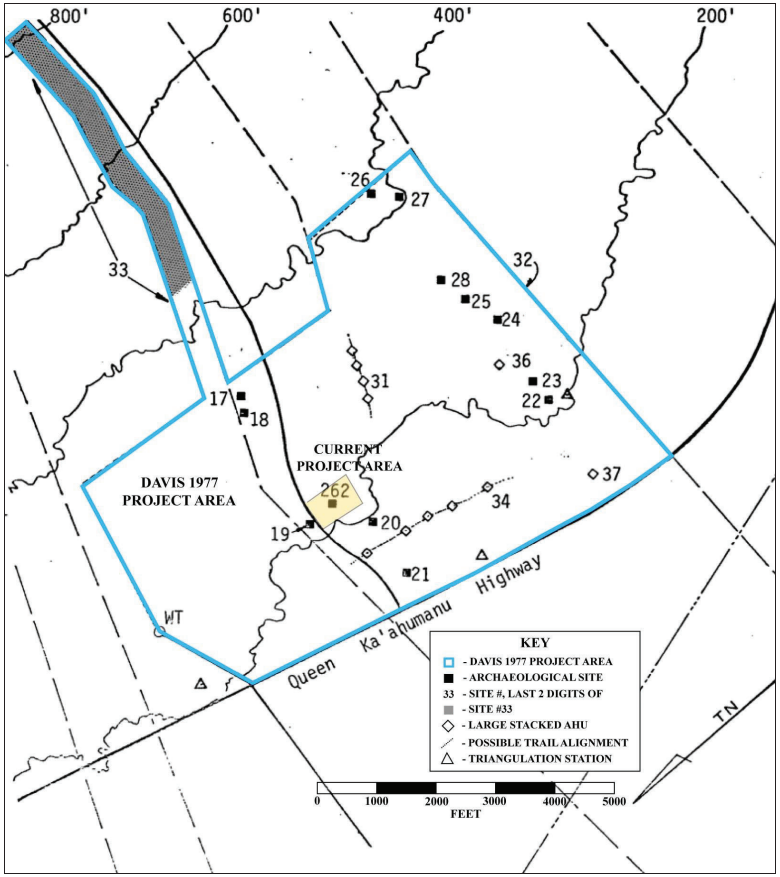

Figure 9: Map Showing Location of Davis (1977) Project Area and Current AIS Project Area (Adapted from Davis 1977:22).

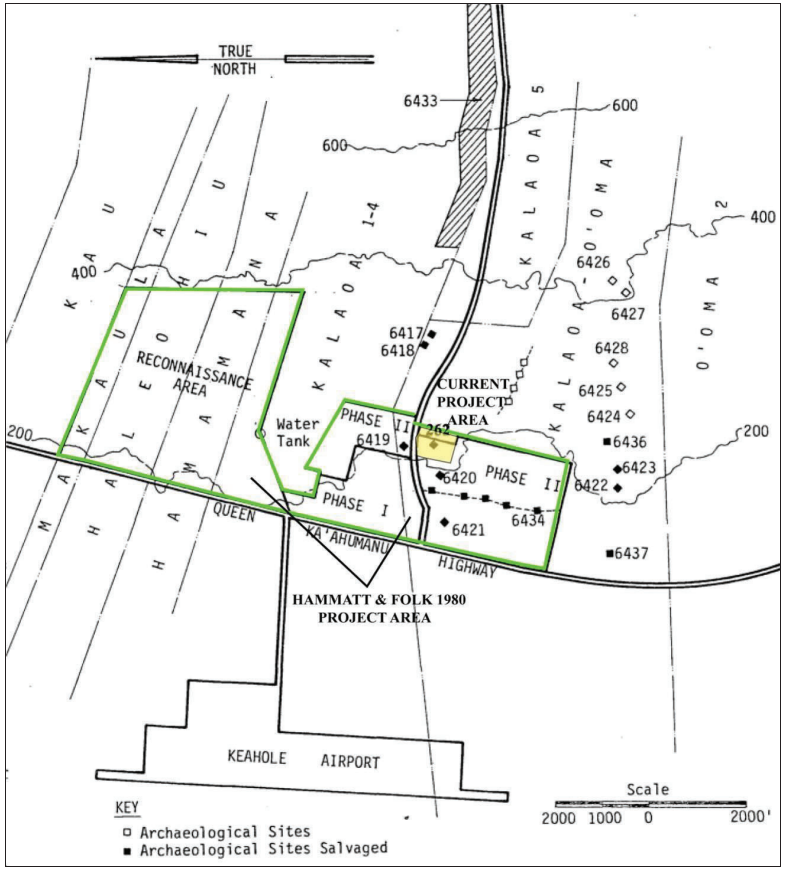

Figure 10: Map Showing Location of Hammatt and Folk (1980) Project Area and Current AIS Project Area (Adapted from Hammatt and Folk 1980:6).

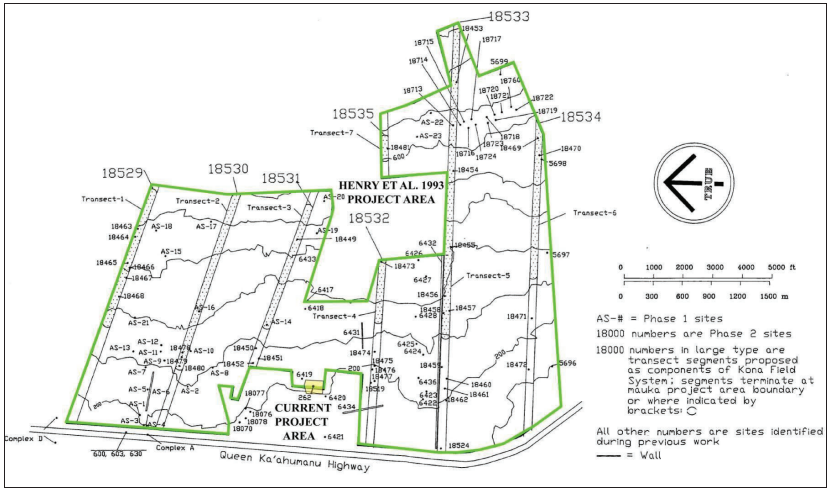

Figure 11: Map Showing Location of Henry et al. (1993) Project Area and Current AIS Project Area (Adapted from Henry et al. 1993:59).

The archaeological reconnaissance survey report written by Davis (1977) documented 22 sites with 59 features (see Figure 9). Sites included rock mound markers possibly marking trails, habitation sites within lava skylights (sinks) and lava tubes, and a large refuge cave site (Site #50-10-27-262, located in the current AIS project area). The report site descriptions summaries were very brief and there were no excavations conducted during the study, making it difficult to assess the nature of many of the habitation sites recorded during the study.

The Phase II inventory survey level recording and excavation conducted by Hammatt and Folk (1980) at 12 sites identified in the Davis (1977) report (see Figure 10). The Phase II report includes in-depth documentation at seven sink and cave sites (Sites #50-10-27-262, 6418, 6418B, 6420, 6421, 6422, and 6423), a Historic era homestead (Site #50-10-27-6418), a habitation complex of indeterminate age (Site #50-10-27-6419), and three sites containing possible rock mound markers (Sites #50-10-27-6434, 6436, and 6437).

Three radiocarbon samples collected at the sites returned a date range of A.D. 1400-1700. Thirteen volcanic glass samples submitted for rind-hydration dating returned a date range of A.D. 1480-1808. An interesting finding of the study is the larger than anticipated number of habitation sites in sinks and lava tubes, and the presence of the large refuge cave complex (Site 262, located in the current AIS project area) containing two burials. The in-depth site documentation, site mapping, subsurface testing, dating, artifact analysis, and conclusions conducted during the study were conducted to a very high professional level. The only omissions are USGS and TMK maps showing the locations of sites; site and feature photographs; and site significance assessments, all of which are now SHPD required in AIS reports.

The archaeological assessment study conducted by PHRI, Inc. (Henry et al. 1993) covered an area of 2,640 acres. Fieldwork included aerial helicopter survey and pedestrian survey of 11.5% of the 2,640 acres. Twelve previously identified sites and eleven newly identified sites were recorded during the aerial survey and 42 new sites were identified during the pedestrian survey. Site types included habitation complexes, rock alignments, enclosures (C-shape, L-shape, and rectangular), modified lava tubes, modified outcrops, enclosures, rock filled cracks, a terrace, modified blisters and depressions, rock mounds, pāhoehoe excavations, rock pavings, platforms, petroglyphs, rock walls, and trail segments. The authors note that there exists a surprisingly larger than anticipated number of habitation and agricultural sites in the barren zone, though site density is much lower below 300 ft amsl. Also, unanticipated is the relative lack of trails and other transportation features.

PROJECT AREA EXPECTATIONS

Based on historical/archival resources and previous archaeological studies, and the fact that the project area is within the arid barren zone and below 300 ft amsl, it is likely that rock mound markers, pāhoehoe excavations, cave and sink temporary habitation features, petroglyphs, and temporary habitation enclosure features will be located within the project area. Given that the distribution of these features is very sparse below 300 ft amsl, it is most likely that few, if any features will be located in the current project area. The one exception is a refuge cave (Site 262) located in the center of the project area.

RESULTS OF FIELDWORK

A single previously documented site (Refuge Cave Site #50-10-27-262) and two new archaeological sites (Site #50-10-27-31109 and Site #50-10-27-31110) were recorded within the current 10-acre project (Figure 12 and Figure 13). Site 31109 is a rectangular rock mound located in the northeast quadrant of the project area. Site 31110 is a group of pāhoehoe excavations located in the southwest quadrant of the project area.

SITE #50-10-27-262	**LAVA TUBES AND SINK**
FUNCTION:	Habitation and Burial
AGE:	Pre-Contact Era
DIMENSIONS:	Length: 320.0 m NE/SW; Width: 50.0 m maximum
CONDITION:	Good
INTEGRITY:	Unaltered: retains integrity of location, setting, feeling, materials, and workmanship
SURFACE ARTIFACTS:	Midden
EXCAVATION:	Trenching (Folk and Hammatt 1980)

DESCRIPTION: Site #50-10-27-262 is a lava tube habitation complex and refuge cave located in a sink at the center of the project area at an elevation ranging between 200 and 220 ft amsl (see Figure 12 and Figure 13). Vegetation surrounding the sink is fountain grass. The sink is the open collapsed portion of a lava tube underneath a pāhoehoe flow. There are three lava tubes (north, south and west tubes) accessed through the sink. The south and west tube entrances are behind a large refuge wall constructed of large boulders to restrict access to the tubes. Site 262 was very thoroughly documented in Hammatt and Folk (1980).

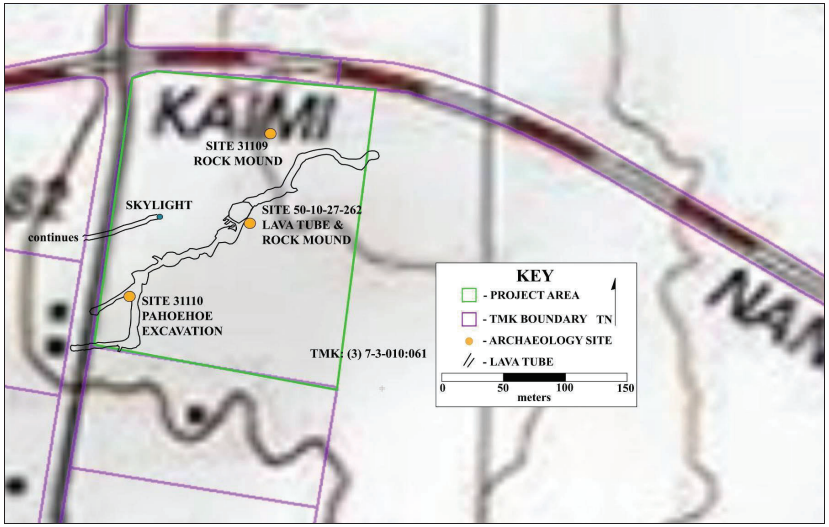

Figure 12: 7.5-Minute Series USGS Topographic Map Showing Location of Project Area Keahole Point Quad) (National Geographic Topo!, 2003. Sources: National Geographic Society, USGS).

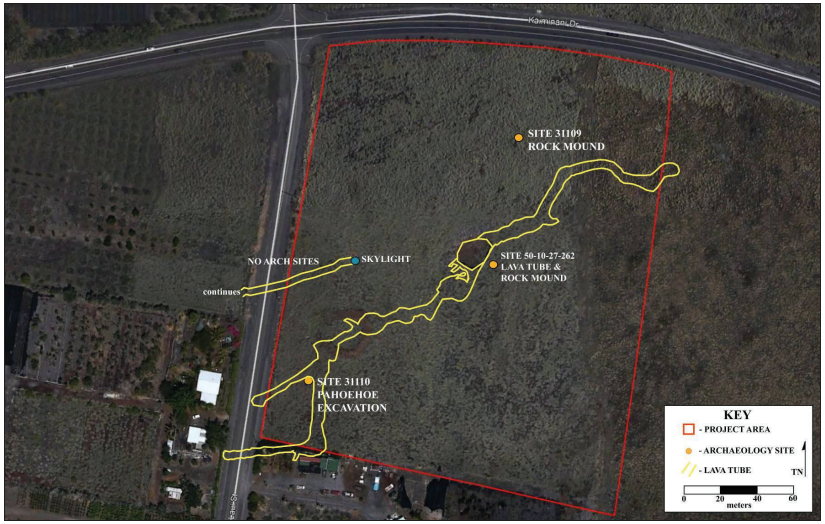

Figure 13: Aerial Photograph Showing Project Area Archaeological Sites, Kalaoa, HI, Zone 4 North, 911795 m E, 2183705 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

SCS archaeologists took that site documentation into the field in order to ground-truth it and to record additional information. The Hammatt and Folk (1980) plan view maps were found to be correct and detailed. The Site 262 summary below closely follows the Hammatt and Folk (1980) site summary and includes newly documented information. The Hammatt and Folk (1980) plan view maps were updated to show the entire lengths of the north and south tubes and ceiling heights were added to those figures.

The Sink Area

The Site 262 sink is a large collapsed section of a lava tube that forms a roughly oval depression in the surrounding pāhoehoe (Figure 14). The resulting sink area is 21.0 m long (NE/SW) by 15.0 m wide (NW/SE) and is between 1.5 to 3.0 m deep below the surrounding ground surface. The upper edge of the sink is high enough to prevent access into the sink, with the exception of a 1.5 m high low spot on the west edge of the sink that is naturally stepped allowing easy access to the sink floor. The low spot is the primary access point into the sink.

The floor of the sink is covered with angular, subangular and slabby pāhoehoe cobbles and small boulders from the collapsed lava tube ceiling. Larger rocks are concentrated around the rim of the sink and are scattered less densely across the remainder of the sink floor. The floor of the sink has been extensively modified by collecting the larger rocks to create alignments and terraces, by filling and leveling with smaller rocks to construct level rough paved use areas near the north and south lava tube openings, and to create rough paths between the two tube openings.

There are two rock alignments oriented northwest/southeast that divide the upper use areas near the north tube from the lower use areas near the south tube entrance (see Figure 14 and Figures 15 through 17). The two rock alignments divide the sink floor into three levels. The north eastern most level is approximately 0.5 m higher than the central level, and the central level is approximately 0.6 m higher than the lowest level to the south west. The general slope of the sink is towards the southwest with the lowest area of the sink defined by two C-shape rock alignments (see Figure 14).

There is a small cobble and pebble paved footpath oriented north/south along the lowest level at the center of the sink (see Figure 14). There are two C-shape rock alignments in the southwest corner of the sink (see Figure 14). The two C-shape rock alignments are constructed of angular and subangular cobbles and small boulders. The western, smaller C-shape is 2.5 m long (E/W) by 2.0 m wide and is a maximum height of 0.4 m. It opens to the west.

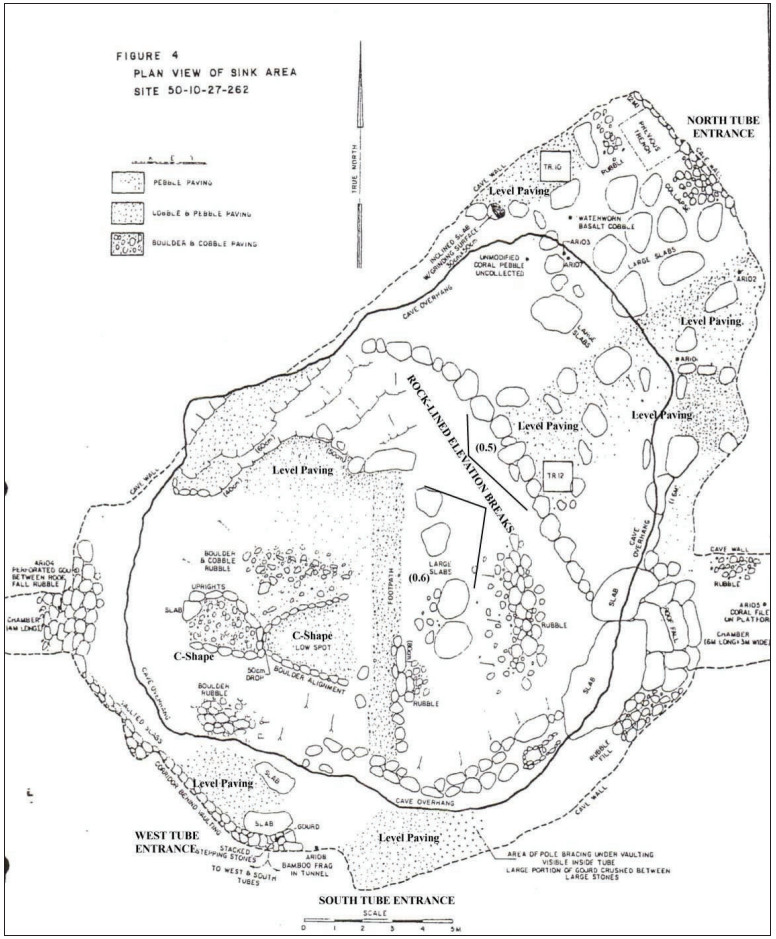

Figure 14: Site 262 Sink Plan View Showing Internal Modifications (Hammatt and Folk 1980:20, Figure 4).

Figure 15: Photograph of Level Paving in the Location of Trench 12, on Top Surface of Rock-Lined Elevation Break, Looking Southeast.

Figure 16: Photograph of Level Paving (Right Side) in the Location of Trench 12 and Rock-Lined Elevation Break (Left Side), Looking North.

Figure 17: Photograph of Rock-Lined Elevation Break, Looking Northeast.

The eastern C-shape is 2.8 m long (E/W) by 2.8 m wide and is a maximum height of 0.4 m. The C-shape opens to the east. Both C-shapes are constructed of one to two courses of angular and subangular cobbles and small boulders. There are small boulders placed on end (upright) along the north edge of the western C-shape. The interior surfaces of both C-shapes are rough paving.

There are seven rough paved use areas within the sink, four near the north tube entrance, two near the south tube entrance, and one along the west edge of the sink (see Figure 14). The paved areas near the north tube entrance are the most level. They are constructed of angular and subangular cobbles. Trench 12 was excavated (Hammatt and Folk 1980) in southeast corner of one of the level pavings near the north tube entrance (see Figure 14 and Figure 15). The rock paved area is 4.3 m long (NW/SE) by 1.3 m wide. There are three level pavings on the northwest and southeast sides of the north tube entrance. The rock paving on the northwest side (Trench 10 was excavated in this paving) is 2.3 m long (NW/SE) by 2.0 wide (Figure 18 and Figure 19). The level rock paving on the southeast side of the north lava tube entrance is roughly 4.3 m long (NE/SW) by 3.2 m wide. The top surface is rough paved with cobbles and small boulders (Figure 20).

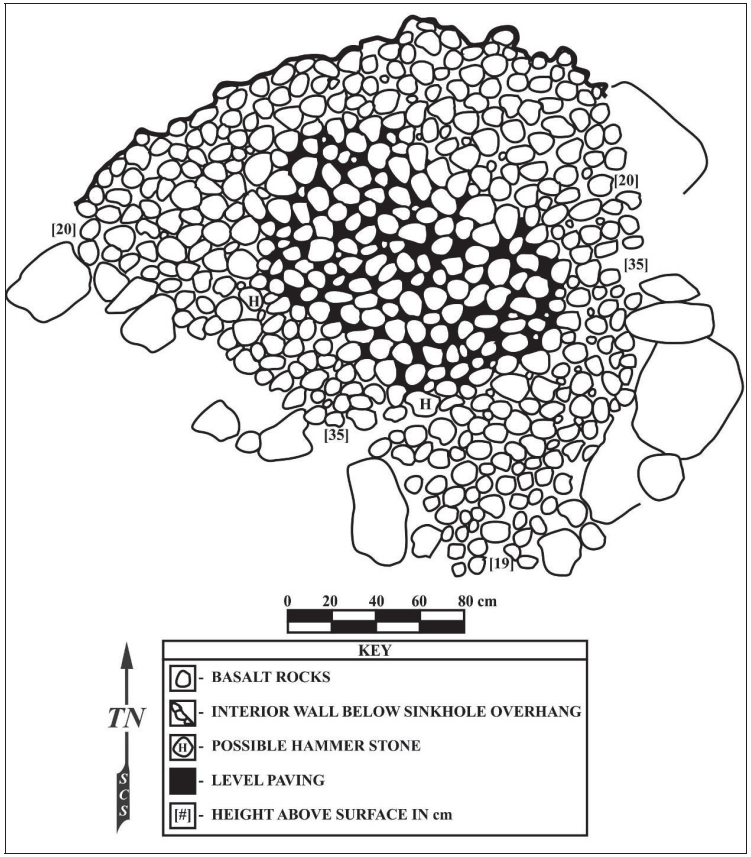

Figure 18: Site 262 Rock Paved Use Area on Northwest Side of North Lava Tube Entrance, Plan View Map.

Figure 19: Photograph of Rock Paved Use Area Located Northwest of North Lava Tube Entrance, Looking Northwest.

Figure 20: Photograph of Rock Paved Use Area Located Southeast of North Lava Tube Entrance, Looking East.

The Refuge Wall (Verbatim From Hammatt and Folk 1980:19 and 21)

The southwest portion of the sink area consists of sloping rough boulder paving which extends to the wall of the sink (Figure 21). Here a small stepped opening (Figure 22) along the sink wall descends two meters into a narrow corridor. One side is composed of the smooth bedrock edge of the sink. The other side is a high wall which extends upwards to meet the sink edge forming a vaulted shaped passageway (Figures 23 through 26). This wall is referred to as a "refuge wall" in that its purpose was to retain the artificially built up sink floor creating an interior passageway whose presence is entirely disguised from the exterior view. Furthermore, access can be carefully controlled through an easily defended narrow and steep entrance.

On the right (north) side of the entranceway the wall, from its base of huge horizontal slabs to a height of two meters consists of large stacked pāhoehoe boulders. Balanced on the top boulders and leaning against the bedrock overhang is a row of large slabs which extend the wall upwards another meter and in one section are held up by wooden poles (Figure 27 and Figure 28). The wall extends northwards from the entrance nine meters and to the south five meters. On the south side the wall is lower and consists mainly of tilted and in some cases overlapping slabs which rest against the cave overhang. The chamber floor consists of a series of huge slabs which extend well under the wall foundation and were definitely put in place before the wall was constructed.

The Buried Habitation Platform (Verbatim From Hammatt and Folk 1980: 21-23)

This feature was discovered through an attempt to trace the source of the numerous artifacts, many of organic materials, which were being located on the passage floor between the rocks of the refuge wall near the entranceway. Careful examination of the spaces in the wall and around the steps of the entranceway showed a clearly defined layer of organic material, grass, matting fragments, shell midden, bone and *kukui* nut shells and other materials. This layer extends horizontally across and along both sides of the entrance passage northwards along the refuge wall approximately two meters above the passageway floor at the base of the large slabs.

The layer rests on a well constructed stacked boulder platform which extends an undetermined distance towards the center of the sink. The entire stacked boulder course of the refuge wall is actually the southwest side of a huge platform, the top of which was a major living surface of the sink and must have covered much of the southwestern portion of the open sink area. The platform surface and the occupation layer on it was buried to a depth of one to two

Figure 21: Photograph of Site 262 Sink Rough Boulder Paving Near Refuge Wall Entrance (Lower Right Corner), Looking Northwest.

Figure 22: Photograph of Site 262 Refuge Wall Entrance, Overview.

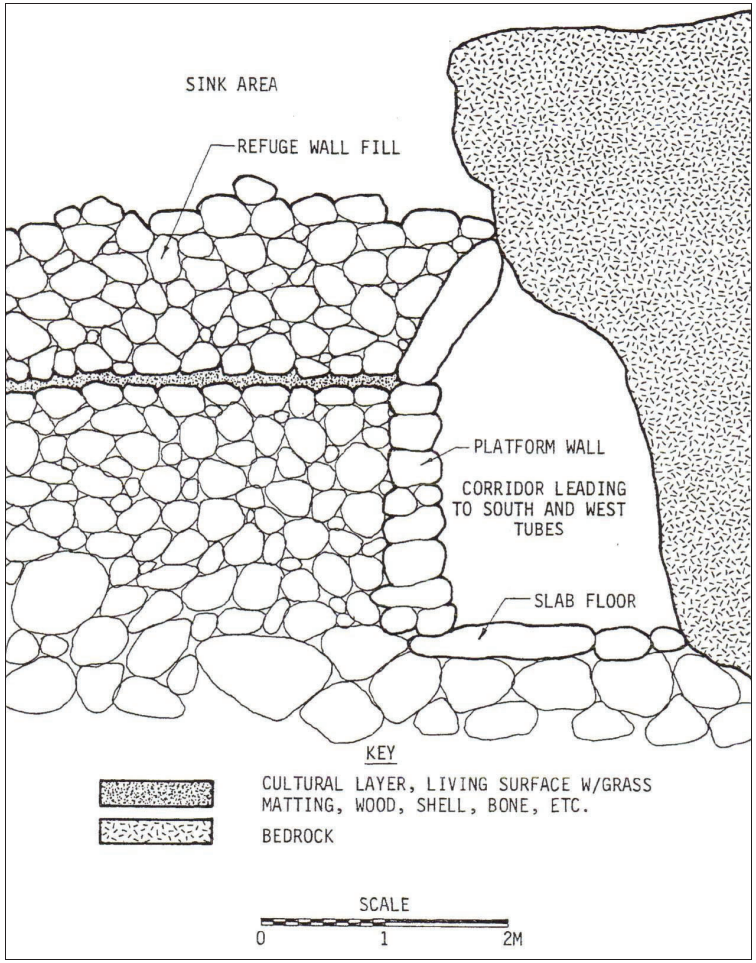

Figure 23: Site 262 Refuge Wall Cross Section Showing Internal Modifications (Hammatt and Folk 1980:22, Figure 5).

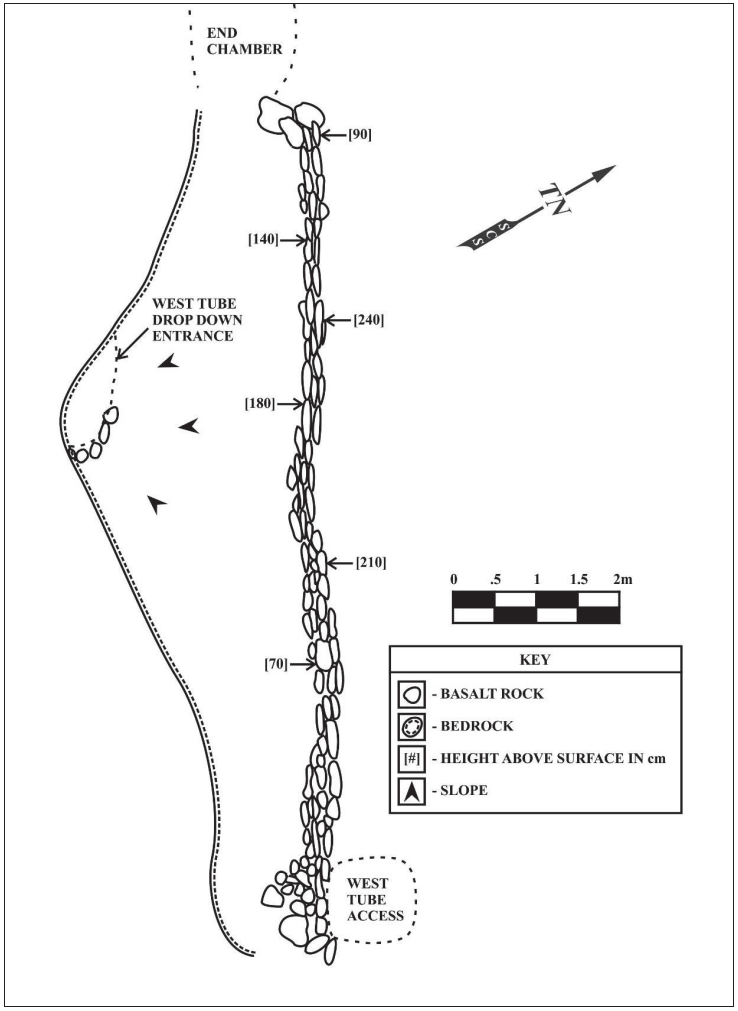

Figure 24: Site 262 Refuge Wall Plan View Map.

Figure 25: Photograph of Site 262 Refuge Wall Interior, Looking Northwest At Entrance.

Figure 26: Photograph of Site 262 Refuge Wall Interior, Looking Southeast Toward Entrance.

Figure 27: Photograph of Site 262 Refuge Wall Vaulted Construction and Wood Supports, Looking Northeast.

Figure 28: Photograph of Site 262 Refuge Wall Vaulted Construction and Wood Supports, Looking Northeast.

meters by the massive rubble piled behind the slab portion of the refuge wall to close the opening and disguise the presence of the interior passageway.

On the basis of the stratigraphic sequence and the construction characteristics observed, the following sequence of events is postulated:

1. Modification and rearrangement of the conical shaped pile of roof-fall into a large platform. This included laying of large slabs adjacent to the lower part of the sink wall to form a smooth floor and construction of a two meter high stacked boulder platform facing wall rising above this floor.

2. Occupation of the platform surface with accumulation of large quantities of organic debris such as grass padding, matting, marine shell, etc.

3. Placement of huge slabs on the southwest wall of the platform and all along the southwest edge of the sink for the purpose of closing the opening between the wall and the sink overhang.

4. Placement of rock fill on the sink side of these slabs to completely hide them from view. This resulted in the covering of the upper surface of the platform with more than a meter thickness of predominately boulder sized rubble. This sequence points to the interpretation that two major forms of activity took place here, namely open air occupation, followed by a refuge phase in which the sink floor actually disguised the presence of living space behind a hidden wall.

The Lava Tubes (Verbatim From Hammatt and Folk 1980:24-31)

There are three major lava tubes which radiate outwards from the sink area. Two of these extend *makai* and are entered through the small stepped opening in the refuge wall. These are designated the south tube and the west tube. The other major tube extends mauka and is designated the north tube. Each of these is described separately below.

The South Tube is entered through the south end of the passageway behind the refuge wall and extends to the south and southwest. There is clear evidence of occupation extending for 100 meters. Beyond this point, the passageways are partially filled with roof-fall and progressively narrow to small cracks which are barely accessible by crawling. Although the tube was explored to a depth of 250 meters, most evidence of human activity was confined to the first

100 meters of the tube. Beyond this, dispersed scatters of charcoal and occasional *kukui* nut shells were the only evidence of human presence. Clean, sharp rock edges indicate recent roof-fall, particularly in areas of high moisture.

The modified section of the tube (Figure 29) turns south from the refuge wall into a passageway with a short section of a stepping stone trail. A very narrow side tube leads to a small chamber with a burial resting on a bedrock ledge. The trail leads to a series of small enclosures with bedrock floors and defined by simple stone alignments. These are distributed around the east and south wall of a high ceiling gallery and there are a total of seven within the gallery. A well constructed low platform is situated on the edge of a conical shaped pile of roof-fall which has itself been modified into a platform. Large boulder slabs face this central platform which stands four meters above the floor of the tube. Its surface is of unevenly placed boulders.

To the southwest of this gallery is a passageway with a slab path in the center and more small enclosures along the southeast wall of the tube. A few meters beyond Station 4 is a slab shelf with the ceiling of the tube only one meter high. Here a boulder wall extends across the passage with a small entryway in the center. Beyond this there are two rough platforms and additional small enclosed areas in the low passage. Beyond this is a second high ceiling gallery with small enclosures and charcoal piles near the tube walls.

Between Stations 6 and 7 is another small stone lined enclosure (see Figure 30). Intact grass matting lines the interior portion of the enclosure indicating its use as a sleeping area. Adjacent to this is a circular concentration of wood charcoal (a small hearth). Beyond Station 7 within a roof-fall pile was the remains of a human burial. Fleshy parts adhered to some of the long bones. The skull was missing and the bones were clearly disturbed from their original position. The remains of a *lauhala* mat were found on a nearby rock. Examination of the sciatic arch on one of the pelvic bones indicated an adult female.

Artifactual material was collected throughout this tube. This material was both organic and inorganic. The unusually high proportion of soft organic materials (wood gourd, etc.) is a reflection of the generally dry environment within the dark zone of the lava tube which is highly conducive to organic preservation. Artifacts included rounded hammerstones, coral files, fishhooks, wood and gourd pieces, and were mapped in place.

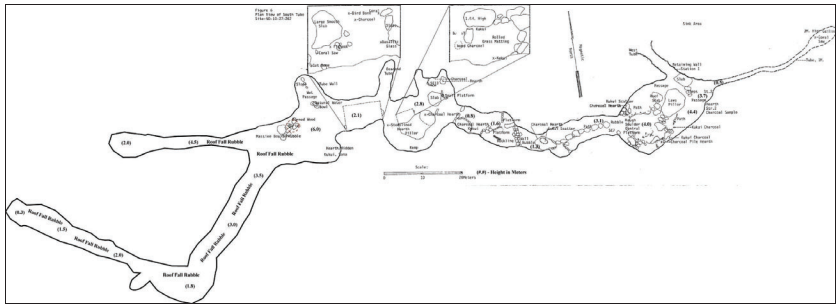

Figure 29: Site 262 South Tube Plan View Map (Adapted from Hammatt and Folk 1980:26, Figure 6).

One area of high concentration was near Station 7. Here a small pile of shells (*Tinabella regossa*) represented a bracelet which had been dropped on the tube floor by a former occupant. Near the large slab was a "cache" of small bone fishhooks, a coral saw, a piece of cut mammal bone, a coral file tip, and a basaltic glass core (see Figure 29 enlargement). This loosely associated assemblage probably represented a fishhook making kit complete with a collection of finished hooks.

The many small charcoal concentrations distributed generally near the walls of the tube represent hearths which, judging by the small amount of charcoal, were used for short periods of time. They are generally not stone lined. In addition there are many concentrations of *kukui* nut on the cave floor, around sleeping enclosures and on the stone platforms. Frequently *kukui* nut and wood charcoal occur together. Some of the *kukui* is burned but large quantities are not. Marine shells, with *'opihi* and cowrie comprising a considerable proportion, are scattered generally throughout the tube.

In all, there are 2 burials, 13 separate-sleeping enclosures, 4 small platforms and a high central platform formed from boulder roof-fall in the first gallery. There are more than ten distinct small wood charcoal and concentrations representing hearths and many more less distinct scatters of this material. If one allows one person per sleeping enclosure and platform, the total sleeping capacity would be l8 people. This estimate is probably conservative and could be tripled to a capacity of 54 or even more considering the size of some of the sleeping enclosures. The hearths, although they may have been used secondarily for cooking, were probably mainly for providing light. In some cases they are located on high bedrock surfaces for more efficient illumination.

The tube is artificially divided into two sections by a boulder wall near Station 4. This is at the point at which the ceiling is lowest and the tube walls are most constricted. This wall probably functioned as a secondary refuge or barrier if and when the main refuge defense was breached at the entrance of the tube. The walls function in the context of ordinary cave occupation would be questionable.

Close examination of the entrance area of the tube showed that preceding the construction of the main refuge wall, the entire front half of the tube up to Station 4 would have had natural light and easy access to the exterior sink area. Before the collapse of large roof slabs, between Station 1 and Station 2, the open space to the outside would have been even larger.

The West Tube is also entered through the corridor behind the refuge wall. The floor of the entrance drops down a four meter high slope onto a smooth bedrock floor. The tube is approximately 50 meters long and 8 to 9 meters wide with no side chambers (Figure 30). The features are similar to those in the south tube with two parallel rock alignments in the center forming a short pathway near the entrance. Three rough alignments form sleeping enclosures. Nearby is a small stone lined hearth with wood charcoal in the center. Adjacent to this are three upright rocks, the highest 1.1 meter above the floor. The function of this feature is uncertain, although it may be the remains of a storage cupboard. At Station 3 west is another rectangular alignment of uprights with an open top. A prominent ceiling drip falls close to the center of this feature. It probably functioned as a support for gourds which were placed here for water catchment.

The tube extends southwest another 16 meters where roof collapse has blocked the passageway. This tube is different from the south tube not only by being smaller, but it is also relatively free of stone rubble. The ceiling and walls are generally smooth and stable. Gravity fall of roof rubble has been minimal.

Clearly this tube was used in a similar manner to the south tube. It too would have been exposed to natural light before the construction of the main refuge wall. The entrance to the tube with a four meter drop-off was an integral part of the construction of the main refuge wall and the slab floor passageway behind it. It served to restrict the size of the opening. A person entering would be forced to turn his back to the occupants of the tube in order to climb downwards.

The North Tube (Figure 31) extends to the north and north-east for approximately 124 meters through a passageway which varies from six to ten meters in width. The tube opening is partially blocked by a high stacked boulder wall with a loose type of construction. The tube is entered by climbing over a partial break in the wall and descending two meters to the rocky floor of the tube. Four meters from the entrance wall is a curving boulder alignment which retains a stone platform roughly paved with boulders including slabs. An approximately two meter square depression in the platform probably represents a former excavation. This platform merges into large roof-fall blocks to the north which are concentrated in the center of the passage- way. Both sides of the passage adjacent to the walls are clear of rocks and have smooth bedrock floors.

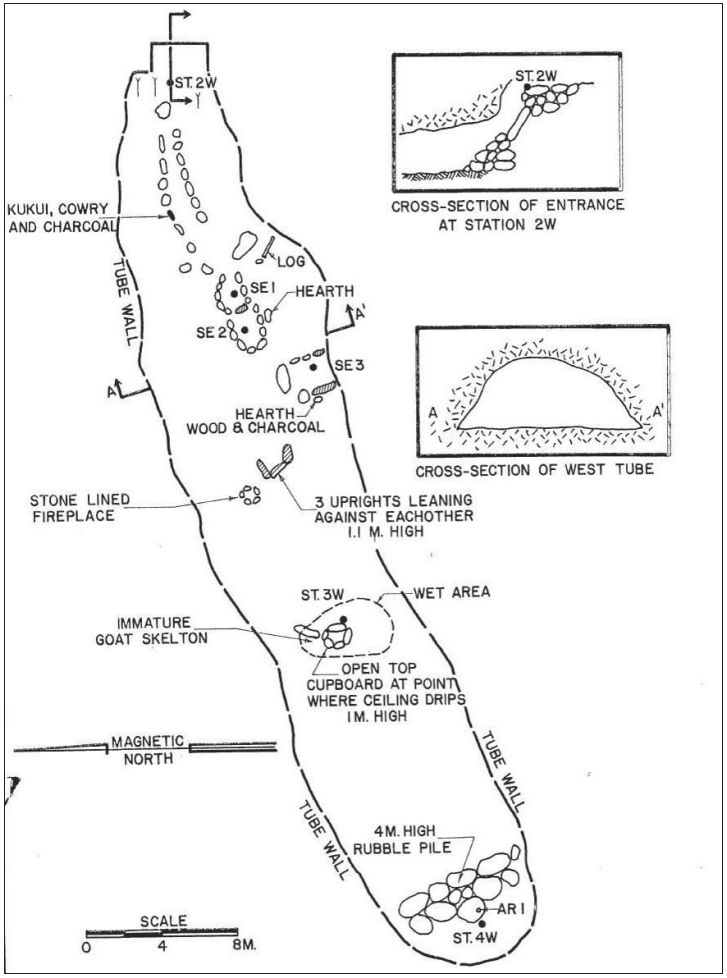

Figure 30: Site 262 West Tube Plan View Map (Hammatt and Folk 1980:29, Figure 7).

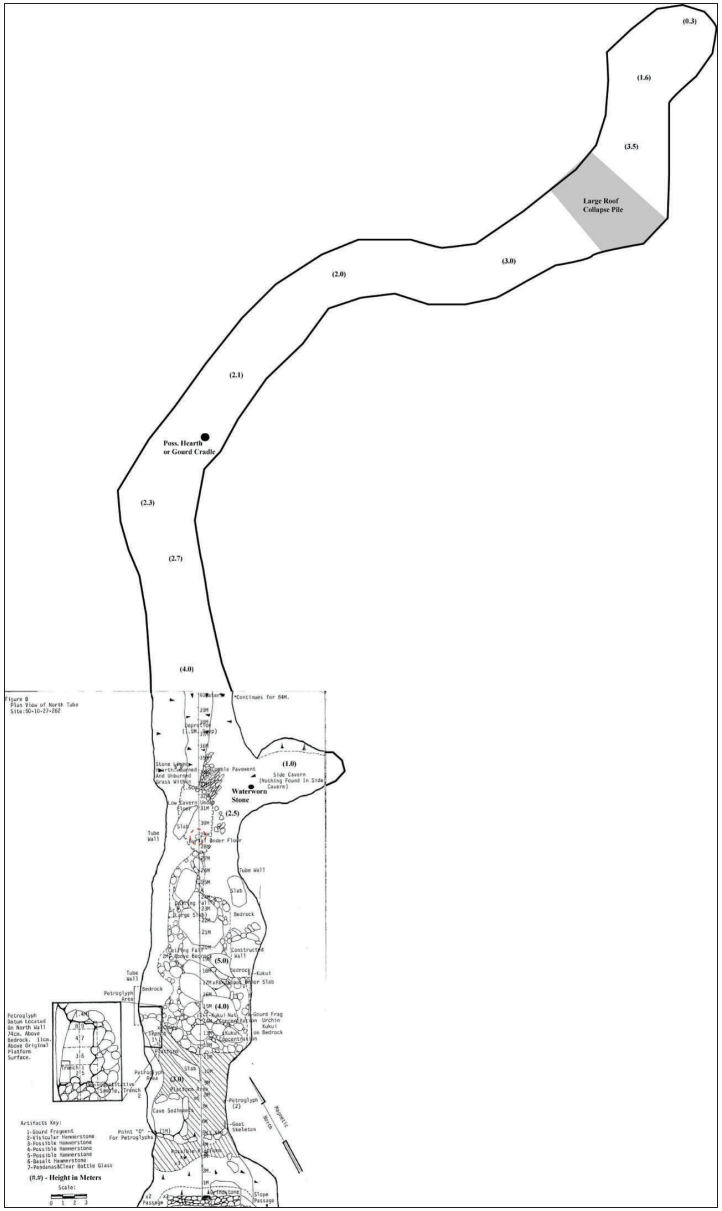

Figure 31: Site 262 North Tube Plan View Map (Adapted from Hammatt and Folk 1980:30, Figure 8).

On the east side a rough wall perpendicular to the cave side may define a small sleeping area. On the east wall of the tube, adjacent to the platform and piled roof-fall are petroglyphs which extend for 12 meters along the tube wall (Figures 32 through 45, presented in order from west to east).

There is a small isolated group of two petroglyphs on the south wall above the platform surface, and a possible figure four meters to the south on the same wall.

Beyond the 25 meter point is a low secondary tube which runs under the main tube floor and forms a low horizontal crack. Inside the crack is a human burial in an extended position. The skeletal remains are all present and of the size of an adult. Some of the bones have been disturbed from their original position including the skull which has been set upright on a rock facing the entrance. This burial was left in place.

Beyond this point, the tube extends to its maximum of 124 meters along a smooth walled corridor. Human modification is limited to isolated marine shells and a scatter of burned grass at the very back of the tube. [The single exception is a rock ring, possibly a hearth or gourd cradle for catching water, located half way up the north tube (see Figure 31 and Figure 46).

Site 262 Summary of Excavations (From Hammatt and Folk 1980:31-38)

Excavations were conducted in two areas within this site; the open sink area and the north tube.

The major effort here was put into the excavation of a rough platform which adjoins the petroglyphs within the north tube. As stated in previous reports, (Davis 1977) it appeared that the upper part of the platform buried parts of the petroglyph figures. One of the purposes of the excavation, therefore, was to determine the exact relationship of the platform strata to the lower petroglyphs and determine, if possible, a date before which the petroglyphs were made (if one of the platform strata could be dated and the platform itself covers the lower petroglyphs, then the lower petroglyphs were clearly made before the date of the platform).

The platform along the base of the petroglyphs had been disturbed and removed in two separate areas either by previous excavations or by relic hunters. The only intact portion of the platform, in contact with the tube wall, stretched for approximately four meters along the wall and was bounded on both sides by disturbed areas. This four meter section was chosen for excavation.

Figure 32: Photograph 1 of Site 262 North Tube Petroglyphs, Looking Northwest.

Figure 33: Photograph 2 of Site 262 North Tube Petroglyphs, Looking Northwest.

Figure 34: Photograph 3 of Site 262 North Tube Petroglyphs, Looking Northwest.

Figure 35: Photograph 4 of Site 262 North Tube Petroglyphs, Looking Northwest.

Figure 36: Photograph 5 of Site 262 North Tube Petroglyphs, Looking North.

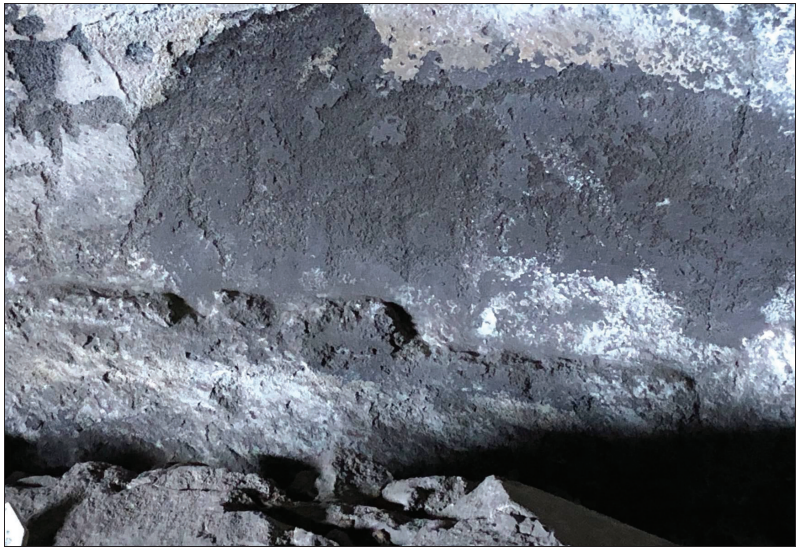

Figure 37: Photograph 6 of Site 262 North Tube Petroglyphs, Looking North.

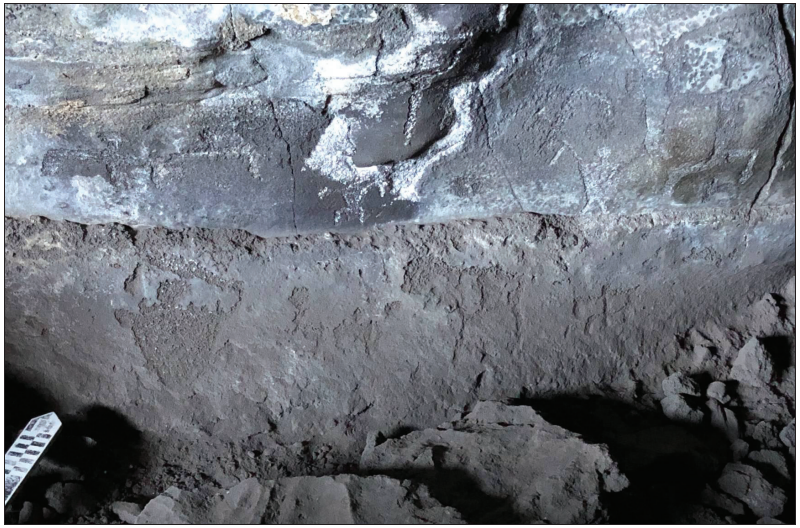

Figure 38: Photograph 7 of Site 262 North Tube Petroglyphs, Looking North.

Figure 39: Photograph 8 of Site 262 North Tube Petroglyphs, Looking North.

Figure 40: Photograph 9 of Site 262 North Tube Petroglyphs, Looking North.

Figure 41: Photograph 10 of Site 262 North Tube Petroglyphs, Looking North.

Figure 42: Photograph 10 Close-Up of Site 262 North Tube Petroglyphs, Looking North.

Figure 43: Photograph 11 of Site 262 North Tube Petroglyphs, Looking Northeast.

Figure 44: Photograph 11 Close-Up of Site 262 North Tube Petroglyphs, Looking Northeast.

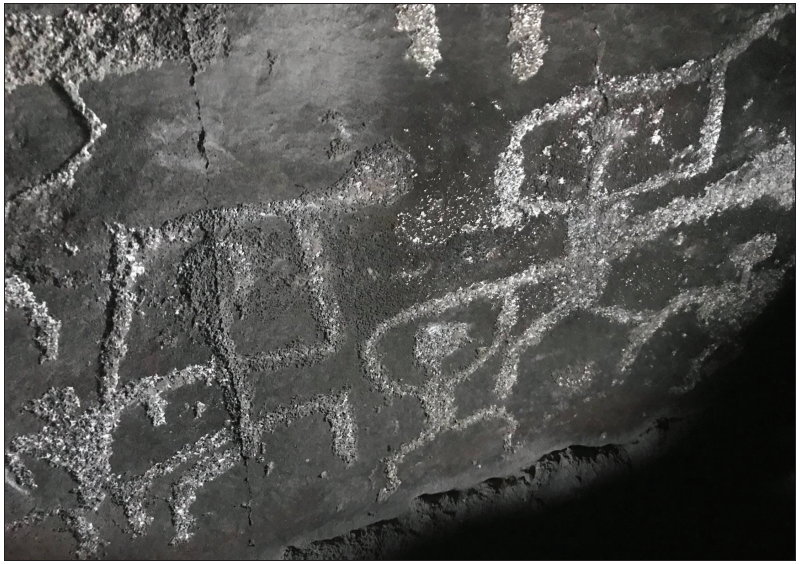

Figure 45: Photograph 11 Close-Up of Site 262 North Tube Petroglyphs, Looking Northeast.

Figure 46: Photograph of Site 262 North Tube Rock Ring, Looking Northwest

Closer examination of this segment of the platform showed that only one section, approximately one meter long, actually had platform slab paving rocks contacting the petroglyphs. This trench, designated Trench l, was excavated first. The loose framework slab platform was removed to a depth of approximately 55 to 60 centimeters exposing 30 centimeters of the lower part of three petroglyph figures (Figure 47). By this relationship it was determined that the making of the petroglyphs preceded the construction of the platform.

At the base of the rock fill of the platform was a five to ten centimeter thick (thinner near the wall) deposit of well sorted grayish brown (10YR 5/2-3) silt size sediment which was deposited after filtering through the platform fill. This sediment was around the base of the rocks but where the rocks directly contacted a thin carbonate layer on bedrock or the bedrock itself, the sediment was not underlying them. This means that the silt filtered down from the platform surface and, therefore, postdates the construction of the platform and is contemporaneous with the use of the platform.

Scattered shell midden and other organic materials were collected from between and on rocks as the platform was removed. However, the bulk of the cultural material was contained within the fine textured five to ten centimeter deposit of cave silt at the base of the platform fill.

This layer contained shells of *Echinodermata cypraea*, *Nerita*, *Cellena exerata*, as well as *Pandanus* keys [*hala* fruit cone segments], charred wood fragments, charcoal, fish bone and scales, bird bone and fragments of grass matting (*pili* grass?). Artifacts include a retouched basaltic glass flake, a complete small basalt adze, a bird bone pick and a modified *isignomen* shell.

This deposit was clearly the end point of deposition of the cultural material associated with the platform above. This platform was judged to be the main occupation area of the north tube. For this reason, the excavations were expanded to the north of Trench l to include the rest of the undisturbed portion of" the platform adjoining the petroglyph wall. A grid of eight square meters was laid out and excavated to bedrock. The platform rocks consisted of a loose network of small to medium sized boulders, many in upright positions underlying a surface of large slabs. These were removed to expose the thin cultural layer underneath which was subsequently excavated by one meter squares and a ten centimeter level (or less depending on the thickness). The artifacts recovered from the fine textured sediment include two small basalt adzes and an adze fragment basaltic glass (eight pieces, predominantly flakes), pearl shell fishhook blanks,

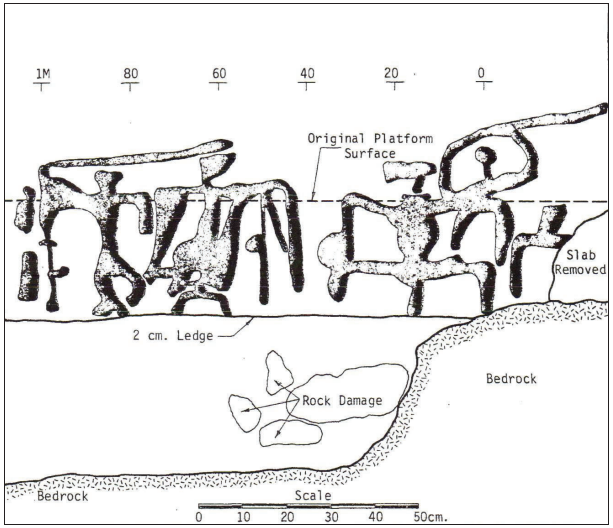

Figure 47: Site 262 North Tube North Profile of Trench 1 Showing Petroglyphs Uncovered Suring Platform Removal (Hammatt and Folk 1980:33, Figure 9).

three bone fishhooks, and worked bone, shell and wood. Miscellaneous artifacts include bone picks, a coral file, and pig and dog tooth ornaments.

This assemblage includes material associated with three kinds of craft activity - fishhook manufacture, wood working and to a minor extent basaltic glass flaking. The raw materials, working tools and the end products are all represented. In addition, there are artifacts reflecting everyday domestic life, ornaments and bone picks. This occupation (at least 1700 A.D. basaltic glass years) postdates the creation of at least some of the petroglyphs (those buried by the platform) and is not the kind of occupation that one would associate with temporary hiding in a refuge cave.

This occupation is confined to an area near the entrance which would be exposed to natural light. This light would have been supplemented by torches and wood fires. The activities which took place here are no different from those to be expected in domestic occupation of a surface feature platform or enclosure.

In addition to those in the north tube, excavations were conducted in two areas within the open sink area of the site where two one meter trenches were placed (see Figure 14). These were designated Trench 10 and Trench 12.

Trench 10 was located approximately three meters southwest of the entrance wall of the north tube. A ten centimeter thick deposit of modern organic debris mixed with a well sorted ‘a‘a pebble and cobble paving overlay a ten centimeter thick cultural deposit consisting of discontinuous lenses of charcoal and ash stained silt between cobbles. Below this was filtered dirt and debris from above descending to loose boulder fill which extended to an undetermined depth below the base of the trench at 40 centimeters. Artifacts were present in the 10 to 20 centimeter discontinuous silt layer and include a coral file, a sea urchin file, cut mammal bone and one piece of basaltic glass. Shell midden was present but very sparse consisting of a few small fragments. Other material included pandanus keys and small clumps of dried grass (modern). The only cultural layer was located in the 10 to 20 centimeter level silt deposit which formed a loose matrix between cobbles. An ash lens 25 centimeters long and 3 centimeters wide was located in the north profile of the trench. The contents of this trench indicate the use of the large gently sloping paved area at the exterior of the north tube for craft activities and cooking. The occupation may have been as intensive as that on the platform within the interior of the cave, but the debris has probably filtered downwards and is presently inaccessible under tons of boulders.

One other area in the sink area was investigated with a one meter square trench. The trench, designated Trench 12, was placed adjacent to a line of boulders which define the southern limit of the sloping paved area on the northeast side of the sink. A second curving line of boulders behind the main one defines a rough semi-circular enclosure (see Figure 14). A well sorted cobble paving on the surface extended to a depth of ten centimeters and rested on cobble and boulder paving with a matrix of silt heavily stained with wood ash and charcoal. This matrix was concentrated in the southeast corner of the square of a depth of 20 centimeters and defined a roughly circular fireplace with a diameter of approximately 50 centimeters. No artifacts were encountered and midden materials consisted of a thin scatter of marine shells and *kukui* nut shells. The ash and charcoal stained silt matrix within this trench indicate intensive burning, more than would be expected from a small single meal fireplace. The burned layer is resting on a buried platform surface and probably represents the major cooking area for the former occupants. There would be good reason to confine the major food cooking activities in open areas away from the inhabited tubes to keep the smoke and heat away from the still air of the tubes and to provide adequate draft for the fire.

The location of this cooking area was predicted on the basis of the information gained from the excavation of the central platform in Site 6418 sink area. Trench 12 was positioned for the purpose of testing this prediction, which proved to be correct.

The following summary statements apply to the thorough examination and selective excavation of Site 262:

1. The north, south and west tubes contain evidence of fairly extensive domestic occupation. This occupation, although it may not have resulted in the accumulation of deep stratified cultural layers, involved a full range of domestic craft activities and probably more than one family unit. The cultural layers are intact and accessible by hand movement of rocks in only limited areas. In many areas in the south tube features are sitting directly on smooth bedrock.

2. The major areas of occupation are in the sink areas adjacent to the north and south tubes and within the formerly (before refuge modification) natural light areas within both the north and south tubes. The most accessible areas for excavation of stratified material are on the northeast side of the sink and in the north tube. However, judging by the amount of cultural material observed at the entrance to the south and west tubes (which dropped

from the huge platform which was subsequently buried under tons of rock in the construction of the refuge wall), this area has immense potential.

3. The petroglyphs which occur on the northeast wall of the north tube at least partly predate the domestic occupation in the tube (around 1700 A.D. basaltic glass years).

4. Modification of the site for the purpose of refuge almost certainly postdates all major domestic occupation. This modification includes the construction of a slab wall covering the opening to the south and west tubes, piling tons of rock over a previous platform area to cover the slab wall, and creation of a narrow easily defended entrance. The wall at the entrance to the north tube may be associated with the refuge phase (as a decoy wall?) but its function is questionable. This modification resulted in the complete darkening of the occupation areas of both the south and the west tube and partial darkening of the north tube, as well as burial of a major occupation surface at the south and west side of the sink.

5. Although part of the occupation of all three tubes is certainly associated with the refuge phase, it is presently clear that the major part of the occupation of these caves, the sleeping enclosures, ‘the boulder roof-fall platforms, the remains of wood working, glass flaking and fishhook manufacture (in the north tube), are associated with domestic occupation proceeding the refuge phase (these activities would be extremely difficult by torchlight). The occupation associated with refuge was probably short term and would be difficult to distinguish from the domestic phase. It is possible that some of the charcoal piles on ledges and the piles of nut in the south and west tubes are associated with the refuge phase and through further C14 dating can be separated from those of the earlier phase .

In summary, the 262 sink and cave complex shows three distinct phases of use: 1) the petroglyph phase, 2) the domestic occupation phase, 3) the refuge phase. The use of the north tube and a side chamber of the south tube for burial is probably part of phase 2. The making of the petroglyphs may overlap with the domestic occupation phase and the use of the paved areas in the open sink area for living and cooking are probably an integral part of the domestic phase. This site, therefore contains a sequence of three phases represented only in part at the other cave sites in the project area (Sites 6421, 6418 and 6420). The only phase not represented at Site 262 is the historic phase, which is found at Sites 6418 and 6418B.

A previously unidentified rock mound marker was located 5.5 meters east of the southwest edge of the Site 626 sink (see Figure 12 and Figure 13). The feature is constructed on level pāhoehoe with fountain grass. The rock mound marker is 1.1 m long (E/W) by 1.0 m wide and is a maximum height of 0.55 m (Figure 48). The rock mound is constructed of angular, subangular and slabby cobbles and small boulders piled three courses high on the ground surface (Figure 49). The rock mound is conical in shape. The rock mound likely marks the location of the lava tube sink. The mound appears to be unaltered and is in good condition.

There are a few modern glass and plastic bottles, and fragments of plastic shopping bags at Site 262, primarily within the sink. There are also modern sneaker prints and gloved hand prints within the lava tubes. In addition, there is a name and date (92) etched into rock at the site. The sink is large and is close to a paved road, allowing easy access to the site. Site 262 appears to be unaltered and is in good condition. It is recommended that Site 262 be preserved in accordance with a SHPD-approved preservation plan. Data recovery is not recommended as the site has been extensively documented. However, if data recovery is conducted at Site 262, it should be limited nonintrusive study, perhaps in the form of additional photographs and drawings of features in the lava tubes and within the sink.

SITE #50-10-27-31109	**ROCK MOND**
FUNCTION:	Location Marker
AGE:	Pre-Contact to early Historic Era
DIMENSIONS:	Length: 2.20 m; Width: 2.2 m; Height, 0.5 m Max.
CONDITION:	Good
INTEGRITY:	Altered: retains integrity of location, setting, and materials
SURFACE ARTIFACTS:	None
EXCAVATION:	1 by 1 meter test-unit (TU-1)

DESCRIPTION: Site 31109 is a square rock mound located in the northeast quadrant of the project area at an elevation of 225 ft amsl (see Figure 12 and Figure 13). The rock mound is on a smooth pāhoehoe lava surface surrounded by fountain grass. The mound is 2.2 m long (NW/SE) by 2.2 m wide and is a maximum height of 0.5 m (Figure 50). The mound is constructed of angular, subangular and slabby basalt cobbles and small boulders piled and stacked two to three courses high on the ground surface (Figure 51 and Figure 52). Portions of the rock mound perimeter are constructed of stacked slabby rocks. Portions of the northwest, northeast and southeast perimeter of the rock mound are faced.

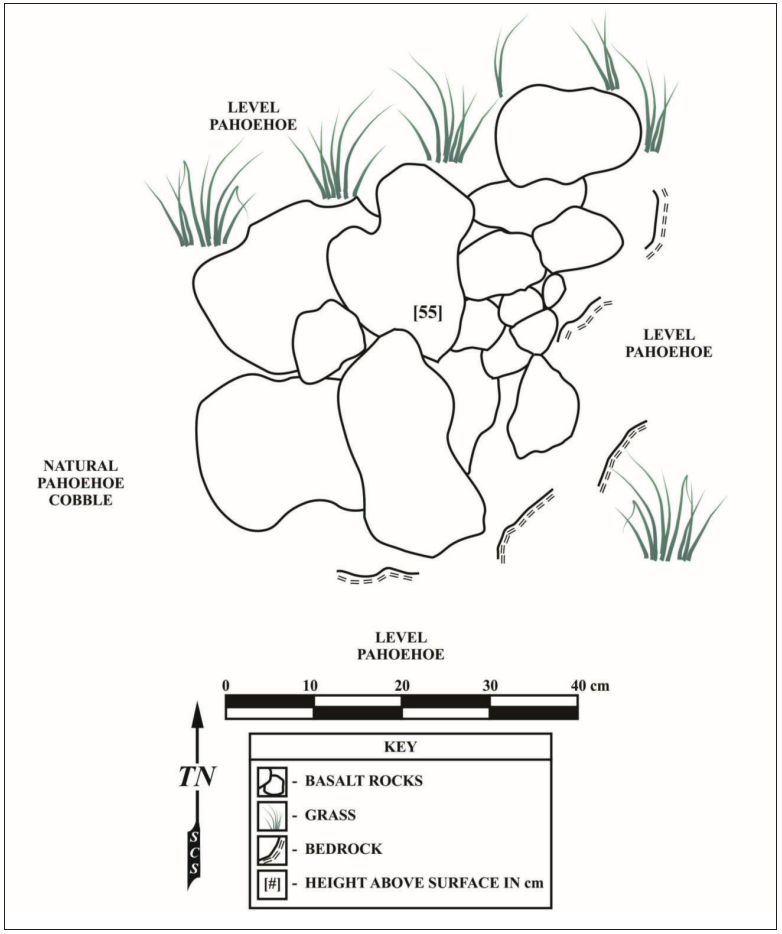

Figure 48: Site 262 Rock Mound Marker Plan View Map.

Figure 49: Photograph of Site 262 Rock Mound Marker, Looking Northwest.

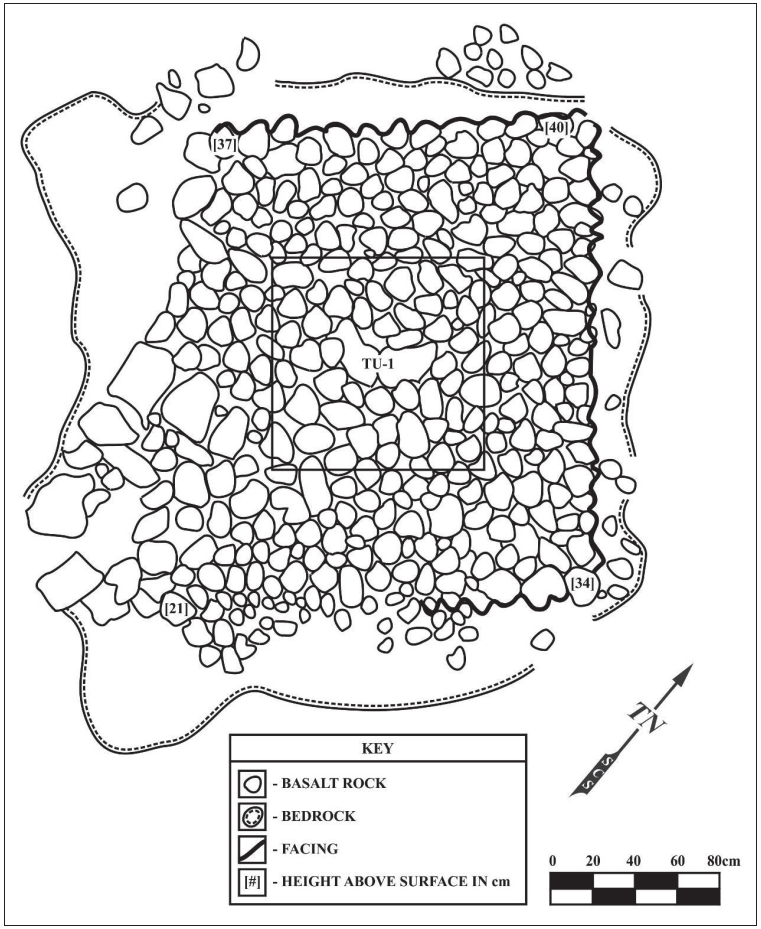

Figure 50: Site 31109 Rock Mound Marker Plan View Map.

Figure 51: Photograph of Site 31109Rock Mound Marker, Looking West.

Figure 52: Photograph of Site 31109Rock Mound Marker, Looking South.

A single 1.0 m by 1.0 m test unit (TU-1) was excavated in the center of the rock mound to record feature construction and to recover diagnostic artifacts to aid in determining the function and age of the feature. TU-1 was excavated as an architectural layer and a thin layer of sediment, and terminated on bedrock at a maximum depth of 0.5 m below the top surface of the rock mound (Figure 53). The architectural layer (30-45 cm thick) was angular, subangular and slabby pāhoehoe cobbles and small boulders. The architectural layer terminated on sediment and bedrock. The architectural layer did not contain artifacts.

Layer I (5 cm thick) was 10YE3/2 very dark grayish brown sandy silt overlaying pāhoehoe bedrock. Layer I did not contain artifacts or subsurface deposits. TU-1 terminated on bedrock and the rock mound was reconstructed to its original condition.

The rock mound is most likely a location marker based on its form, construction and the lack of artifacts in TU-1. The rock mound is on a slight high point within the project area that affords good views both *makai* and *mauka*. It might have been used as a survey station or as a triangulation point for the Kalaoa-ʻOʻoma Homestead Lots survey. It could just as well serve as a location marker for people traveling to the lava tube complex at Site 262.

Site 31109 appears to be unaltered and is in good condition. No further work is recommended at Site 31109.

SITE #50-10-27-31110	**PĀHOEHOE EXCAVATIONS**
FUNCTION:	Resource Extraction
AGE:	Pre-Contact Era
DIMENSIONS:	Length: 9.5 m (E/W); Width: 5.2 m; Depth, 0.08 m Max.
CONDITION:	Good
INTEGRITY:	Unaltered: retains integrity of location and materials
SURFACE ARTIFACTS:	None
EXCAVATION:	None

DESCRIPTION: Site 31110 is three pāhoehoe excavations located at 205 ft amsl within the southwest quadrant of the project area (see Figure 12 and Figure 13). The excavations are in the level pāhoehoe lava surface and are surrounded by fountain grass (Figure 54 through Figure 57). Pieces of slabby pāhoehoe removed from the three excavations are on the ground surface and within the excavation pits. Site 31110 appears to be unaltered, is in good condition, and no further work is recommended for Site 31110.

Figure 53: Photograph of Site 31109 TU-1 Base of Excavation, Looking South.

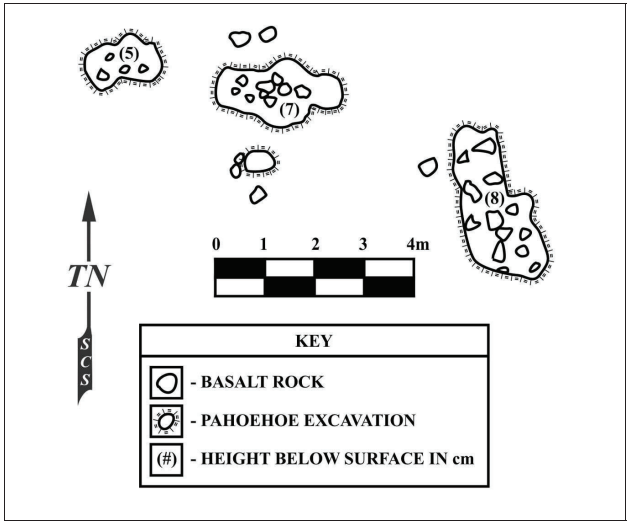

Figure 54: Site 31110 Pāhoehoe Excavations Plan View Map.

Figure 55: Photograph of Site 31110 Pāhoehoe Excavation, Looking North.

Figure 56: Photograph of Site 31110 Pāhoehoe Excavation, Looking North.

Figure 57: Photograph of Site 31110 Pāhoehoe Excavation, Looking South.

CONCLUSION

SIGNIFICANCE ASSESSMENTS

Sites identified during this project were assessed for their significance as outlined in Hawai‘i Administrative Rules §13-275-6. To be assessed as significant a site must be characterized by one or more of the following five criteria:

(a) It must be associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property.
(b) It must be associated with the lives of persons significant in the past.
(c) It must embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction.
(d) It must have yielded or may be likely to yield, information important in prehistory or history.
(e) Have important value to native Hawaiian people or other ethnicities in the state, due to associations with cultural practices and traditional beliefs that were, or still are, carried out.

All of the sites documented in this report are significant under criterion d (Table 3). Site #50-10-27-262 is also significant under criteria a and e.

Table 1: Site Significance and Recommended Treatments.

SITE	TYPE	FUNCTION	AGE	SIGNIFICANCE CRITERIA	RECOMMENDED TREATMENT
262	Lava Tube and Sink	Habitation, Refuge and Burial	Pre-Contact Era	a, d, e	Preservation
31109	Rock Mound	Marker	Pre-Contact to Historic Era	d	No Further Work
31110	Pāhoehoe Excavations	Resource Extraction	Pre-Contact Era	d	No Further Work

Sites 31109 and 31110 are significant under criterion d as they contain information important to pre-history and history. Site 31109 is significant as it contains information important to either pre-Contact era refuge cave transportation markers or Historic era survey methods.

Site 262 contains information important to the construction and use refuge caves during periods of increased warfare (criterion a and d). The habitation component, the petroglyphs and the burials at Site 262 are significant for their importance to the Hawaiian people (criterion e).

RECOMMENDED TREATMENTS

Preservation in-place (avoidance and protection) is recommended for Site 262. No further work is recommended for Site 31109 and Site 31110. The overall proposed DLNR offices and base yard project determination is effect with proposed mitigation. In this case, mitigation will take the form of a Burial Treatment Plan for the burials at Site 262 and an Archaeological Preservation Plan for the archaeological features at Site 262.

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APPENDIX D

Cultural Impact Assessment by Scientific Consultant Services, Inc.

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A CULTURAL IMPACT ASSESSMENT FOR PROPOSED DLNR OFFICES & BASE YARD IN KALAOA 5TH AHUPUA'A, NORTH KONA DISTRICT, ISLAND OF HAWAI'I, HAWAI'I

[TMK: (3) (3) 7-3-010:061 (por.)]

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July 2020
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Table 1: Individuals Responding to CIA. 29

INTRODUCTION

Under contract to Limtiaco Consulting Group and at the request of the Department of Land and Natural Resources (DLNR), Scientific Consultant Services, Inc. (SCS) conducted a Cultural Impact Assessment (CIA) for the lands of TMK: (3) 7-3-010:061 in Kalaoa 5th Ahupua‘a, North Kohala District, Island of Hawai‘i (Figure 1 through 4). Parcel 061 is 79.098 acres of undeveloped land consisting of open pāhoehoe lava with scattered fountain grass. The property is owned by the State of Hawai‘i.

DLNR is proposing to build administration offices and a base yard on a 5.0-acre portion of Parcel 061. An Archaeological Inventory Survey (AIS) study was conducted for ten acres Escott 2019 Draft), though the proposed project will only affect five acres. The point of contact for the project is Ms. Claire Oshiro of Limtiaco Group. The mailing address for Limtiaco Group is 1622 Kanakanui Street Honolulu, HI 96817. Ms. Oshiro can be contacted by email at claire@tlcghawaii.com or by phone at 808-687-8750.

The preferred location of the proposed construction is in the north half of ten acre project area (Figure 5). The proposed DLNR offices and base yard project includes grubbing and grading of approximately five acres, the construction of a two-story building with a covered base yard and parking, and paved access roads.

The project area is located along the west coast of Hawai‘i Island, 1.5 km east of Kona International airport, and is situated between 200 and 225 feet (61 to 69 m) above mean sea level (amsl). The project area is bounded by Kaiminani Street to the north, by Laui Street to the west, by a privately owned commercial nursery and residential dwelling to the south, and by undeveloped open pāhoehoe grassland to the east. The property is accessible from both Kaiminani Street and Laui Street.

The Constitution of the State of Hawai‘i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of native Hawaiians. Article XII, Section 7 requires the State to “protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua‘a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778” (2000). In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the people's traditional right to subsistence.

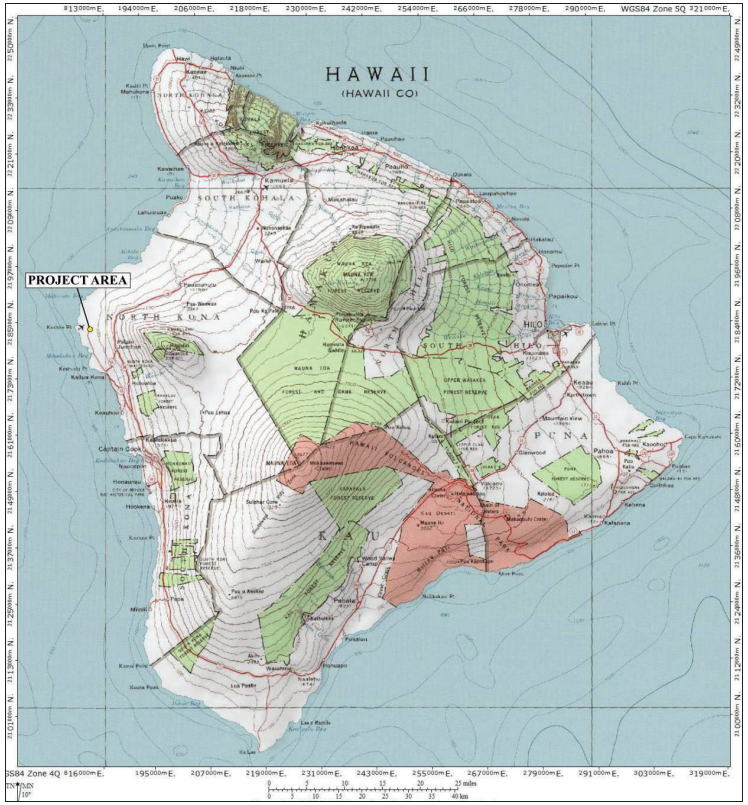

Figure 1: 5,500 K-Series Map of Hawai'i Showing Location of Project Area (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

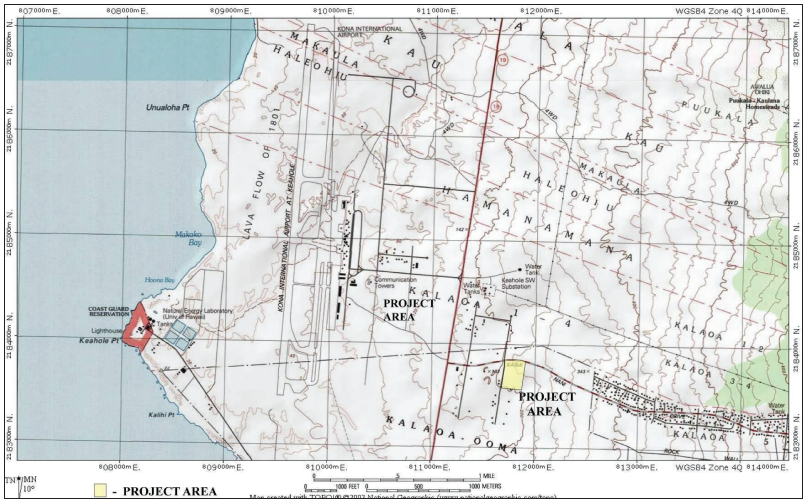

Figure 2: 7.5-Minute Series USGS Topographic Map Showing Location of Project Area (Keahole Point Quad) (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

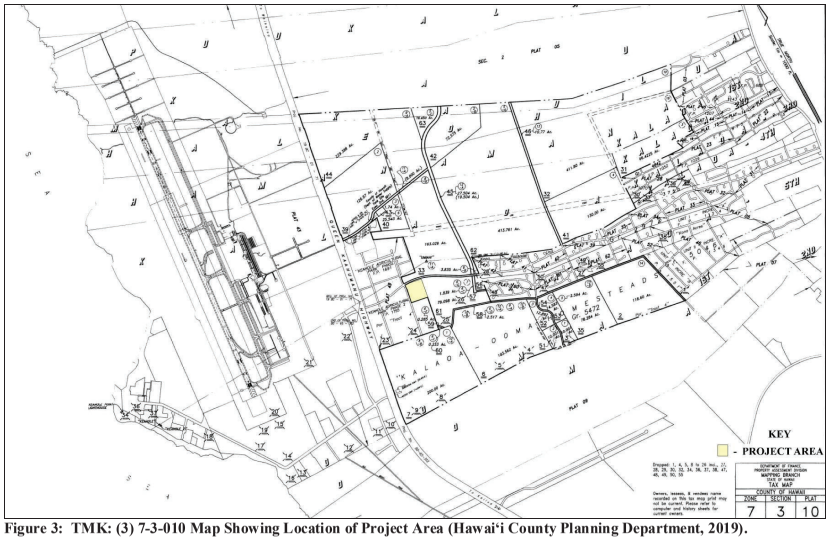

Figure 3: TMK: (3) 7-3-010 Map Showing Location of Project Area (Hawai'i County Planning Department, 2019).

Figure 4: Aerial Photograph Showing Project Area, Kalaoa, HI, Zone 4 North, 911795 m E, 2183705 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

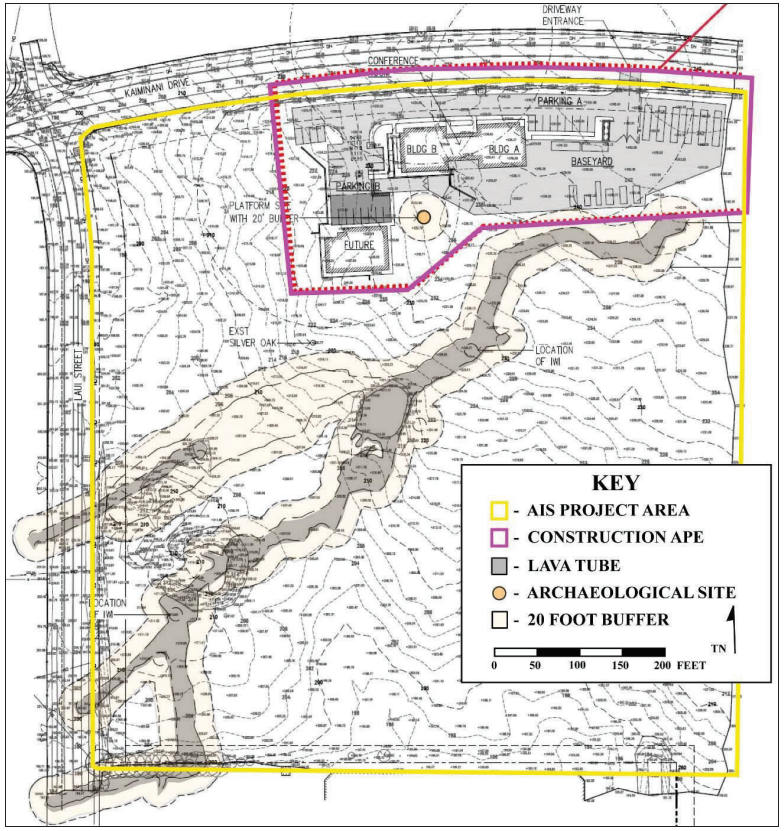

Figure 5: Preliminary DLNR Facilities Site Plan.

As a result, in 1850 the Hawaiian Government confirmed the traditional access rights to native Hawaiian *ahupua'a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawai'i Revised Statutes (HRS) 7-1. In 1992, the State of Hawai'i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights…may extend beyond the *ahupua'a* in which a native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawaii (2000) with House Bill 2895, relating to Environmental Impact Statements, proposes 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… [H.B. NO. 2895].

Act 50 requires state agencies and other developers to assess the effects of proposed land use or shoreline developments on the "cultural practices of the community and State" as part of the HRS Chapter 343 environmental review process (2001).

Its purpose has broadened, "to promote and protect cultural beliefs, practices and resources of native Hawaiians [and] other ethnic groups, and it also amends the definition of 'significant effect' to be re-defined as "the sum of effects on the quality of the environment including actions that are…contrary to the State's environmental policies…or adversely affect the economic welfare, social welfare, or cultural practices of the community and State" (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires an assessment of cultural practices to be included in the Environmental Assessments and the Environmental Impact Statements, and to be taken into consideration during the planning process. The concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua'a*" (OEQC 1997). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control:

> 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, which support such cultural beliefs (OEQC 1997).

This Cultural Impact Assessment involves evaluating the probability of impacts on identified cultural resources, including values, rights, beliefs, objects, records, properties, and stories occurring within the project area and its vicinity (H.B. 2895, Act 50, 2000).

METHODOLOGY

This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the "Cultural Impact Assessment Methodology", the OEQC states: …information may be obtained through scoping, community meetings, ethnographic interviews and oral histories… (1997).

The report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). The assessment concerning cultural impacts should address, but not 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 of limitations with 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, as well as the particular perspective of the authors, if appropriate, any opposing views, and any other relevant constraints, limitations or biases;

(6) a discussion concerning the cultural resources, practices and beliefs identified, and for the 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, and;

(11) the inclusion of bibliography of references, and attached records of interviews, which were allowed to be disclosed.

Based on the inclusion of the above information, assessments of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps and land records such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological project reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with applicable state laws and guidelines. Individuals and/or groups who have knowledge of traditional practices and beliefs associated with a project area or who know of historical properties within a project area are sought for consultation. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs, historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the information available for this study. When telephone interviews occur, a summary of the information is often sent for correction and approval, or dictated by the informant and then incorporated into the document. Key topics discussed with the interviewees vary from project to project, but usually include: personal association to the *ahupua'a*, land use in the project's vicinity; knowledge of traditional trails, gathering areas, water sources, religious sites; place names and their meanings; stories that were handed down concerning special places or events in the vicinity of the project area; evidence of previous activities identified while in the project vicinity.

Consultation letters, maps and project descriptions, were sent to individuals and organizations whose jurisdiction includes knowledge of the area. Consultation was conducted with nine individuals who either work for the Office of Hawaiian Affairs (OHA), SHPD, or are associated with Kalaoa Ahupua'a, or are long-time Kona residents.

Public notices (Appendix A) were placed in the September 2019 issue of the Office of Hawaiian Affairs (OHA) Ka Wai Ola Newspaper. Public notices were also published in the Honolulu Star-Advertiser, and the Hawai'i Tribune Herald on July 7th, 10th and 11th.

If cultural resources are identified based on the information received from these organizations and/or additional informants, an assessment of the potential effects on the identified cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

PROJECT AREA NATURAL ENVIRONMENT

The project area is located in the arid coastal region of leeward Hawai'i. The coastal region ground surface is characterized by bare pāhoehoe lava flows with extremely shallow rocky soil. There is sparse vegetation in the region due to lack of rainfall and lack of soil. The project area substrate is a Hualālai pāhoehoe lava flow (h1y series flow) dated to between 3,000 to 5,000 years before present (ybp) (Wolfe and Morris 1996:2).

The Soil Survey of Hawai'i characterizes the project area ground surface as bare pāhoehoe (rLW Series) without soil cover and with minimal vegetation (Sato et al. 1973:34). Average annual rainfall at the project area ranges from 10 to 20 inches (DLNR 1986). Vegetation in the project area is dominated by *kiawe* (*Prosopis pallida*) and sparse fountain grass (*Cenchrus setaceus*) and a single small silver oak tree (*Grevillea robusta*) (Starr Environmental, 2013). The silver oak is an introduced invasive now commonly found growing in Kona.

HISTORICAL AND CULTURAL CONTEXTS

EARLY SETTLEMENT AND EXPANSION

Many archaeologists believe that Hawai'i Island was first settled around A.D 1,000 by people sailing from the Marquesas (Athens et al. 2014; Dye 2011; Kahn et al. 2014; Kirch 2011; Kirch and McCoy 2007; McCoy 2005 and 2007; Mulrooney et al. 2011; Reith et al. 2011; Wilmhurst et al. 2011a and 2011b). An article published in the Journal of Archaeological Science reviewing radiocarbon dates recovered at archaeological sites on the Island of Hawai'i suggests that, by relying on only carbon samples from short-lived plant remains, the most reliable dates point to initial Polynesian

colonization of Hawai‘i Island occurring between AD 1220 and 1261 (Rieth et al. 2011:2747).

Initial settlement of Hawai‘i Island is believed to have occurred along the wetter and more fertile windward (*ko‘olau*) shores where conditions were optimal for marine and terrestrial exploitation (Maly and Maly 2006:7). This exploitation involved inshore and pelagic fishing, gathering shellfish from the shore, horticulture and animal husbandry, and the utilization of natural terrestrial flora and fauna (Kirch 1985; Kirch and Kelly 1975; Pearson et al. 1971; Maly and Maly 2006). The pattern of early windward settlement is thought to have consisted of widely spaced, permanent home bases that gradually expanded to form a nearly continuous zone of permanent settlement along the windward coasts as local populations grew.

The dry leeward shores of Hawai‘i Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the motives that lead to the establishment and spread of settlements on the leeward side of Hawai‘i, but archaeological evidence suggests the process was underway by the 1100s (Cordy 2000). Early radiocarbon dates have been obtained from coastal sites in Kona, South Kohala, at Kalāhuipua‘a and ‘Anaeho‘omalu, and from inland sites in the *ahupua‘a* of Waimea (Kirch 1979: 198, Cordy 2000: 130).

The early coastal settlements are located on, or adjacent to, the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jenson 1989a, 1989b, 1990a, and 1990b). The earlier phases of occupation were likely temporary habitations used when fishing, and later permanent habitations associated with fishpond production. Cordy suggests people who lived inland occasionally frequented the Kalāhuipua‘a and ‘Anaeho‘omalu area for its anchialine pond and marine resources (Cordy 2000:131). The implication is that, along the barren leeward coast, inland settlements and agriculture may have developed first, perhaps spreading from nearby Waimanu and Waipi‘o. Maly suggests that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Maly and Maly 2002).

The fertile plain of Waimea and the area of Kona receive roughly 40 to 80 inches of rainfall annually and Waimea is watered by streams from the Kohala Mountains (the Waikōloa, Wai‘aka, and Keanu‘i‘omanō streams). Inhabitants of these areas planted taro and sweet potato for subsistence. Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000: 135). Leeward expansion away from the coastline, at least on a permanent basis, is believed to have occurred only with the development or improvement of dry-land cultivation methods, possibly spurred by the introduction of sweet potato. Current evidence suggests that significant inland leeward settlement did not occur until 600 to 900 years after initial settlement, *i.e.*, between AD 1100 and 1400 (Green 1980; Hommon 1976; Cordy 2000). At lower elevations in North Kona and South Kohala Districts, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. It is possible that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of sandy soil.

In South Kona, Waimea, and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s. Permanent communities were developing at Kona, Lapakahi, and along the coastal region from ‘Upolu Point to Kawaihae (Cordy 2000: 140). Temporary residences and an agricultural field system were also established in the mid-elevations of Kona and the uplands of the Waikōloa-Waimea area (Moffat and Fitzpatrick 1995, Maly and Maly 2002: 4). As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000: 142). Cordy notes that just north of the project area “two different settlement and political zones seem to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to ‘Upolu Point” (Cordy 2000:385, footnote 15). Kona also became an important political center south of the current project area.

By the late 1700s extensive permanent field systems were well established in the Kona area, North Kohala, Waimea, and Lālāmilo (Clark 1981, Clark and Kirch 1983, Cordy 2000). Lands of the current project area remained barren and unoccupied except for small fishing villages located at some distance along the coast.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai'a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

Current archaeological, linguistic, and ethnological data suggest that Hawaiian social organization initially followed a Polynesian conical clan-pattern in which individual status was based upon genealogical ranking (Green 1980:72). Kinship formed the basis for regional and island-wide societal integration; however, the most important social subsistence unit was the localized, territorial community-based, corporate kin group. Leadership within this group fell to the "highest ranking individual of the locally dominant, socially ranked lineage" (*ibid*:73). This individual acted as the local chief, overseeing the social, political, and economic functioning of the community.

The subsequent development of a uniquely Hawaiian institution, the *ahupua`a*, resulted in a more complex level of social and political integration (Cordy 1978; Hommon 1976; Green 1980; Kirch 1985). The *ahupua`a* was the fundamental land division in late pre-contact Hawai`i. Ideally this land extended from the coast to the mountains–often corresponding with a valley drainage–and thus theoretically crosscut all primary resource zones, allowing each *ahupua`a* relative economic self-sufficiency. With the emergence of the *ahupua`a*, however, production shifted from the kinship-based relationship between chief and community to an incipient state-structured hierarchy. On his succession, the paramount chief chose the best lands for himself, and allocated the rest to his…

> warrior chiefs who had assisted in his conquests…[who], after retaining…land for themselves, reallotted the remaining lands to the inferior chiefs, who in turn reallotted portions of their lands to their own

> followers [and so on] down the scale to the lowest tenants, the common farmers who actually tilled the soil [Chinen 1961:7].

The chief (*konohiki*) responsible for the *ahupua'a* was now a member of a non-localized ruling elite (*ali'i*) and extracted rents or tribute from the common people (*maka`ainana)* working the land. "All of these allotments to lands, from warrior chiefs down to the commoners, were on a revocable basis," and Chinen wryly notes that, "what the superior gave, he was able to take away at pleasure" (*ibid*).

WAHI PANA (LEGENDARY PLACES)

The most informative *mo'olelo* describing events that took place in the barren lands of North Kona District is The Heart Stirring Story of Ka-Miki (*Ka'ao Ho'oniua Pu'uwai no Ka-Maiki*) recorded and published between 1914 and 1917 in the weekly Hawaiian Newspaper *Ko Hōkū o Hawai'i* and translated by Maly (excerpts cited in Maly 1992). The *mo'olelo* is set in the 1300s, though it is an early 20th Century collection of narratives about local traditions, tales, and family histories. The tales do have some time depth as they have been handed down through generations. They contain a mixture of "ancient" and 20th Century descriptions of the areas through which Ka-Miki and his brother Maka-'iole traveled. Descriptions of three places related to the current project area, Hale'ohi'u, Kalaoa, and 'O'oma, are described in the story.

The lands of Kalaoa was named after Chiefess Kalaoa Pu'umoi (Pukui et al. 1976:75) who was well known for her expertise in competitive riddling. Hale-'ohi'u is translated as "house made with a thatching shuttle". Kalua'ōlapa was the priest of Hale'ohi'u and Kamāhoe, also referred to as Nā-Kalaoa-wai'ole, translated as "the waterless Kalaoa lands" (Maly 1992:220). Kalua'ōlapa dwelt along the *'ilima (Sidafallax)* covered upland plain of Māulukua. Ka'elehuluhulu is the name of the land, Hale'ohi'u is the sub-district, Kanāhāhā is the fishing ground, and Keawehala is the landing (ibid: 220). 'O'oma is also only mentioned for its famous fishermen (ibid: 386).

EARLY ACCOUNTS OF PREHISTORIC EVENTS IN NORTH KONA

There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands. Cordy notes that the "oral traditions are silent" for the years of early settlement of and expansion along the leeward shores of Hawai'i (Cordy 2000: 130). The little information that does exist concerns the activities of *ali'i* and was collected and published by Fornander, I'i, and Kamakau.

Haleʻohiʻu is the only area within the project area to be mentioned in these early accounts. Haleʻohiʻu was a well-known fishing village at the time of ʻUmi-a-liloa (Kamakau 1992:216) and is a well-known place to catch "sweet-tasting *aku* fish" up through the time of Kamehameha (*ibid*:185). During the fourth year of Kamehameha's reign, he was advised by a *kaula* (a seer devoted to Pele) to go to Kekaha to make sacrifices to Pele in order to stop the lava flow threatening his fishponds and the homes of the people in the area. The lava had already flowed through the adjacent lands of Mahaiʻula, Kaʻūpūlehu, and Kīholo. It was believed that Pele desired *awa* from the fishponds of Kaʻūpūlehu, the *ʻahi* of Kīholo, and the *aku* from Haleʻohiʻu and Kaʻelehuluhulu. The flow stopped soon after Kamehameha made sacrifices to Pele.

Descriptions of lands both north and south of the project area are brief. ʻŌhiki is a stretch of sand and Kaloko has a large walled fishpond (*ibid*:56). ʻOʻoma is also mentioned by Kamamkau, but only as an out of way place, where the prince Ke-aweaweʻula was raised until he was five years old. (*ibid*:264).

HISTORICAL NARRATIVES, THE *ALIʻI*, AND WARFARE IN THE REGION

Historical narratives set near the project area describe battles between warring *aliʻi*, land traversed by warriors, and the place names where battles were fought. There are three accounts of historical events that took place near the project area between the 14th and 18th centuries. The events are documented by Fornander (1996), Kalākaua (1990), Kamakau (1961), and Malo (1951), and are treated in detail by Maly and Maly (2002).

The first event is the 14th century battle between Kamiole, a Kaʻū chief and Kalapana, the son of Kanipahu the sixth *mōʻī* of the Pili line. Kamiole and his warriors, reinforced by warriors from Kona, Hilo, and Puna had previously defeated Kanipahu at Kohala. Kalapana, with the aid of chiefs from Kohala and Hāmākua met Kamiole at ʻAnaehoʻomalu and defeated him.

The second historical event that took place near the project area is the battle between Lonoikamakahiki (ruler, A.D. 1640-1660) and rebel chiefs (most notably his elder brother Kanaloa-kuaʻana) encamped along the shore at ʻAnaehoʻomalu. Lonoikamakahiki and his Kona warriors were joined by forces from Kaʻū at the border of Kohala and Kona, on inland ʻAnaehoʻomalu.

> The next day Lono marched down and met the rebels at the place called Wailea, not far from Wainanalii, where in those days a watercourse appears to have been flowing. Lono won the battle, and the rebel chiefs fled northward with their forces. At Kaunooa, between Puakō and Kawaihae, they made another stand, but were again routed by Lono, and retreated to Nakikiaianihau, where they fell in with reinforcements from Kohala and Hamakua. Two other engagements were fought at Puupa and Puukohola, near the Heiau of that name, in both of which Lono was victorious (Fornander 1996:120-121).

A third battle was fought at Waimea during the reign of Lonoikamakahiki. The king of Maui (Kamalālāwalu), desiring to take over the Island of Hawaiʻi, sent spies to discover the best place from which to launch an attack (Kamakau 1961:56). They returned after investigating the shores of Hawaiʻi and reported that Kohala would be easy to capture as the inhabitants lived only on the coast and were few in number (*ibid.*).

Kamalālāwalu and his forces captured Puakō, and mislead by two old men of Kawaihae, marched to the dry grassy plain of Waimea (Waikoloa), and the hills of Hōkūʻula and Puʻu ʻOaʻoaka to await the warriors of Hawaiʻi. The warriors of Hawaiʻi took several routes to Waikoloa and stationed themselves around the forces of Maui. Fornander records:

> After Kama-lala-walu's warriors reached the grassy plain, they looked seaward on the left and beheld the men of Kona advancing toward them. The lava bed of Kaniku and all the land up to Hu'ehu'e was covered with the men of Kona. Those of Ka'u and Puna were coming down from Mauna Kea, and those of Waimea and Kohala were on the level plain of Waimea. The men covered the whole of the grassy plain of Waimea like locusts. Kamalalawalu with his warriors dared to fight. The battlefield of Pu'oa'oaka was outside of the grassy plain of Waimea, but the men of Hawaii were afraid of being taken captive by Kama, so they led (Kamalalawalu's forces) to the waterless plain lest Maui's warriors find water and hard, waterworn pebbles (Kamakau: 1961:58).

The two armies only skirmished in the beginning, soon turning to full battle, and a final route of the forces of Maui (Kamakau 1961). Almost all of the chiefs and warriors of Maui were slain either on the field of battle or at the Kawaihae shoreline.

The altar (*Ke Ahu a Lono*) at the coastal boundary between Kona and Kohala is often described as an alter for "the warrior leaders and warriors of Lonoikamakahiki, built at the time he went to battle with Kamalalawalu" (Kihe in *Ka Hoku o Hawaii* Jan.

31-Feb. 14, 1924, translated by Maly and Maly (2002: 15). A second account ascribes *Ke Ahu a Lono* to the restoration of friendship between Lonoikamakahiki and Kapaihiahilina. Lonoikamakahiki built the *ahu* for offerings made to consecrate their reconciliation. The *Ahu a Lono* was also the place where offerings were gathered during the *Makahiki*.

Kamehameha also built (or rebuilt) Pu‘ukoholā *heiau*, possibly completed by 1791, *mauka* of Mailekini *heiau* above Kawaihae (Kamakau 1961:154-155, Cordy 2000:338). It has been suggested the *heiau* construction undertaken by Kamehameha was a reconstruction of a previously built *heiau* that was re-consecrated to his god Kūkā‘ilimoku (Kinney 1913: 43 and Kamakau 1961: 154). Kamehameha and his chiefs resided in Kawaihae during the construction and after, from 1792 to 1796 (Maly and Maly 2002: 16). Lonoikamakahiki, Alapa‘inui, Keawe‘āpala, and numerous lesser chiefs often visited and stayed at Kawaihae, Puakō, and Waimea (Kamakau 1961: 182-183).

EARLY HISTORIC ERA LAND USE

William Ellis described two trips he made between Kawaihae and Kailua. He traveled by boat during the first trip and only remarked on the coast to say it was “a rugged and barren shore of lava” (Ellis 2004:83). During his second trip, Ellis traveled by canoe from Kawaihae to Kailua. He left the former at six in the morning, stopped at Kapalaoa around 9:00am, and arrived in Kīholo around 4:00pm. He described Kīholo as “a straggling village, inhabited principally by fishermen” (Ellis 2004:418). He also described the large fishpond created by order of Kamehameha at that village. He left Kīholo just before sunset and arrived at Ka‘ūpūlehu between 7:00 and 8:00pm. He records little about the village except that everyone was asleep. When the moon had risen, by 11:00pm, he continued his journey by moonlight, arriving in Kailua an hour before sunrise. In all Ellis makes little description of the coastal area of North Kona District, perhaps because he was traveling at night.

Isabella Bird, who traveled from Kailua to Kawaihae some fifty years later described the coastal region by writing, “We sailed for some hours along a lava coast, streamless, rainless, verdureless, blazing under the fierce light of a tropical sun and some time after noon anchored in the scorching bay of Kawaihae” (Bird 2007:144).

THE MĀHELE (1845-1850)

With the Māhele of 1848 and the two Acts of 1850, authorizing the sale of land in fee simple to resident aliens and the award of *kuleana* lands to native tenants, land tenure in Hawaii arrived at a significant turning point (Chinen 1961:13). Article IV of the Board of Commissioners to Quiet Land Titles was passed in December 1845 and began the legal process of private land ownership. Through the Māhele of 1847-48 and the Kuleana Act of 1850, land was made available for private ownership.

The Māhele established a board of five commissioners to oversee land claims and to issue patents and leases for valid claims. Many scholars believe that Kauikeaouli (Kamehameha III) was forced to establish laws in order to protect Hawaiian sovereignty and crown lands from foreigners who had already begun claiming ownership of land they were granted permission to use for homes and business interests (Daws 1968:111; Kame‘eleihiwa 1992: 169-70, 176; Kelly 1983: 45; Kuykendall 1938(1): 145 footnote 47, 152, 165-6, 170;). Among other things, the foreigners were demanding private ownership of land to secure their island investments (Kame‘eleihiwa 1992: 178; Kuykendall 1938(1): 138, 145, 178, 184, 202, 206, 271).

As legal statutes defining the Māhele continued to evolve (up to 1850), the lands of the kingdom of Hawai‘i were divided among the king (crown lands), the *ali‘i* and *konohiki*, and the government. Once lands were thus divided and private ownership was instituted, the *maka‘āinana* (commoners), if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living as stipulated in the Kuleana Act (1850). These claims, however, could not include any previously cultivated or presently fallow land, *okipu‘u*, stream fisheries, or many other resources traditionally necessary for survival (Kame‘eleihiwa 1992:295; Kelly 1983:45-76; Kirch and Sahlins 1992 vol.1:3, 135-137, and vol.2:2).

The right of claimants to land was based on the written testimony of at least two witnesses who could corroborate the claimant’s long-standing occupation and use of the parcel(s) in question. The claimant might have been awarded a patent for the property, subsequently called Land Commission Awards (LCAs) (Chinen 1961:16).

It appears that the vast majority of Kalaoa 5th Ahupa‘a became government lands during the Māhele. There were only two LCAs awarded in Kalaoa 5th Ahupa‘a (Maly 1993:32-33). There are no maps showing the location or boundaries of the two LCAs,

but they both appear to have been in the uplands near to Māmalahoa trail and *mauka* of it (above 1,800 ft amsl).

LCA 7899, an area of land 60 fathoms (360 ft) in circumference, was awarded to Kupae (Kupuae or Kupuoe). Testimony given in support of LCA 7899, describes it as mauka Kalaoa 5th in the *'ili* of Kamo or Kaweo or Kawao. The claim included a house lot with one house and 12 partially cultivated garden plots. There were also eight garden plots claimed in Kalaoa 4th as part of LCA 7899.

LCA 7937, an unspecified area of land, was awarded to Kukaaui. Testimony given in support of LCA 7937, describes it as in the *'ili* of Kahuku, in the corner of Kalaoa 5th Ahupa'a. There were nine garden plots, eight of which were partially cultivated. The testimony suggests that some of the gardens were in Kalaoa 4th Ahupua'a.

In the early1900s, the *makai* lands of Kalaoa 5th, 'O'oma 1st and 'O'oma 2nd Ahupua'a were surveyed and mapped as part of a plan to sell homestead lots. The current 10-acre project area appears to be a portion of 55.60-acre Lot 9B. It does not appear that Lot 9B and surrounding lots were sold, as much of the property remained government lands.

MODERN LAND USE

The introduction of fee simple land ownership and commercial ventures in cattle ranching, sandalwood collection, supplying whaling vessels, and the cultivation of coffee, sugarcane, and other food crops greatly changed land-use patterns, settlement patterns, and cultural practices. The introduction of commercial economic practices further spurred on these rapid changes. Cattle ranching in particular either restricted or limited the use of entire *ahupua'a* from the traditional land tenure and horticultural regimes.

The dry barren lands of the current project area had limited use from the time of settlement on the leeward side of the Island of Hawai'i up to the modern era. Land use was restricted to small coastal settlements focused on fishing, and trail systems situated between these coastal villages and larger, socio-politically important populations centered in Kawaihae to the north and Kona to the south. During the post-Contact era, the wetter upland regions on either side of the Māmalahoa trail were settled as homesteads with home gardens. The Māmalahoa trail and associated features (*ahu* and two habitation

sites) are the only major cultural resources located in the general vicinity of the current project area, and none of these will be impacted by the proposed improvements documented in this report.

The following interview conducted February 12, 2009 with Aunty Josephine Palacat Barney of Kona documents her knowledge of the coastal area from Kohanaiki to Kailua-Kona during the period from 1925 to 1935. The interview was part of a cultural impact assessment (Escott and Spear 2009) for lands of the Kona International Airport. The information she provided paints a vivid image of life along the arid coastal region of North Kona.

Josephine is the daughter of Palacat Catalino (father) and Pararat Philipa (mother) of the Philippines. Palacat Catalino arrived in Hawai'i in 1912 at the age of 15. Pararat Philipa was brought to Hawaii by her adoptive father. Palacat Catalino and Pararat Philipa met in Onomea when she was 14. He was a field supervisor for Hamakua Sugar. They later married and moved to Kona.

Josephine is one of fifteen children. She is fifth born and the oldest girl. They lived in Kaloko, Honokohau, and Kohanaiki between 1925 and 1935 during which time her father was the supervisor of the *opae* ponds. He was hired to care for and maintain the ponds and was responsible for keeping them in pristine condition, for all people had the privilege of using the shrimp without permission. The fish in those ponds such as *awa* and mullet were the property of the person leasing the ponds, and only they had access to them. Most land in the area belonged to Greenwell's Huehue Ranch, so the ponds were probably leased through them. Other individuals would help clean the ponds, removing algae and debris. The algae was burned so it didn't make its way back into the pond.

The Palacats first beach house was just south of the Kaloko fish pond. They also lived in homes along the beach in Honokohau and Kohanaiki. They used the tax trail (Māmalahoa Trail) and traveled by donkey up and down the coast. By that time the trail was no longer used for collecting taxes. That ended after Kamehameha's death. They traveled north on the trail to Kalaoa to gather taro and breadfruit, and south to Kailua.

The house they lived in at Kohanaiki was already standing when they arrived (Figure 6). It was a ranch house that Josephine's father proceeded to repair and enlarge. They began their stay there in 1930 and continued on there until 1935. The house belonged to the Greenwell's, and was probably obtained through payment of unpaid taxes. The Keanaaina family claimed that land. At one time they lived there because they have two family members buried there. This was before the Palacats lived there.

There was once a village near there prior to the 1801 lava flow. The flow stopped before it got to the ocean. The legend is that Kamehameha was concerned about the village taken by Pele, and feared that she was headed for Kailua. Kamehameha went to Hualalai but forgot *ho'okupu* (gifts). All the Kahuna were with him, and he asked them to make peace with Pele. As he had forgotten the gifts, he grasped his hair and cut it off as he was chanting and the lava stopped flowing.

During the Palacats stay at Kohanaiki, only one other family lived in the area. Pedro Espigata was from the same province in the Philippines as Josephine's father, so they were good friends, and he and his family moved wherever the Palacats happened to be.

When the Palacats moved to Kaloko, the Espigatas moved to Kaloko. When the Palacats moved to Kohanaiki, the Espigatas moved to Kohanaiki. And when the Palacats moved to Kailua, the Espigatas moved there, too. He was married to Sarah Pai. She was very dedicated to her name because she was a descendent of an old Hawaiian Chief named Pai from ancient times. She was part Hawaiian, but also had ancestors from the Philippines, China and Portugal. She and Pedro had several children. There were no other individuals living near there during that time.

People at that time had respect for one another and for the *'aina*, and fishermen had respect for the ocean, as well. If a person used something, they were compelled to give something back in return. There were fishing traditions like the *Opelu Koa*. There were several on the west side of the island. The tradition was to fish one, then skip one. Then fish the next, and skip the one after that. Later, on their way back down the coast, they would feed the ones that they skipped. The next time they went fishing they would fish the ones that were skipped the last time.

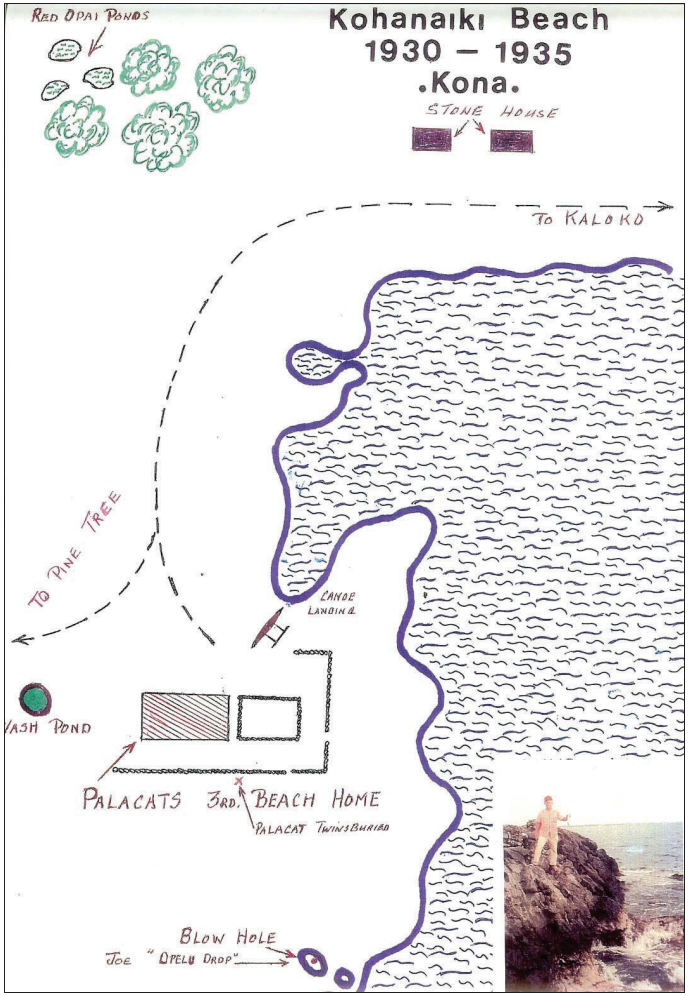

Figure 6: Palacat House at Kohanaiki Drawn by Mr. Joseph Palacat (in photo).

There was a tradition that was practiced so that the shrimp were not depleted. *Kauna'oa* flower (*Cuscuta sandwichiana*), which is also called the flower of Lāna'i is orange in color. It used to be plentiful along the coast, but the only place that it still exists is Makalawena. To chum the fish, it was customary to use a piece of cloth the size of a men's handkerchief. Josephine used soil from the base of the *kiawe* tree (*Prosopis pallida*) made into mud, a pinch of shrimp and the orange *kauna'oa* flower. The handkerchief was closed up and thrown out into the water. The handkerchief opens, the dirt forms a cloud, then the fish feed on the *kauna'oa* because it's the same color as the shrimp. There was no need to deplete the shrimp population. This is not practiced by fishermen today, because there's not a fisherman alive today that has learned or even knows about this technique. Josephine and her brother remember this. Her sister doesn't because she wasn't involved.

Fish *imu* at Honokohau. Depending on the currents, Josephine's brother would go out and make fish *imu*. He would take rocks and depending on the way the waves were breaking, he would construct a mound, setting the rocks in such a way so that the waves wouldn't disturb them. Once the fish made a home there, inhabiting the rocks, a net could be thrown over it to catch the fish. In those days, those who fished using this method were free to use any *imu*, but were obligated to rebuild it for the next person to use. People at that time were respectful of others and of their efforts. There were strong notions concerning keeping things the way they were and putting things back, and not being disruptive.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

More than 50 archaeological studies have been conducted in the region of the current project area (Figure 7). Archaeological evidence suggests the broad *ahupua'a* settlement pattern for the area is one of small coastal villages established from A.D. 1000s through A.D. 1400. Initial habitation sites were seasonal and were associated with fishing. Limited horticulture may have been practiced at coastal sites at this time. From the 1400s to the early historic period, there appears to be a limited expansion in the middle to upper reaches of the upland forest zone. Expansion in the upland zone is associated with dryland swidden agriculture (Henry *et al*. 1993:56). Likely dryland crops consisted of taro, sweet potatoes, gourds, breadfruit, bananas, paper mulberry, *ti*, and sugar cane. During the historic era, there was increased population growth in the upland forest zone associated with the development of homesteads involved in the growing of coffee and sheep and cattle ranching. The barren zone does not appear to be a permanent habitation zone at any time in history.

Barren zone archeological features include pāhoehoe excavations, trail segments, *ahu*, and small rock pavements, small temporary habitation c-shape enclosures, and lava tubes (refuge caves and temporary habitation along trail segments). Sites suggesting resource extraction include excavated lava blisters, likely for the production of abraders. Other blister excavations appear to have been created while hunting nesting birds, or collecting eggs and chicks. Feature distribution is extremely sparse in this zone.

There are three previous archaeology reports that include portions of the current AIS project area. Davis (1977) conducted an archaeological reconnaissance survey of the Keahole Agricultural Park, just *mauka* of Queen Ka'ahumanu Highway across from Kona International Airport (Figure 8). Hammatt and Folk (1980) conducted additional reconnaissance survey and excavations in the Keahole Agricultural Park (Figure 9). The study included reconnaissance survey of land north of the Davis (1977) project area and Phase II inventory survey-level recording, excavations, artifact analysis, and basalt glass dating at sites previously identified during the Davis (1977) reconnaissance survey. PHRI, Inc. conducted an archaeological assessment study (Henry et al. 1993) of a large project area adjacent to the current AIS study (Figure 10). The study included aerial helicopter survey and pedestrian survey of 11.5% of the 2,640-acre State-owned land.

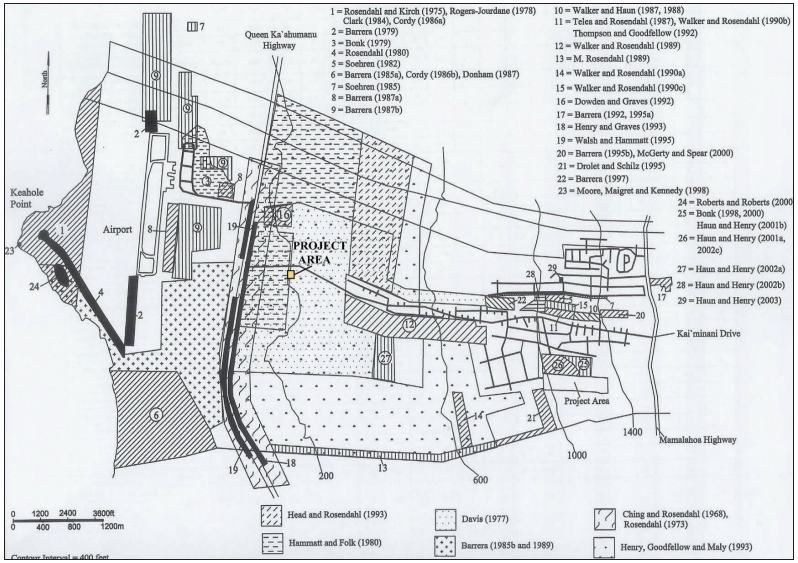

Figure 7: Map of Previous Archaeology (Adapted from Haun and Henry 2004).

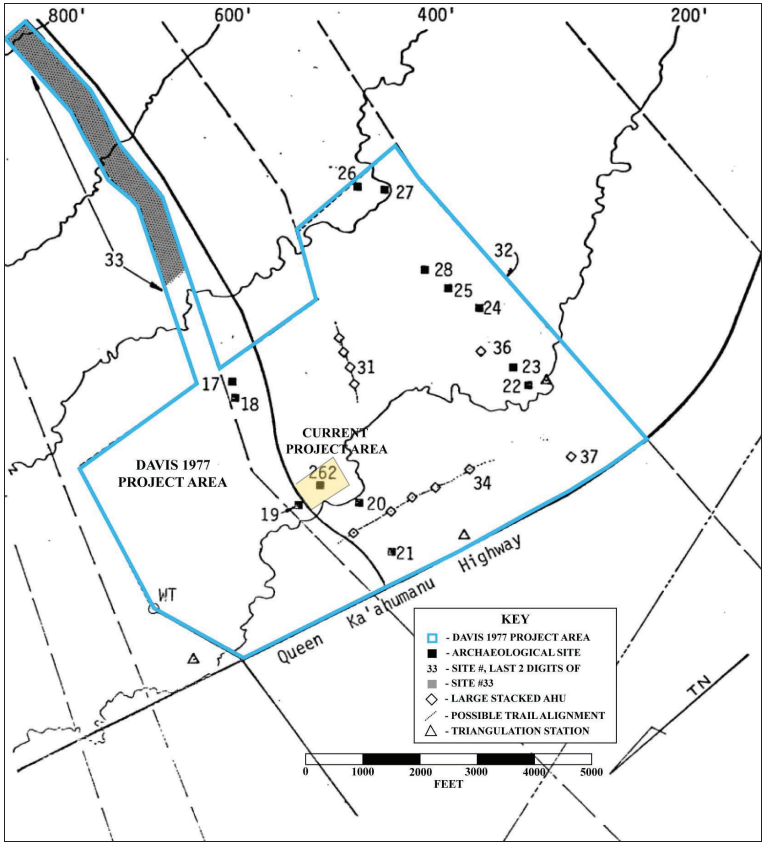

Figure 8: Map Showing Location of Davis (1977) Project Area and Current AIS Project Area (Adapted from Davis 1977:22).

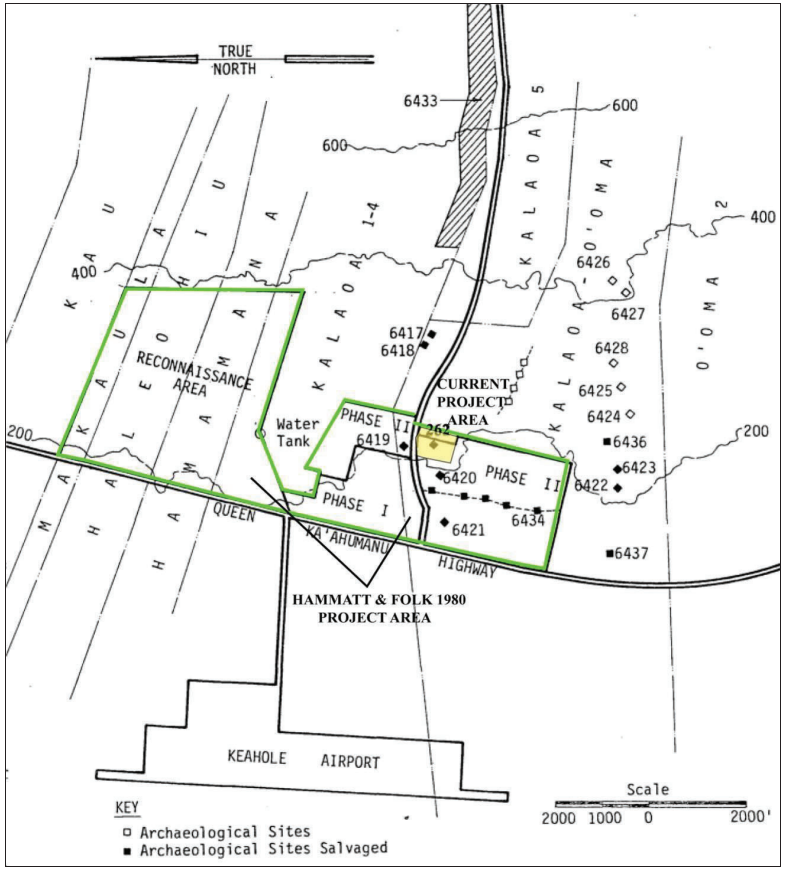

Figure 9: Map Showing Location of Hammatt and Folk (1980) Project Area and Current AIS Project Area (Adapted from Hammatt and Folk 1980:6).

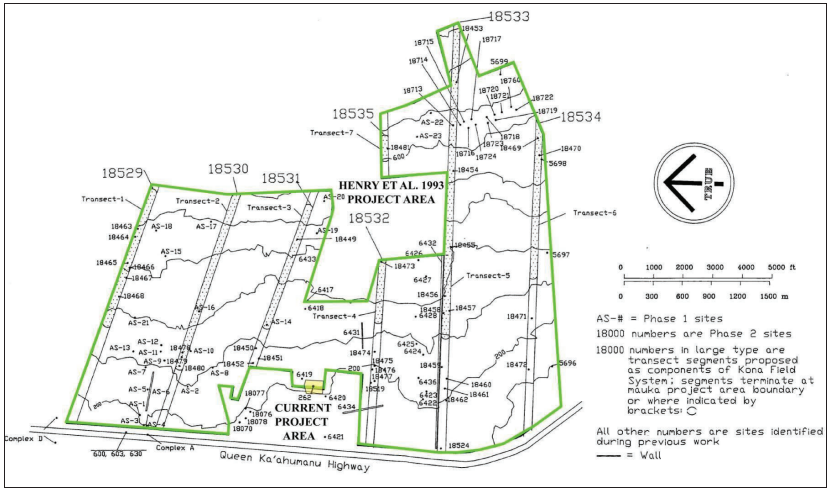

Figure 10: Map Showing Location of Henry et al. (1993) Project Area and Current AIS Project Area (Adapted from Henry et al. 1993:59).

The archaeological reconnaissance survey report written by Davis (1977) documented 22 sites with 59 features (see Figure 8). Sites included rock mound markers possibly marking trails, habitation sites within lava skylights (sinks) and lava tubes, and a large refuge cave site (Site #50-10-27-262, located in the current AIS project area). The report site descriptions summaries were very brief and there were no excavations conducted during the study, making it difficult to assess the nature of many of the habitation sites recorded during the study.

The Phase II inventory survey level recording and excavation conducted by Hammatt and Folk (1980) at 12 sites identified in the Davis (1977) report (see Figure 9). The Phase II report includes in-depth documentation at seven sink and cave sites (Sites #50-10-27-262, 6418, 6418B, 6420, 6421, 6422, and 6423), a Historic era homestead (Site #50-10-27-6418), a habitation complex of indeterminate age (Site #50-10-27-6419), and three sites containing possible rock mound markers (Sites #50-10-27-6434, 6436, and 6437).

Three radiocarbon samples collected at the sites returned a date range of A.D. 1400-1700. Thirteen volcanic glass samples submitted for rind-hydration dating returned a date range of A.D. 1480-1808. An interesting finding of the study is the larger than anticipated number of habitation sites in sinks and lava tubes, and the presence of the large refuge cave complex (Site 262, located in the current AIS project area) containing two burials. The in-depth site documentation, site mapping, subsurface testing, dating, artifact analysis, and conclusions conducted during the study were conducted to a very high professional level. The only omissions are USGS and TMK maps showing the locations of sites; site and feature photographs; and site significance assessments, all of which are now SHPD required in AIS reports.

The archaeological assessment study conducted by PHRI, Inc. (Henry et al. 1993) covered an area of 2,640 acres. Fieldwork included aerial helicopter survey and pedestrian survey of 11.5% of the 2,640 acres. Twelve previously identified sites and eleven newly identified sites were recorded during the aerial survey and 42 new sites were identified during the pedestrian survey. Site types included habitation complexes, rock alignments, enclosures (C-shape, L-shape, and rectangular), modified lava tubes, modified outcrops, enclosures, rock filled cracks, a terrace, modified blisters and depressions, rock mounds, pāhoehoe excavations, rock pavings, platforms, petroglyphs, rock walls, and trail segments. The authors note that there exists a surprisingly larger

than anticipated number of habitation and agricultural sites in the barren zone, though site density is much lower below 300 ft amsl. Also, unanticipated is the relative lack of trails and other transportation features.

SCS conducted an AIS study (Escott 2019 draft) of the 10.0-acre project area and recorded a single previously documented site (Refuge Cave Site #50-10-27-262) and two new archaeological sites (Site #50-10-27-31109 and Site #50-10-27-31110) (Figure 11 and Figure 12). Site 31109 is a rectangular rock mound located in the northeast quadrant of the project area. Site 31110 is a group of pāhoehoe excavations located in the southwest quadrant of the project area.

The refuge cave (Site #50-10-27-262) includes several habitation and activities areas within the open sink and numerous features within the lava tube system, including a petroglyph panel, a refuge enclosing wall, burials, and numerous other small features. The refuge cave, open sink and burials at Site #50-10-27-262 will be preserved in-place.

TRADITIONAL BURIAL PRACTICES

Hawaiians have traditionally buried their *kūpuna* in different ways. Burials were often interred in lava tubes or in graves constructed in the ground. Burial locations were sometimes marked with rock mounds or by well-faced rectangular platforms. At other times, burials were interred under the stone foundations of homes, or under rock-paved terraces. During the Historic era, burials were often marked with cement monuments. There is also the Hawaiian tradition of burying secretly in unmarked locations. Burials in lava tubes might be sealed, or those in the ground were often not marked.

In either case, Hawaiians consider the protection of *iwi kūpuna* to be a sacred responsibility. It is common that burial locations will be kept secret and that family members will take care of the graves. Protecting the bones of the deceased is a traditional Hawaiian cultural practice with a long history.

Today, it is common to make burial locations known to the Hawai‘i Island Burial Council (HIBC) for official preservation. During this process, the location of burial sites is made known to the HIBC members and cultural and lineal descendants. The HIBC and the Hawai‘i State Preservation Division (SHPD) determine proper

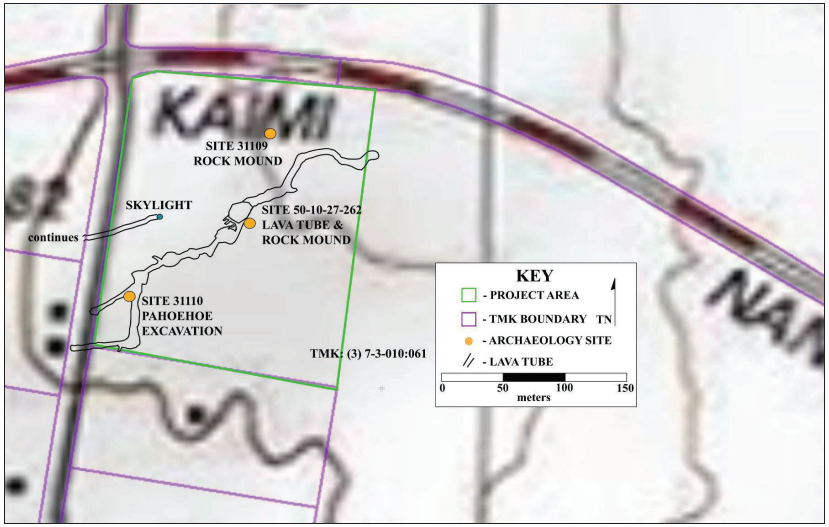

Figure 11: 7.5-Minute Series USGS Topographic Map Showing Location of Project Area Keahole Point Quad) (National Geographic Topo!, 2003. Sources: National Geographic Society, USGS).

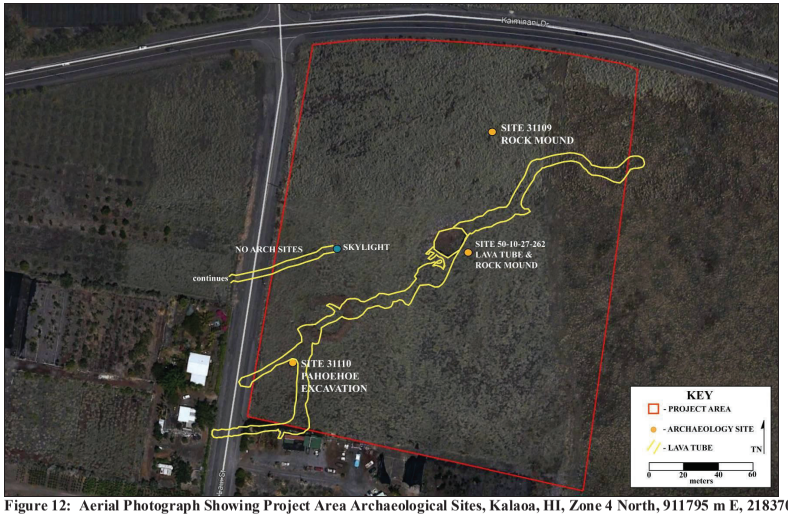

Figure 12: Aerial Photograph Showing Project Area Archaeological Sites, Kalaoa, HI, Zone 4 North, 911795 m E, 2183705 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

preservation treatments necessary to prevent impacts to the burial. While this is the common modern practice, many people do not feel comfortable discussing the location of burials with others, and they often prefer to protect the burials themselves.

Whether a person decides to participate in the official burial treatment process, or decides to protect a burial on their own, they are still practicing a traditional Hawaiian cultural practice.

CULTURAL INFORMANT INTERVIEWS

SCS, Inc contacted nine individuals that either work for the Office of Hawaiian Affairs (OHA), SHPD, or are associated with Kalaoa 5th Ahupuaʻa, or are long-time Kona residents with considerable knowledge of Kona history and cultural practices (Table 1).

Table 1: Individuals Responding to CIA.

Name	Affiliation	Responded	Has Knowledge	Cultural Practices
Shane Palicat Nelson	OHA West Hawaiʻi	Yes	Some	No
Kamakana Ferreirra	OHA Compliance Division	No	-	-
Kekoa Nazara	President Kona Hawaiian Civic Club	Yes	Yes	No
Jacob Keanaaina	Associated with Lands of Kalaoa 5th	Yes	Yes	No
Kamaka Ohana	Associated with Lands of Kalaoa 5th	No	-	-
J. Curtis Tyler III	Associated with Lands of Kalaoa 5th	No	-	-
Iwalani Arakaki	Long-Time Kona Resident	Yes	-	No
Sean Naleimaile	SHPD Archaeologist	No	-	-
Jordan Kea Calpito	SHPD Burial Sites Specialist	No	-	-

SUMMARY

The "level of effort undertaken" to identify the potential effects of a project to cultural resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential.

In the case of the present parcel, inquiries were made to organizations and individuals

whose expertise include the project area lands. Consultation was sought from the Office of Hawaiian Affairs, the SHPD Burial Sites Branch, the SHPD Archaeology Branch, families associated with Kaloa 5th Ahupuaʻa, and long-time Kona residents.

Public notices were published in the Office of Hawaiian Affairs Ka Wai Ola Newspaper, and were published in the Honolulu Star-Advertiser and the Hawaiʻi Tribune Herald.

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as Iʻi, Kamakau, Chinen, Kameʻeleihiwa, Fornander, Kuykendall, Kelly, Handy and Handy, Pukuʻi and Elbert, Thrum, and Cordy have contributed, and continue to contribute to our knowledge and understanding of Hawaiʻi, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona ʻAina 2007 Data Base.

CIA INQUIRY RESPONSE

As suggested in the "Guidelines for Accessing Cultural Impacts" (OEQC 1997), CIAs incorporating personal interviews should include ethnographic and oral history interview procedures, circumstances attending the interviews, as well as the results of this consultation. It is also permissible to include organizations with individuals familiar with cultural practices and features associated with the project area.

As stated above, consultation was sought from the Office of Hawaiian Affairs, the SHPD Burial Sites Branch, the SHPD Archaeology Branch, families associated with Kaloa 5th Ahupuaʻa, and long-time Kona residents.

Public notices were printed in the September 2019 issue of the Office of Hawaiian Affairs (OHA) Ka Wai Ola Newspaper. Public notices were also published in the Honolulu Star-Advertiser, and the Hawaiʻi Tribune Herald on July 7th, 10th and 11th.

Aunty Iwalani Arakaki, a respected *kapuna* from Kona, responded by phone call after reading the Ka Wai Ola public notice. Information containing maps and a description of the project area and proposed DLNR base yard and offices project was mailed to her. After receiving the information, she called from her home on Maui to discuss the project area. She did not know of any past or ongoing cultural practices conducted at the project area. She recommended we speak with members of the Keanaaina family.

Shane Palicat Nelson, OHA West Hawai‘i Representative, also recommended we consult with the Keanaaina *‘ohana* and with Kekoa Nazara, President of the Kona Hawaiian Civic Club.

Mr. Jacob Keanaaina and Mr. Kekoa Nazara met with SCS Senior Archaeologist Glenn Escott, M.A. at the project area on December 15, 2019. Mr. Keanaaina’s family has lived in the broader Kalaoa region for many generations. His family had an upland home above modern day Māmalahoa Highway, a *kula* house midway down to the coast and coastal property as well. They would travel from the upland residence, stop at the *kula* house for the night and then continue down to the coast. Their travel usually followed the trail known as The Road to the Sea, down through Kohanaiki Homesteads and continuing to the coast in Kaloko Ahupua‘a.

When Jacob was younger, he and his cousins and friends caught goats in the region of the project area. They would quietly approach lava tube sinks (shallow skylights and tube collapses), look for goats resting in the sinks and assess where the goats were most likely to exit the skylight. The boys would spook the goats from the side opposite the access route and the boys hiding by the access would knock the goats over with sticks as the goats climbed out of the sink. They could then grab the goats and take them home. Jacob wasn’t aware of archaeological sites in the lava tubes as they didn’t enter them.

Mr. Kekoa Nazara, who is related to the Keanaaina family through marriage, was aware that the project area lava tube existed, but had never visited it. Both Keokoa and Jacob know the history of the project area lands through stories told by the previous Keanaaina family generations, but are not aware of any specific past or ongoing cultural practices conducted there. The only uses of the rocky grasslands at this elevation involved hunting or catching goats and donkeys, and travel through the area to reach upland homes and gardens or coastal fish ponds, fishing areas and temporary residences

Mr. Escott expressed that the DLNR intended to preserve the entire lava tube and skylight in accordance with measures to be detailed in an archaeological preservation plan and a burial treatment plan. Mr. Keanaaina and Mr. Nazara agreed that the lava tube should be preserved.

An analysis of the potential effect of the proposed construction on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). To our knowledge, the project area was used for travel, resource extraction, as a refuge cave area in times of warfare, and for habitation in the pre-Contact to early post-Contact eras. Based on historical research and consultation responses, it is reasonable to conclude that, as the current project is not currently a location for ongoing cultural practices, there will be no traditional cultural practices affected and no direct adverse effect upon cultural practices or beliefs in the broader project area region. However, as burials have been identified, and as descendants to the burials might be identified and recognized, a burial treatment plan will be developed to ensure that future cultural practices associated with the care of burials will not be adversely affected.

CULTURAL ASSESSMEMNT

Based on the results of an archaeological inventory survey (Escott 2019) of the project area, the results of previous archaeological studies, as well as organizational response, individual cultural informant responses, and archival research, cultural practices identified within the project area and wider region are associated with burials, refuge during times of warfare and the petroglyphs, all located within the Site #50-10-27-262 lava tube. The entire lava tube site will be preserved in place (avoidance and protection) in accordance with an archaeological preservation plan and a burial treatment plan to be written. The burial treatment plan preservation treatments will be determined through consultation with the Hawai‘i Island Burial Council (HIBC) and recognized descendants.

Whereas SHPD will preserve and protect the Site #50-10-27-262 lava tube and will not restrict access to recognized descendants, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by proposed development activities on this parcel. The proposed undertaking will not produce adverse effects to any native Hawaiian cultural practices within the project area or in the broader region.

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APPENDIX A: PUBLIC NOTICES AND AFFIDAVITS

CULTURAL IMPACT ASSESSMENT NOTICE

Information requested by Sci
entific Consultant Services, Inc. o
past and ongoing cultural practice
on 79.098 acres of land in Kalao
5th Ahupua'a, North Kona Distric
Island of Hawai'i, TMK: (3) 7-3
010:061. Please respond within 3

days to Glenn Escott at (808) 93
0968.

September 2019 Ka Wai Ola Public Notice.

AFFIDAVIT OF PUBLICATION

IN THE MATTER OF
CULTURAL IMPACT ASSESSMENT NOTICE - KALAOA

STATE OF HAWAII }
} SS.
City and County of Honolulu }

Doc. Date: JUL 11 2019 **# Pages:** 1
Notary Name: Patricia K. Reese **First Judicial Circuit**
Doc. Description: Affidavit of Publication
Notary Signature JUL 11 2019 Date

PATRICIA K. REESE NOTARY PUBLIC No. 86-467 STATE OF HAWAII

CULTURAL IMPACT ASSESSMENT NOTICE

Information requested by Scientific Consultant Services, Inc. of past and ongoing cultural practices on 79.098 acres of land in Kalaoa 5th Ahupua'a, North Kona District, Island of Hawai'i, TMK: (3) 7-3-010:061. Please respond within 30 days to Glenn Escott at (808) 938-0968.
(SA1213266 7/7, 7/10, 7/11/19)

Lisa Sakakida being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser, MidWeek, The Garden Island, West Hawaii Today, and Hawaii Tribune-Herald, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the

Honolulu Star-Advertiser 3 times on:
07/07, 07/10, 07/11/2019
MidWeek 0 times on:
The Garden Island 0 times on:
Hawaii Tribune-Herald 0 times on:
West Hawaii Today 0 times on:
Other Publications: 0 times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

Lisa Sakakida

Subscribed to and sworn before me this 11 day of July A.D. 20 19

Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07, 2022

Ad # 0001213266

PATRICIA K. REESE NOTARY PUBLIC No. 86-467 STATE OF HAWAII

SP.NO.: _____ L.N.

July 2019 Honolulu Star-Advertiser Public Notice.

IN THE MATTER OF
CULTURAL IMPACT ASSESSMENT NOTICE - KALAOA

STATE OF HAWAII }
} SS.
City and County of Honolulu }

Doc. Date: JUL 11 2019 **# Pages:** 1
Notary Name: Patricia K. Reese **First Judicial Circuit**
Doc. Description: Affidavit of Publication
Notary Signature JUL 11 2019 Date

PATRICIA K. REESE NOTARY PUBLIC No. 86-467 STATE OF HAWAII

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(HH1213268 7/7, 7/10, 7/11/19)

Lisa Sakakida being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser, MidWeek, The Garden Island, West Hawaii Today, and Hawaii Tribune-Herald, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the

Honolulu Star-Advertiser 0 times on:
MidWeek 0 times on:
The Garden Island 0 times on:
Hawaii Tribune-Herald 0 times on:
West Hawaii Today 3 times on:
07/07, 07/10, 07/11/2019
Other Publications: 0 times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

Lisa Sakakida

Subscribed to and sworn before me this 11 day of July A.D. 20 19

Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07, 2022

Ad # 0001213268

PATRICIA K. REESE NOTARY PUBLIC No. 86-467 STATE OF HAWAII

SP.NO.: _____ L.N.

July 2019 Hawai'i Tribune-Herald Public Notice.

APPENDIX E

Traffic Impact Assessment Report by SSFM International

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DRAFT

DLNR Administration Facility

Tax Map Key (3) 7-3-010: 061

Traffic Impact Analysis Report

Kona, Island of Hawaii

April 3, 2020

Prepared for

Erskine Architects, Inc.

Prepared by

SSFM International

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I. PROJECT DESCRIPTION

DLNR is proposing to relocate and consolidate several divisions into a new administration facility with base yard on the west coast of the island of Hawaii. The property, owned by the State of Hawaii, is located at the corner of Kaiminani Drive and Laui Street at TMK (3) 7-3-010:061. The driveway is proposed off Kaiminani Drive. The project location, along with the study intersections associated with this traffic impact analysis report (TIAR), are shown in Figure 1.

The proposed project site is on approximately five (5) acres of a 79.098-acre (3,445,509 square-feet) project site and is zoned "open." The new administration facility will be composed of three (3) buildings at complete future buildout. Each building will be approximately 2,500 square-foot for an approximate total of 7,500 square-feet. DLNR's proposed site plan is shown in Figure 2. The project plans to be fully constructed and occupied by 2026.

The intent of this TIAR is to evaluate existing conditions and assess impacts in the surrounding areas as a result of the proposed development. To consider the greater traffic impact, all trips will be analyzed through the primary driveway off Kaiminani Drive. This TIAR was prepared in support of the proposed environmental permitting.

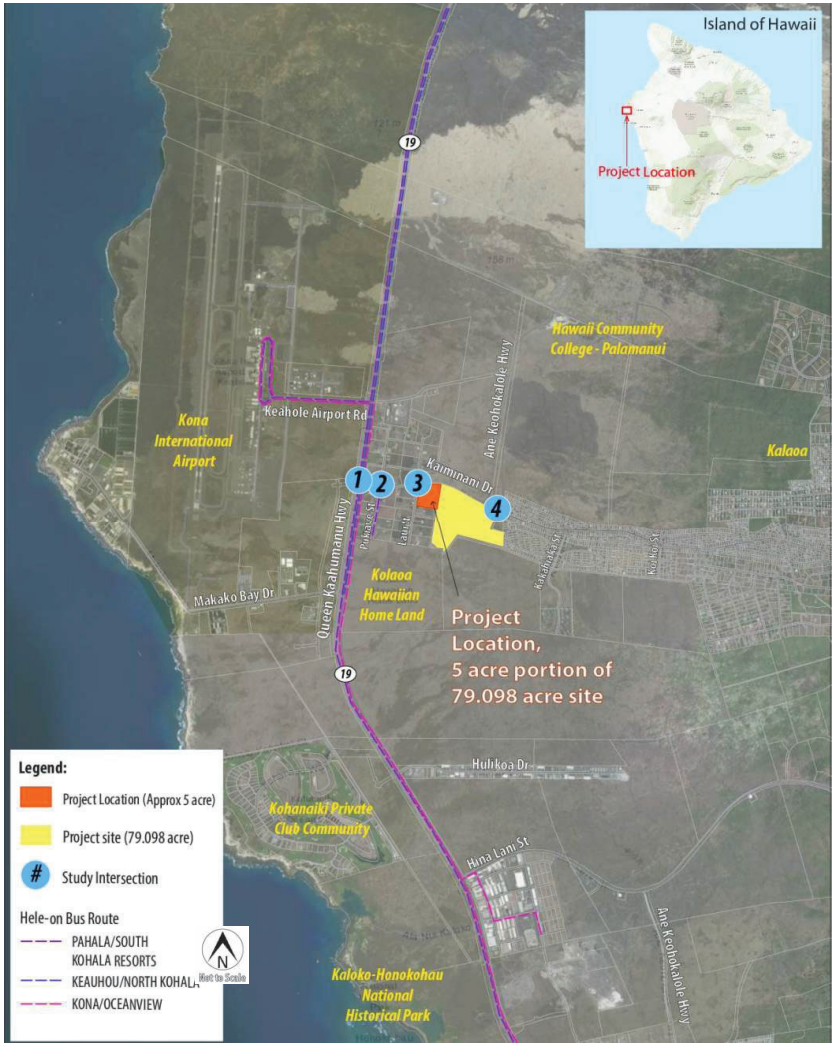

Figure 1: Project Location and Site Map

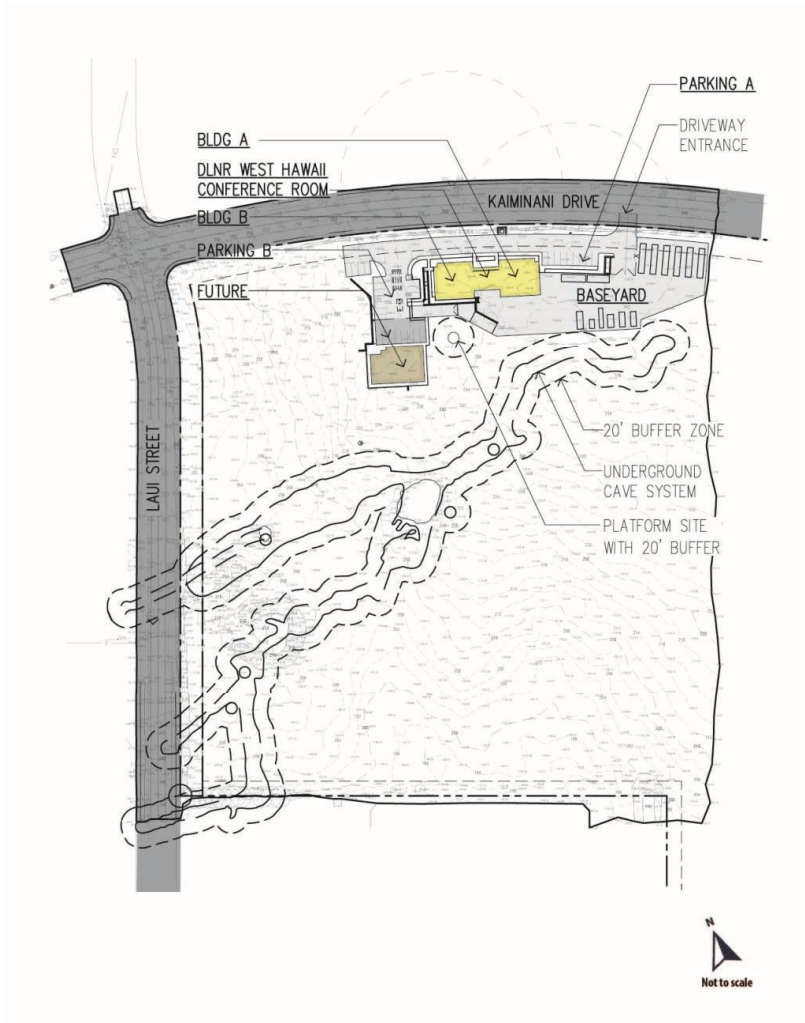

Figure 2: Proposed Site Plan

II. EXISTING CONDITIONS

A. Geometric Configuration

1. Roadway Configuration

a) Kaiminani Drive

The proposed facility will have its primary driveway off Kaiminani Street, approximately 420 feet east of the intersection with Laui Street. Kaiminani Street is an undivided, two-lane, urban collector road, oriented in the east-west direction. Kaiminani Drive is one of the primary east-west corridors between the Kona International Airport and the Kalaoa residential neighborhood. It starts from Mamalahoa Highway in the east and ends at Queen Kaahumanu Highway in the west. The posted speed limit is 35 miles per hour (mph). It has dedicated left turn lanes at major intersections.

b) Queen Kaahumanu Highway

Where it crosses Kaiminani Drive, Queen Kaahumanu Highway (Route 19) is a divided, six-lane, State-owned arterial, oriented in the north-south direction. Queen Kaahumanu Highway extends from Kawaihae Road (Route 19) in the north to the intersection with Palani Road (Route 130) where it turns into State Route 11. The posted speed limit varies from 45-55 mph.

c) Ane Keohokalole Highway

Ane Keohokalole Highway is a two-lane road that runs parallel to Queen Kaahumanu Highway, intersecting with Kaiminani Drive, and provides access to Hawaii Community College Palamanui Campus. It is oriented in the north-south direction and traverses 1.5 mile long. The north leg of the intersection with Queen Kaahumanu Highway widens to four lanes with dedicated turn lanes.

d) Pukiawe Street and Laui Street

Pukiawe Street and Laui Street are both two-lane local roadways oriented in north-south direction. They run parallel to each other and are less than a mile long, intersecting only with Kaiminani Drive.

2. Intersection Configuration

The study intersections include the following:

1. Kaiminani Drive and Queen Kaahumanu Highway
    a. Four-leg signalized intersection with dedicated left turning lanes for all approaches.
    b. Channelized right turn lane exists for both northbound and westbound approaches.
2. Kaiminani Drive and Pukiawe Street
    a. Four-leg, two way stop controlled intersection with “STOP” sign on Pukiawe Street.
3. Kaiminani Drive and Laui Street
    a. Four-leg, two way stop controlled intersection with “STOP” sign on Laui Street.
4. Kaiminani Drive and Ane Keohokalole Highway
    a. Four-leg, two way stop controlled intersection with “STOP” sign on Ane Keohokalole Highway. Dedicated left turn lanes are present on all approaches.
    b. Channelized right turn lane exists for southbound approach.

Existing (2019) lane configurations and traffic controls at the study intersections are shown in Figure 3.

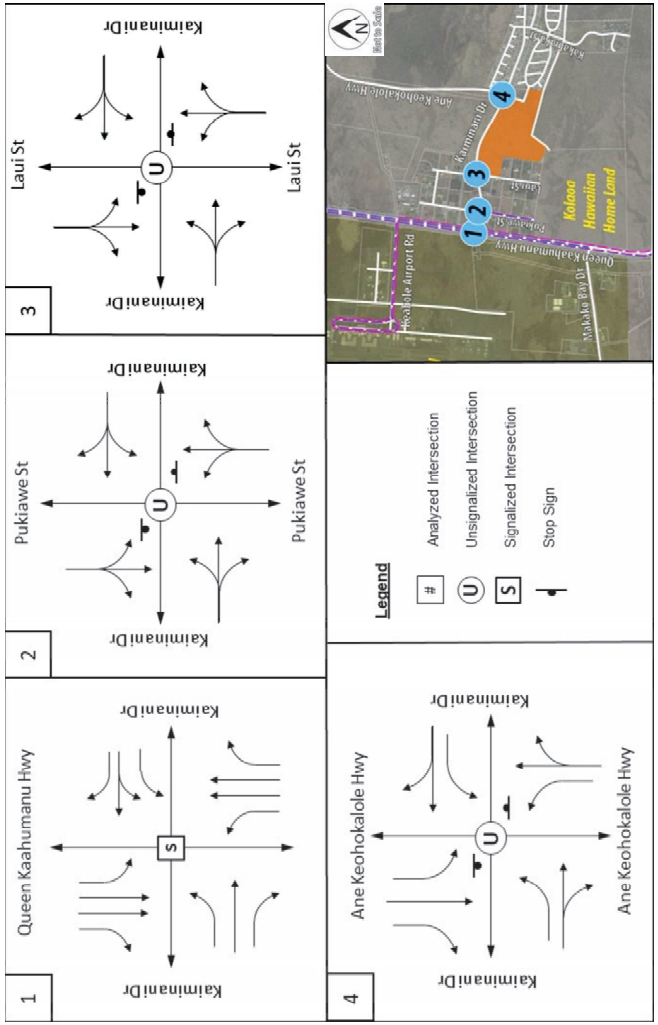

Figure 3: Existing 2019 Lane Configuration

B. Volumes

1. Vehicular Volume

a) Roadway Traffic Volumes

Historical average daily traffic (ADT) and peak hour volumes along Kaiminani Drive in the study area are shown in Table 1. The ADT is based on Hawaii DOT traffic counts included in *Historical Traffic Station Maps*.

Table 1: Roadway Traffic Volumes

Roadway	Location	ADT	Year
Kaiminani Dr.	Between Laui St. and Ane Keohokalole Hwy.	10,300	2016
		10,200	2015

Source: *Historical Traffic Station Maps* (HDOT)

The 24-hour traffic volume distribution along Kaiminani Drive (see Figure 4) at the traffic count station shows a variation in travel patterns throughout the day with prominent morning and afternoon commuter peak periods. Detailed 24-hour counts are included in Appendix A.

Along Kaiminani Drive, during the morning peak hour of 6:30 - 7:30 AM, there were approximately 760 vehicles per hour (vph) travelling eastbound and 110 vph travelling westbound for a total of 870 vph. During the afternoon peak hour of 3:45 – 4:45 PM, there were approximately 170 vph travelling eastbound and 650 travelling northbound for a total of 820 vph.

b) Existing 2019 Intersection Peak Hour Volumes

Manual intersection turning movement traffic counts were taken at the four study intersections: 1) Kaiminani Drive and Queen Kaahumanu Highway, 2) Kaiminani Drive and Pukiawe Street, 3) Kaiminani Drive and Laui Street, and 4) Kaiminani Drive and Ane Keohokalole Highway. Counts were collected during the peak periods on Tuesday, April 30, 2019 and included tabulation of passenger vehicles, heavy trucks, pedestrians, and bicycles. The Existing (2019) peak hour volumes are shown in Figure 5. Detailed peak period counts are included in Appendix A.

2. Bus Transit Volumes

The County of Hawaii's transit system (Hele-on Bus) doesn't have bus routes that travel along Kaiminani Drive near the study area. The closest bus stops to the proposed facility is located at Matsuyama Market, 2.2 mile away near the corner of Queen Kaahumanu Highway and Hukikoa Drive. The Intra Kona bus route serves this stop and operate between 6:55 AM to 8:30 PM, Monday to Saturday. Appendix B includes the detailed bus route schedule and map for this route.

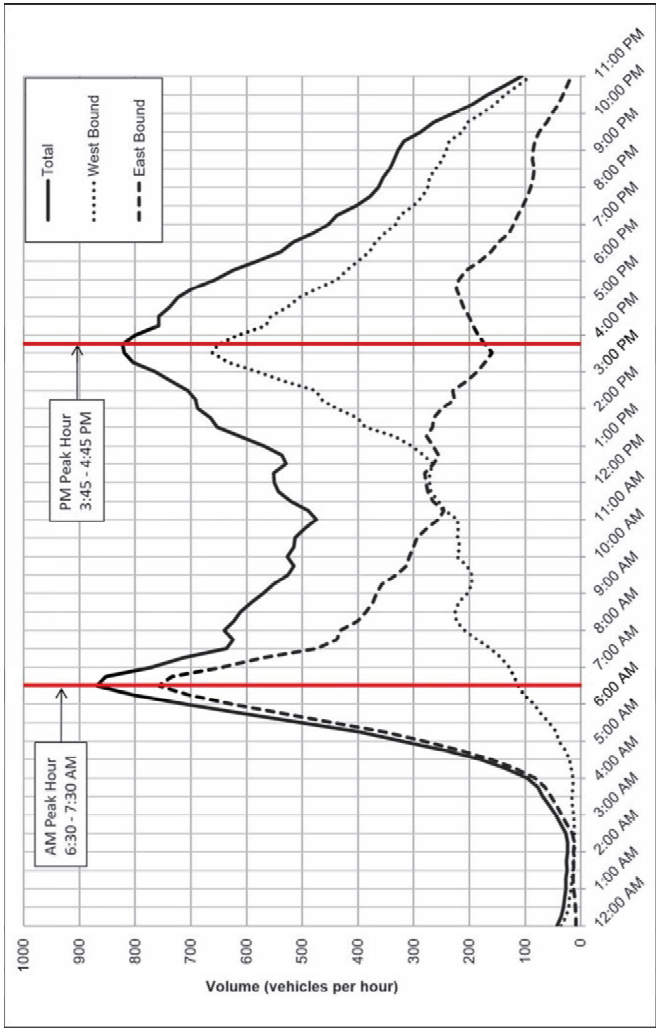

Figure 4: Kaiminani Drive (Laui St. to Ane Keohokalole Hwy.), 24-Hour Volume Distribution (2016)

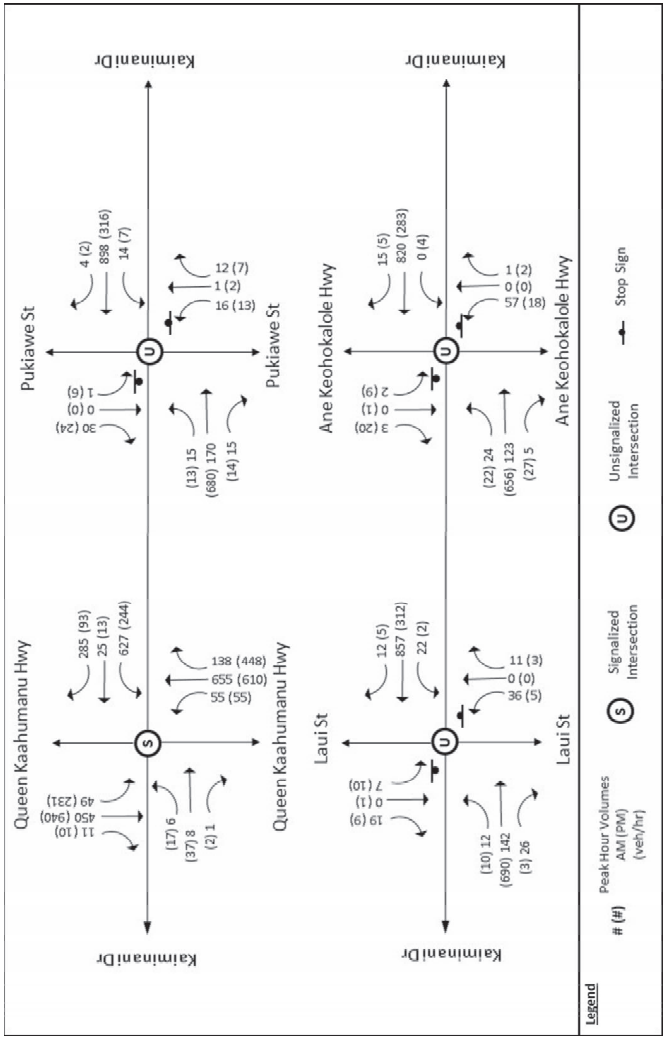

Figure 5: Existing 2019 Peak Hour Volumes

3. Pedestrian and Bicycle Volumes

Kaiminani Drive doesn't have designated sidewalks or bike lanes, but wide shoulders exist along its entirety. Queen Kaahumanu Highway is a frequently use training route for Ironman and therefore has regular bicycle activity. Only minor pedestrian and bike activity was observed at the study intersections during the peak hours. A total of 13 bikes were counted on Queen Kaahumanu Highway at the intersection with Kaiminani Drive during AM peak hour and only 1 bike during PM peak hour. A total of 4 pedestrians and 3 bicycles were counted at the intersection of Kaiminani Drive and Ane Keohokalole Highway during AM peak hour and no activity was observed during PM peak hour.

C. Level of Service

1. Methodology

Level of service (LOS) is an operational analysis rating system used in traffic engineering to measure the effectiveness of roadway operating conditions. There are six LOS ranging from A to F. LOS A is defined as being the least interrupted flow conditions with little or no delays, whereas LOS F is defined as conditions where extreme delays exist. Guidelines from the *Statewide Uniform Design Manual for Streets and Highways* (HDOT, 1980) and *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011) state that an appropriate peak hour LOS for an urban arterial is LOS C or D. Intersection LOS and delay were determined for the AM and PM peak hours using *Synchro 10* traffic analysis software and analyzed using *HCM* 6th Edition (TRB, 2016) methodologies.

As stated in the *Highway Capacity Manual* (*HCM*) 6th Edition (TRB, 2016), LOS for a two-way stop controlled (TWSC) intersection is determined by the measured control delay (see Table 2) and is defined for each minor movement, not for the intersection as a whole. Vehicles traveling along the major, free-flow road, of a TWSC intersection, proceed through with minimal delay or no delay at all. Those vehicles approaching the intersection along the minor movement are controlled by a stop sign and thus experience delay attributable to the volume of vehicles passing along the free-flow road and the gaps available.

Table 2: LOS Criteria for Unsignalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤15	B	F
>15 and ≤25	C	F
>25 and ≤35	D	F
>35 and ≤50	E	F
>50	F	F

Source: *HCM* (TRB, 2016)

The LOS analysis for signalized intersections is based on average total vehicle delay based on the methodologies of the *HCM* (TRB, 2000), as shown in Table 3. The HCM 6th Edition doesn't support the analysis with both exclusive and shared lanes.

Another measure of intersection delay is the volume to capacity (v/c) ratio. This is the ratio of the volume of traffic utilizing the intersection compared to the maximum volume of vehicles that can be accommodated by the intersection during a specific period of time. A v/c ratio under 0.85 means the intersection is operating under capacity and excessive delays are not experienced. An intersection is operating near its capacity when v/c ratios range from 0.85 to 0.95. Unstable flows are expected when the v/c ratio is between 0.95 and 1.0. A traffic movement can have a poor LOS but low v/c which suggests that the traffic volumes along that movement are low but have to wait a long time to make the movement. This is common for low volume protected turn movements or side streets that have to wait through a long cycle length for their split to come up.

Table 3: LOS Criteria for Signalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio <=1.0
≤ 10.0	A
>10 and ≤20	B
>20 and ≤35	C
>35 and ≤55	D
>55 and ≤80	E
>80	F

Source: *HCM* (TRB, 2000)

2. Existing 2019 Intersection LOS

Existing intersection and movement LOS and average delay (in seconds per vehicle) were determined for the AM and PM peak hours. All movements at the signalized intersection of Kaiminani Drive and Queen Kaahumanu Highway resulted in appropriate LOS D or better during AM and PM peak hours.

All movements at the unsignalized controlled intersections at Kaiminani Drive and Pukiawe Street resulted in appropriate LOS D or better during AM and PM peak hours.

At the unsignalized intersection of Kaiminani Drive and Laui Street, all movements resulted in appropriate LOS D or better during AM and PM peak hours, except the northbound movement which had LOS E (v/c of 0.32) during the AM peak hour.

At the unsignalized intersection of Kaiminani Drive and Ane Keohokalole Highway, all movements resulted in appropriate LOS D or better during both AM and PM peak hours, except the northbound left turning movement which had LOS E (v/c of 0.36) during the AM peak hour.

Table 4: Existing 2019 Intersection Level of Service

	Intersection		Control Type	AM			PM		
	Approach	Movement		Delay (s)	v/c	LOS	Delay (s)	v/c	LOS
HCM 2000 Methodology	Kaiminani Dr. and Queen Kaahumanu Hwy.			22.10	0.64	C	20.40	0.62	C
	Eastbound	L	Signal	32.80	0.10	C	33.30	0.24	C
		T		33.10	0.13	C	33.20	0.29	C
		R		32.20	0.00	C	31.40	0.00	C
	Westbound	L		28.10	0.76	C	32.90	0.60	C
		T		27.50	0.75	C	32.50	0.59	C
		R		17.40	0.20	B	26.80	0.08	C
	Northbound	L		14.70	0.19	B	15.60	0.30	B
		T		22.60	0.64	C	20.90	0.53	C
		R		16.40	0.10	B	19.20	0.32	B
	Southbound	L		15.50	0.26	B	11.90	0.58	B
		T		19.40	0.44	B	17.60	0.66	B
		R		15.60	0.01	B	10.80	0.01	B
HCM 6th Edition Methodology	Kaiminani Dr. and Pukiawe St.			1.50	-	-	1.50	-	-
	Eastbound	L	Free	11.30	0.03	B	8.20	0.01	A
	Westbound	L	Free	7.70	0.01	A	9.50	0.01	A
	Northbound	LTR	Stop	30.00	0.18	D	28.00	0.17	D
	Southbound	LTR	Stop	21.40	0.13	C	15.00	0.12	C
	Kaiminani Dr. and Laui St.			2.30	-	-	0.80	-	-
	Eastbound	L	Free	10.10	0.02	B	8.40	0.01	A
	Westbound	L	Free	7.60	0.02	A	9.20	0.00	A
	Northbound	LTR	Stop	38.10	0.32	E	22.20	0.04	C
	Southbound	LTR	Stop	24.30	0.13	C	20.30	0.11	C
	Kaiminani Dr. and Ane Keohokalole Hwy.			2.30	-	-	1.30	-	-
	Eastbound	L	Free	10.20	0.04	B	8.10	0.02	D
	Westbound	L	Free	-	-	-	9.20	0.01	B
	Northbound	L	Stop	36.90	0.36	E	29.70	0.12	A
		TR		9.40	0.00	A	13.60	0.01	A
	Southbound	L	Stop	26.10	0.01	D	27.10	0.08	D
		T		-	-	-	23.60	0.01	C
		R		16.40	0.01	C	10.50	0.04	B

III. FUTURE CONDITIONS

Full build-out and occupancy of the DLNR administration facility is expected by 2026. Hawaii County Code, Section 25-2-46 Concurrency requirements, require projections and analysis for future growth in the traffic for five, ten and twenty years for all the projects which propose zoning amendments. Since this project is not proposing zoning amendments, future projections and analysis for the future year 2026 is presented.

A. Surrounding Area Conditions

Palamanui is a proposed master planned mixed-use community containing residential, commercial, open space recreational elements, and university related facilities. The proposed development (see Figure 6) is situated between Queen Kaahumanu Highway and Mamalahoa Highway, north of Kaiminani Drive (TMK 3-7-2-05:01). University Drive is the primary road for accessing the development, providing access off Queen Kaahumanu Highway. The development was proposed to build out in four phases. In 2012, Palamanui contributed to the construction of the first phase of Hawaii Community College Palamanui campus which included the construction of a stretch of Ane Keohokalole Highway, between Hawaii Community College Palamanui campus and Kaiminani Drive. Since then, the project has been stalled and there are no updates on when it will resume development.

No other significant developments or future construction projects are expected in the immediately surrounding area that would significantly affect the roadway geometrics or traffic volumes at the study intersections. This is based on research completed on June 6th, 2019 at the State of Hawaii Office of Environmental Quality Control (OEQC) website and the Statewide Transportation Improvements Program (STIP).

B. Volumes

1. Future 2026 Without Project Volumes

The project study area within Kona has been experiencing modest growth. HDOT ADT counts on Kaiminani Drive between Laui Street and Ane Keohokalole Highway showed an average annual growth rate of 1% from 2013 to 2016. Similarly, the 2035 Federal Aid Highways Long Range Transportation Plan predicts an annual growth rate of 1% from 2020 to 2035 in this part of the island. Therefore, background growth rate of 1% per year was assumed, to account for additional traffic at the study intersections. The estimated future volumes without the project for the future year 2026 is shown in Figure 7.

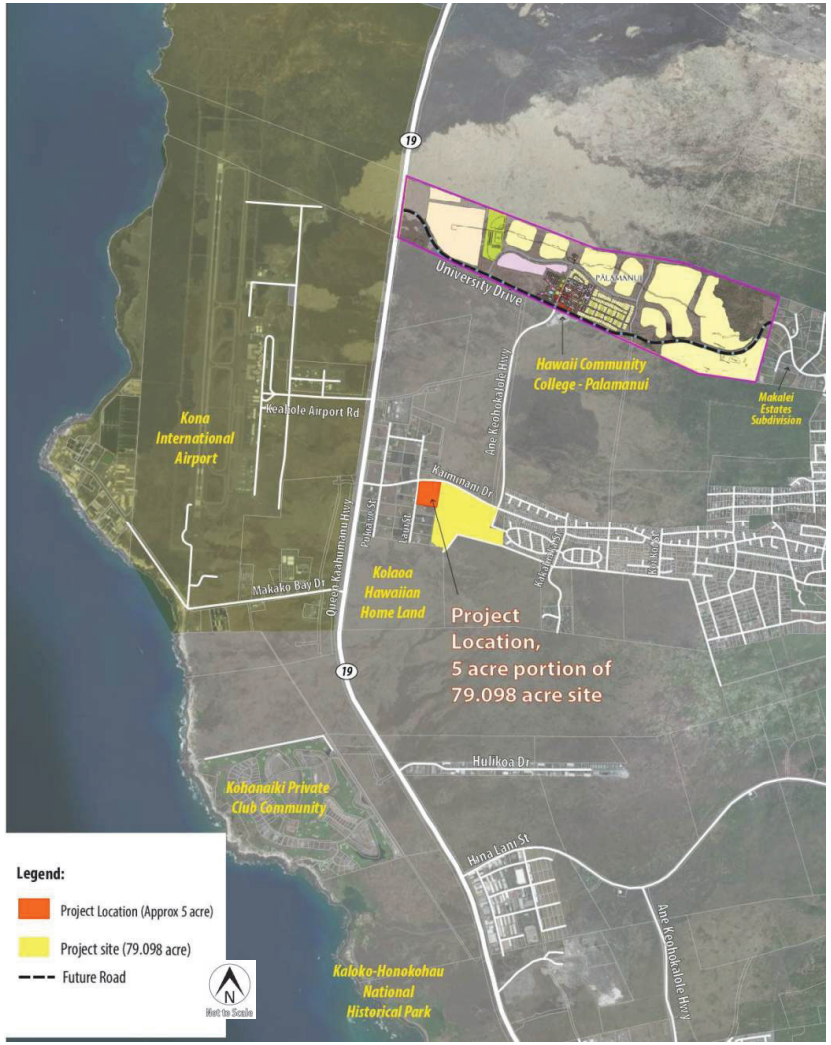

Figure 6: Surrounding Area Developments

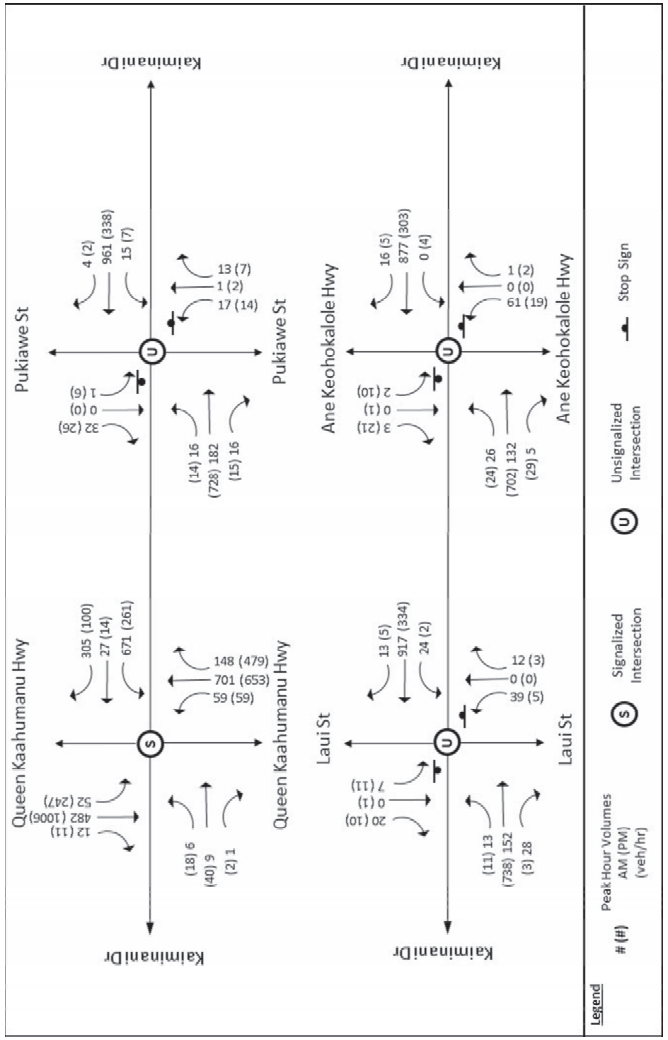

Figure 7: Future 2026 Without Project Peak Hour Volumes

2. Project Related Volumes

The proposed DLNR facility is planning to include three (3) buildings, each with approximately 2,500 square-feet of office building space, for an approximate total of 7,500 square-feet. In this analysis, a conservative 10,000 square-feet of office building space was used for the trip generation to account for potential building expansion. Trips generated from the proposed facility were estimated using nationally accepted land use rates from the *Trip Generation*, 10th Edition (ITE, 2016). ITE defines the General Office Building Land Use [710] as follows: "a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted." The analysis used a GFA of 10,000 square-feet as the independent variable to estimate new trips expected from the proposed project. The estimates for new trips generated by the project are shown in Table 5.

Table 5: Estimated Trips Generated by Project

	AM		PM	
Land Use [ITE Code]	**Equation**		**Equation**	
General Office Building [912]	T = 0.94 (X) + 26.49		Ln (T) = 0.95*Ln (X) + 0.36	
Gross Floor Area (GFA)	10,000 sf		10,000 sf	
New Trips	36		14	
	In[1]	**Out**	**In**	**Out**
	86%	14%	16%	84%
	31	5	3	11

T = Total number of trips generated, X = GFA/1000 = 10.

Project related trips were distributed through study intersections and the Kaiminani Drive project driveway using to existing traffic patterns and distribution. The resulting project-related peak hour volumes are shown in Figure 8.

3. Future 2026 With Project Volumes

Project related trips were added to the Future 2026 Without Project volumes to estimate Future 2026 With Project peak hour volumes (see Figure 9).

[1] In and Out split provided by *Trip Generation*, 10th Edition (ITE 2016) for Land Use 710

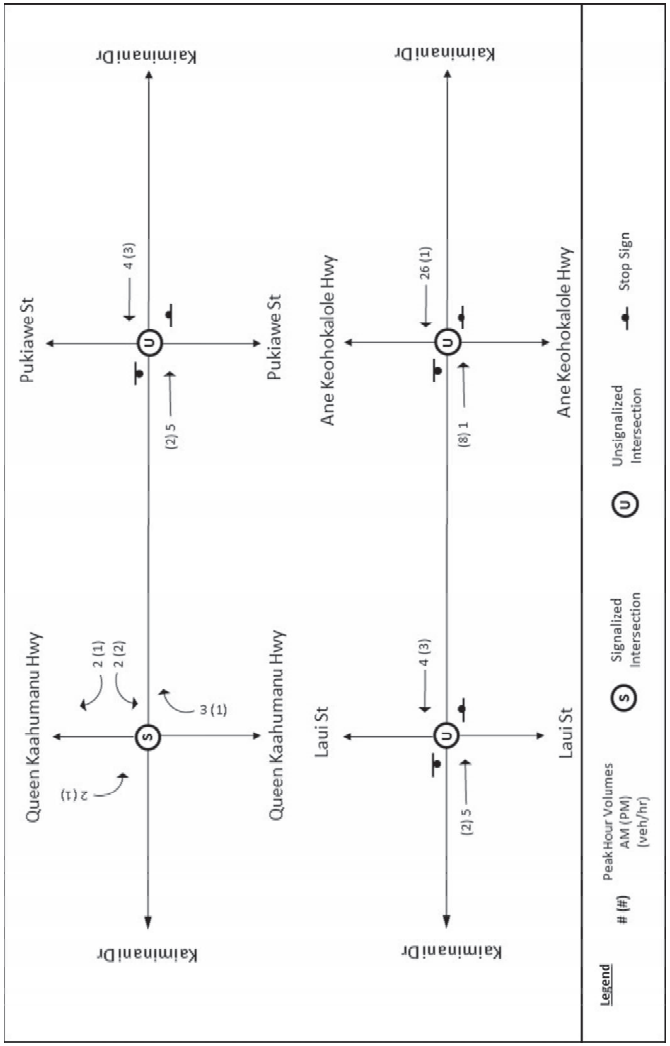

Figure 8: Project Related Trips

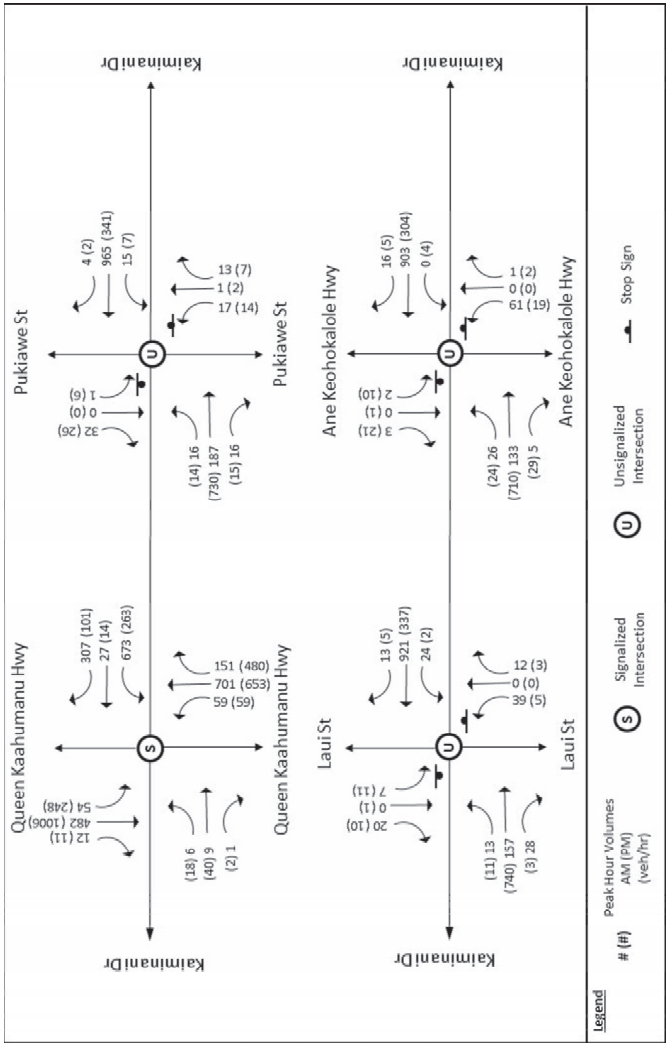

Figure 9: Future 2026 With Project Peak Hour Volumes

C. Future 2026 Intersection Level of Service

1. Future 2026 Without Project Intersection LOS

Using the Future 2026 Without Project volumes from Figure 7, LOS was determined for each study intersection. All movements at the signalized intersection of Kaiminani Drive and Queen Kaahumanu Highway resulted in appropriate LOS D or better during AM and PM peak hours.

All movements at the unsignalized intersection of Kaiminani Drive and Pukiawe Street resulted in appropriate LOS D or better during AM and PM hours, except for the northbound movement which had LOS E (v/c of 0.16) during the AM peak hour.

At the unsignalized intersection of Kaiminani Drive and Laui Street, all movements resulted in appropriate LOS D or better during AM and PM peak hours, except the northbound movement had LOS E (v/c of 0.41) during the AM peak hour.

At the unsignalized intersection of Kaiminani Drive and Ane Keohokalole Highway, all movements resulted in appropriate LOS D or better during both AM and PM peak hours, except the northbound left turning movement had LOS E (v/c of 0.44) during the AM peak hour.

All results are shown in Table 6.

2. Future 2026 With Project Intersection LOS

An analysis was performed for Future 2026 With Project conditions, using volumes from Figure 9. All movements at the signalized intersection of Kaiminani Drive and Queen Kaahumanu Highway resulted in appropriate LOS D or better during AM and PM peak hours.

All movements at the unsignalized intersection of Kaiminani Drive and Pukiawe Street resulted in appropriate LOS D or better during AM and PM peak hours, except the northbound movement had LOS E (v/c of 0.23) during the AM peak hour.

At the unsignalized intersection of Kaiminani Drive and Laui Street, all movements resulted in appropriate LOS D or better during AM and PM peak hours, except the northbound movement had LOS F (v/c of 0.42) during the AM peak hour.

At the unsignalized intersection of Kaiminani Drive and Ane Keohokalole Highway, all movements resulted in appropriate LOS D or better during both AM and PM peak hours, except the northbound left turning movement had LOS E (v/c of 0.46) during the AM peak hour.

All results are shown in Table 7.

3. Mitigation

While LOS E/F resulted for some side street movements during the AM peak hours, v/c remained low which is reflective of sufficient capacity. Therefore, no mitigation measures are proposed with the project.

Table 6: Future 2026 Without Project Intersection Level of Service

	Intersection		Control Type	AM			PM		
	Approach	Movement		Delay (s)	v/c	LOS	Delay (s)	v/c	LOS
HCM 2000 Methodology	Kaiminani Dr. and Queen Kaahumanu Hwy.			23.50	0.68	C	23.40	0.68	C
	Eastbound	L	Signal	33.90	0.10	C	32.90	0.25	C
		T		34.20	0.14	C	32.10	0.26	C
		R		33.20	0.00	C	30.60	0.00	C
	Westbound	L		30.10	0.79	C	34.00	0.62	C
		T		29.10	0.78	C	34.40	0.63	C
		R		17.50	0.21	B	27.30	0.09	C
	Northbound	L		15.50	0.22	B	17.10	0.35	B
		T		24.40	0.69	C	23.80	0.60	C
		R		17.20	0.11	B	21.10	0.34	C
	Southbound	L		16.60	0.31	B	15.90	0.67	B
		T		20.60	0.47	C	22.10	0.76	C
		R		16.20	0.01	B	12.50	0.01	B
HCM 6th Methodology	Kaiminani Dr. and Pukiawe St.			1.70	-	-	1.60	-	-
	Eastbound	L	Free	11.70	0.03	B	8.20	0.01	A
	Westbound	L	Free	7.80	0.01	A	9.80	0.01	A
	Northbound	LTR	Stop	35.70	0.16	E	32.50	0.20	D
	Southbound	LTR	Stop	23.70	0.22	C	15.90	0.13	C
	Kaiminani Dr. and Laui St.			2.80	-	-	0.80	-	-
	Eastbound	L	Free	10.40	0.02	B	8.50	0.01	A
	Westbound	L	Free	7.70	0.02	A	9.40	0.00	A
	Northbound	LTR	Stop	48.80	0.41	E	24.50	0.05	C
	Southbound	LTR	Stop	27.10	0.15	D	22.50	0.13	C
	Kaiminani Dr. and Ane Keohokalole Hwy.			2.80	-	-	1.40	-	-
	Eastbound	L	Free	10.60	0.04	B	8.10	0.02	A
	Westbound	L	Free	-	-	-	9.40	0.01	A
	Northbound	L	Stop	46.20	0.44	E	33.90	0.14	D
		TR		9.40	0.00	B	14.10	0.01	B
	Southbound	L	Stop	29.00	0.01	D	30.6	0.10	D
		T		-	-	-	25.90	0.01	D
		R		17.40	0.01	C	10.70	0.05	B

Table 7: Future 2026 With Project Intersection Level of Service

	Intersection		Control Type	AM			PM		
	Approach	Movement		Delay (s)	v/c	LOS	Delay (s)	v/c	LOS
HCM 2000 Methodology	Kaiminani Dr. and Queen Kaahumanu Hwy.			23.60	0.68	C	23.90	0.68	C
	East Bound	L	Signal	33.90	0.10	C	32.70	0.25	C
		T		34.20	0.14	C	32.10	0.26	C
		R		33.20	0.00	C	30.50	0.00	C
	West Bound	L		30.30	0.79	C	33.90	0.62	C
		T		29.20	0.78	C	34.30	0.63	C
		R		17.50	0.22	B	27.10	0.09	C
	North Bound	L		15.50	0.22	B	17.30	0.35	B
		T		24.40	0.69	C	24.30	0.62	C
		R		17.20	0.11	B	21.40	0.34	C
	South Bound	L		16.60	0.32	B	15.60	0.67	B
		T		20.60	0.47	C	22.10	0.76	C
		R		16.20	0.01	B	12.50	0.01	B
HCM 6th Methodology	Kaiminani Dr. and Pukiawe St.			1.70	-	-	1.60	-	-
	East Bound	L	Stop	11.80	0.03	B	8.30	0.01	A
	West Bound	L		7.80	0.01	A	9.80	0.01	A
	North Bound	LTR		36.50	0.23	E	32.90	0.21	D
	South Bound	LTR		23.80	0.16	C	16.00	0.13	C
	Kaiminani Dr. and Laui St.			2.90	-	-	0.80	-	-
	East Bound	L	Stop	10.40	0.02	B	8.50	0.01	A
	West Bound	L		7.70	0.02	A	9.40	0.00	A
	North Bound	LTR		50.40	0.42	F	24.60	0.05	D
	South Bound	LTR		27.30	0.15	D	22.50	0.13	C
	Kaiminani Dr. and Ane Keohokalole Hwy.			2.90	-	-	1.50	-	-
	East Bound	L	Stop	10.70	0.04	B	8.10	0.02	A
	West Bound	L		-	-	-	9.40	0.01	A
	North Bound	L		49.60	0.46	E	34.40	0.14	D
		TR		9.40	0.00	A	14.30	0.01	B
	South Bound	L		30.20	0.02	D	31.00	0.10	D
		T		-	-	-	26.20	0.01	D
		R		17.90	0.01	C	10.70	0.05	B

IV. SUMMARY

DLNR is proposing to relocate and consolidate several divisions into a new administration facility with base yard at a location at the corner of Kaiminani Drive and Laui Street. The project's driveway is proposed off Kaiminani Drive. Plans are for full-build and occupancy by 2026. Trips resulting from the proposed project were distributed through study intersections in the surrounding area and analyzed for the future year of occupancy. The resulting impacts resulted in poor LOS operations for some side street movements but acceptable v/c, showing sufficient capacity and a negligible impact.

V. REFERENCES

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APPENDIX

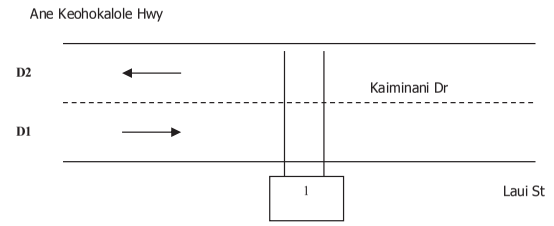
APPENDIX A
24-Hour and Peak Hour Traffic Counts

Traffic Data Service
Traffic Station Sketch

N

Island: Hawaii
Area: Kona

Section ID/Station #: B71019800276



	Meter #	File Name	GPS
1.	V279	D0902001_B71019800276 D0902002_B71019800276	19.72454, -156.0222

Station Description: Kaiminani Dr: Ane Keohokalole Hwy to Laui St			
Survey Beginning Date/Time: 9/2/15@ 0000		Survey Ending Date/Time: 9/3/15@ 2400	
Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	1347		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Kaiminani Dr		17		0198	

D1 = Direction to End
D2 = Direction to Begin

D1: Laui St/ Queen Kaahumanu Hwy
D2: Ane Keohokalole Hwy/ Mamalahoa Hwy

Run Date: 2016/05/18

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2015 Program Count - Summary

Site ID: B71019800276 **Town:** Hawaii **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 10200
Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 198
Location: Kaiminani Dr - Ane Keohokalole Hwy to Laui St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 09/02/2015															
12:00-12:15	1	9	10	06:00-06:15	126	10	136	12:00-12:15	58	65	123	06:00-06:15	42	95	137
12:15-12:30	3	11	14	06:15-06:30	119	19	138	12:15-12:30	77	77	154	06:15-06:30	46	80	126
12:30-12:45	1	7	8	06:30-06:45	193	22	215	12:30-12:45	61	55	116	06:30-06:45	41	92	133
12:45-01:00	1	7	8	06:45-07:00	192	25	217	12:45-01:00	73	66	139	06:45-07:00	33	77	110
01:00-01:15	2	5	7	07:00-07:15	193	28	221	01:00-01:15	64	78	142	07:00-07:15	35	67	102
01:15-01:30	3	3	6	07:15-07:30	195	21	216	01:15-01:30	65	56	121	07:15-07:30	38	84	122
01:30-01:45	1	1	2	07:30-07:45	216	23	239	01:30-01:45	64	97	161	07:30-07:45	29	72	101
01:45-02:00	1	5	6	07:45-08:00	173	49	222	01:45-02:00	80	75	155	07:45-08:00	19	68	87
02:00-02:15	1	5	6	08:00-08:15	118	41	159	02:00-02:15	87	86	173	08:00-08:15	26	47	73
02:15-02:30	4	5	9	08:15-08:30	126	47	173	02:15-02:30	64	97	161	08:15-08:30	20	68	88
02:30-02:45	4	1	5	08:30-08:45	98	45	143	02:30-02:45	52	100	152	08:30-08:45	19	62	81
02:45-03:00	7	1	8	08:45-09:00	103	40	143	02:45-03:00	50	97	147	08:45-09:00	25	49	74
03:00-03:15	2	1	3	09:00-09:15	79	54	133	03:00-03:15	69	111	180	09:00-09:15	18	56	74
03:15-03:30	5	5	10	09:15-09:30	93	55	148	03:15-03:30	71	113	184	09:15-09:30	8	57	65
03:30-03:45	11	3	14	09:30-09:45	85	37	122	03:30-03:45	50	152	202	09:30-09:45	21	46	67
03:45-04:00	9	2	11	09:45-10:00	78	42	120	03:45-04:00	36	179	215	09:45-10:00	11	48	59
04:00-04:15	12	2	14	10:00-10:15	75	40	115	04:00-04:15	37	171	208	10:00-10:15	17	47	64
04:15-04:30	16	1	17	10:15-10:30	81	47	128	04:15-04:30	44	164	208	10:15-10:30	12	45	57
04:30-04:45	22	3	25	10:30-10:45	59	50	109	04:30-04:45	42	163	205	10:30-10:45	5	52	57
04:45-05:00	33	4	37	10:45-11:00	93	48	141	04:45-05:00	39	182	221	10:45-11:00	10	32	42
05:00-05:15	44	3	47	11:00-11:15	78	39	117	05:00-05:15	28	170	198	11:00-11:15	7	19	26
05:15-05:30	47	5	52	11:15-11:30	54	68	122	05:15-05:30	42	134	176	11:15-11:30	5	17	22
05:30-05:45	87	13	100	11:30-11:45	73	54	127	05:30-05:45	56	100	156	11:30-11:45	3	14	17
05:45-06:00	99	12	111	11:45-12:00	63	61	124	05:45-06:00	49	103	152	11:45-12:00	3	14	17

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	777	121	898
AM - K FACTOR (%)			8.88
AM - D (%)	86.53	13.47	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM	07:45 AM to 08:45 AM	
AM - PEAK HR VOLUME	796	182	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM		
PM - PEAK HR VOLUME	162	680	842
PM - K FACTOR (%)			8.33
PM - D (%)	19.24	80.76	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	04:00 PM to 05:00 PM	
PM - PEAK HR VOLUME	226	680	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	777	121	898
AM - K FACTOR (%)			8.88
AM - D (%)	86.53	13.47	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM		
PM - PEAK HR VOLUME	162	680	842
PM - K FACTOR (%)			8.33
PM - D (%)	19.24	80.76	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:30 PM to 02:30 PM		
PEAK HR VOLUME	295	355	650
DIRECTIONAL PEAK			
PEAK HR TIME	09:00 AM to 10:00 AM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	335	380	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,763	965	3,728
AM 12-HR PERIOD (00:00-12:00)	3,179	1,079	4,258
PM 6-HR PERIOD (12:00-18:00)	1,358	2,691	4,049
PM 12-HR PERIOD (12:00-24:00)	1,851	3,999	5,850
24 HOUR PERIOD	5,030	5,078	10,108
D (%)	49.76	50.24	100.00

Run Date: 2016/05/18

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2015 Program Count - Summary

Site ID: B71019800276 **Town:** Hawaii **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 10200
Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 198
Location: Kaiminani Dr - Ane Keohokalole Hwy to Laui St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 09/03/2015															
12:00-12:15	3	14	17	06:00-06:15	118	12	130	12:00-12:15	79	63	142	06:00-06:15	50	116	166
12:15-12:30	2	17	19	06:15-06:30	134	24	158	12:15-12:30	73	69	142	06:15-06:30	41	94	135
12:30-12:45	1	8	9	06:30-06:45	181	24	205	12:30-12:45	78	60	138	06:30-06:45	46	101	147
12:45-01:00	1	3	4	06:45-07:00	204	8	212	12:45-01:00	65	59	124	06:45-07:00	42	96	138
01:00-01:15	1	9	10	07:00-07:15	197	25	222	01:00-01:15	52	56	108	07:00-07:15	32	92	124
01:15-01:30	1	4	5	07:15-07:30	177	18	195	01:15-01:30	75	59	134	07:15-07:30	38	96	134
01:30-01:45	2	2	4	07:30-07:45	210	40	250	01:30-01:45	60	70	130	07:30-07:45	26	82	108
01:45-02:00	0	4	4	07:45-08:00	134	49	183	01:45-02:00	62	74	136	07:45-08:00	31	75	106
02:00-02:15	2	1	3	08:00-08:15	130	42	172	02:00-02:15	75	80	155	08:00-08:15	22	72	94
02:15-02:30	2	2	4	08:15-08:30	100	52	152	02:15-02:30	58	102	160	08:15-08:30	16	75	91
02:30-02:45	3	1	4	08:30-08:45	116	36	152	02:30-02:45	45	121	166	08:30-08:45	19	62	81
02:45-03:00	4	4	8	08:45-09:00	106	51	157	02:45-03:00	53	98	151	08:45-09:00	20	46	66
03:00-03:15	4	2	6	09:00-09:15	95	58	153	03:00-03:15	43	105	148	09:00-09:15	13	49	62
03:15-03:30	7	4	11	09:15-09:30	100	55	155	03:15-03:30	49	131	180	09:15-09:30	15	47	62
03:30-03:45	12	1	13	09:30-09:45	97	44	141	03:30-03:45	34	151	185	09:30-09:45	23	57	80
03:45-04:00	14	3	17	09:45-10:00	88	25	113	03:45-04:00	40	147	187	09:45-10:00	21	53	74
04:00-04:15	16	5	21	10:00-10:15	76	42	118	04:00-04:15	21	181	202	10:00-10:15	17	47	64
04:15-04:30	19	1	20	10:15-10:30	83	50	133	04:15-04:30	41	168	209	10:15-10:30	16	49	65
04:30-04:45	20	3	23	10:30-10:45	68	60	128	04:30-04:45	49	137	186	10:30-10:45	10	50	60
04:45-05:00	29	2	31	10:45-11:00	66	52	118	04:45-05:00	32	132	164	10:45-11:00	7	36	43
05:00-05:15	46	2	48	11:00-11:15	67	54	121	05:00-05:15	39	130	169	11:00-11:15	6	27	33
05:15-05:30	39	3	42	11:15-11:30	71	46	117	05:15-05:30	56	106	162	11:15-11:30	9	24	33
05:30-05:45	84	8	92	11:30-11:45	58	62	120	05:30-05:45	56	110	166	11:30-11:45	4	23	27
05:45-06:00	94	8	102	11:45-12:00	78	58	136	05:45-06:00	56	101	157	11:45-12:00	5	10	15

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	788	91	879
AM - K FACTOR (%)			8.73
AM - D (%)	89.65	10.35	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM	07:30 AM to 08:30 AM	
AM - PEAK HR VOLUME	788	183	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	151	633	784
PM - K FACTOR (%)			7.79
PM - D (%)	19.26	80.74	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:15 PM to 06:15 PM	03:30 PM to 04:30 PM	
PM - PEAK HR VOLUME	218	647	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	788	91	879
AM - K FACTOR (%)			8.73
AM - D (%)	89.65	10.35	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	151	633	784
PM - K FACTOR (%)			7.79
PM - D (%)	19.26	80.74	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	231	401	632
DIRECTIONAL PEAK			
PEAK HR TIME	09:00 AM to 10:00 AM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	380	401	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,754	987	3,741
AM 12-HR PERIOD (00:00-12:00)	3,160	1,098	4,258
PM 6-HR PERIOD (12:00-18:00)	1,291	2,510	3,801
PM 12-HR PERIOD (12:00-24:00)	1,820	3,989	5,809
24 HOUR PERIOD	4,980	5,087	10,067
D (%)	49.47	50.53	100.00

Run Date: 2016/05/18

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2015

Site ID:	B71019800276	**Route No:**	198	**Date From:**	2015/09/02 0:00
Town:	Hawaii	**Direction:**	+MP	**Date To:**	2015/09/03 23:45
Location:	Kaiminani Dr - Ane Keohokalole Hwy to Laui St				

Functional Classification: 17 URBAN:COLLECTOR

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	63	0.31%	125
PC	14316	70.96%	28632
2A-4T	5521	27.37%	11042
LIGHT VEHICLE TOTALS	19900	98.63%	39799
HEAVY VEHICLES			
Bus	57	0.28%	142
SINGLE UNIT TRUCK			
2A-6T	117	0.58%	234
3A-SU	49	0.24%	147
4A-SU	6	0.03%	24
SINGLE-TRAILER TRUCKS			
4A-ST	30	0.15%	120
5A-ST	4	0.02%	20
6A-ST	0	0.00%	0
MULTI-TRAILER TRUCKS			
5A-MT	3	0.01%	15
6A-MT	4	0.02%	24
7A-MT	6	0.03%	42
HEAVY VEHICLE TOTALS	276	1.37%	768
CLASSIFIED VEHICLES TOTALS	20176 (A)	100.00%	40568 (B)
UNCLASSIFIED VEHICLES TOTALS	-1	-0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.995

ROADTUBE EQUIVALENT(B/2) = 20284 (C)

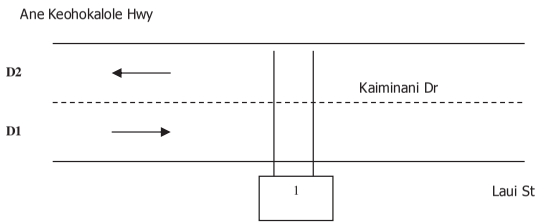
PEAK HOUR VOLUME : 898 2015/09/02 07:00	PEAK HOUR TRUCK VOLUME	% TOTAL PEAK HOUR VOLUME	24 HOUR TRUCK VOLUME	AADT	% OF AADT	HPMS K-FACTOR (PEAK/AADT) (ITEM 66)
SINGLE UNIT TRUCKS (TYPE 4-7)	9	(65A-1) 1.00%	114	10200	(65A-2) 1.12%	8.80%
COMBINATION (TYPE 8-13)	2	(65B-1) 0.22%	23		(65B-2) 0.23%	8.80%

N

Traffic Data Service
Traffic Station Sketch

Island: Hawaii
Area: Kona

Section ID/Station #: B71019800276



Meter #	File Name	GPS
1. V279	D0426015_B71019800276 D0426016_B71019800276	19.72454, -156.0222

Station Description: Kaiminani Dr: Ane Keohokalole Hwy to Laui St			
Survey Beginning Date/Time: 4/26/16@ 0000		Survey Ending Date/Time: 4/27/16@ 2400	
Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	1347		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	MILE
Kaiminani Dr		17		0198	

D1= Direction to End
D2= Direction to Begin

D1: Laui St/ Queen Kaahumanu Hwy
D2: Ane Keohokalole Hwy/ Mamalahoa Hwy

Run Date: 2017/08/09

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2016 Program Count - Summary

Site ID: B71019800276 **Town:** Hawaii **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 10300
Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 198
Location: Kaiminani Dr - Ane Keohokalole Hwy to Laui St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/26/2016															
12:00-12:15	8	2	10	06:00-06:15	11	119	130	12:00-12:15	61	63	124	06:00-06:15	104	46	150
12:15-12:30	8	1	9	06:15-06:30	23	156	179	12:15-12:30	69	98	167	06:15-06:30	127	53	180
12:30-12:45	8	1	9	06:30-06:45	22	176	198	12:30-12:45	65	75	140	06:30-06:45	93	51	144
12:45-01:00	12	2	14	06:45-07:00	19	196	215	12:45-01:00	60	61	121	06:45-07:00	91	42	133
01:00-01:15	2	2	4	07:00-07:15	31	185	216	01:00-01:15	65	61	126	07:00-07:15	86	29	115
01:15-01:30	4	1	5	07:15-07:30	32	194	226	01:15-01:30	59	64	123	07:15-07:30	100	31	131
01:30-01:45	4	2	6	07:30-07:45	33	164	197	01:30-01:45	84	66	150	07:30-07:45	70	22	92
01:45-02:00	3	3	6	07:45-08:00	33	111	144	01:45-02:00	98	65	163	07:45-08:00	76	27	103
02:00-02:15	3	5	8	08:00-08:15	44	123	167	02:00-02:15	103	63	166	08:00-08:15	73	22	95
02:15-02:30	3	2	5	08:15-08:30	54	116	170	02:15-02:30	120	56	176	08:15-08:30	65	26	91
02:30-02:45	6	4	10	08:30-08:45	50	120	170	02:30-02:45	93	61	154	08:30-08:45	60	20	80
02:45-03:00	1	3	4	08:45-09:00	64	94	158	02:45-03:00	122	49	171	08:45-09:00	62	27	89
03:00-03:15	4	3	7	09:00-09:15	62	78	140	03:00-03:15	120	40	160	09:00-09:15	74	13	87
03:15-03:30	0	6	6	09:15-09:30	49	100	149	03:15-03:30	106	62	168	09:15-09:30	62	22	84
03:30-03:45	4	12	16	09:30-09:45	53	101	154	03:30-03:45	164	36	200	09:30-09:45	53	19	72
03:45-04:00	2	12	14	09:45-10:00	40	83	123	03:45-04:00	173	40	213	09:45-10:00	56	17	73
04:00-04:15	4	13	17	10:00-10:15	48	80	128	04:00-04:15	179	45	224	10:00-10:15	60	16	76
04:15-04:30	5	15	20	10:15-10:30	54	67	121	04:15-04:30	143	39	182	10:15-10:30	40	16	56
04:30-04:45	2	24	26	10:30-10:45	53	71	124	04:30-04:45	134	51	185	10:30-10:45	43	13	56
04:45-05:00	0	29	29	10:45-11:00	59	87	146	04:45-05:00	146	40	186	10:45-11:00	32	8	40
05:00-05:15	9	53	62	11:00-11:15	49	64	113	05:00-05:15	133	47	180	11:00-11:15	32	4	36
05:15-05:30	4	54	58	11:15-11:30	61	66	127	05:15-05:30	154	46	200	11:15-11:30	26	7	33
05:30-05:45	11	74	85	11:30-11:45	60	61	121	05:30-05:45	110	72	182	11:30-11:45	28	0	28
05:45-06:00	17	99	116	11:45-12:00	69	67	136	05:45-06:00	109	64	173	11:45-12:00	13	3	16

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM			PM - PEAK HR TIME	03:30 PM to 04:30 PM		
AM - PEAK HR VOLUME	104	751	855	PM - PEAK HR VOLUME	659	160	819
AM - K FACTOR (%)			8.23	PM - K FACTOR (%)			7.88
AM - D (%)	12.16	87.84	100.00	PM - D (%)	80.46	19.54	100.00
DIRECTIONAL PEAK				DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	06:30 AM to 07:30 AM		PM - PEAK HR TIME	03:30 PM to 04:30 PM	05:30 PM to 06:30 PM	
AM - PEAK HR VOLUME	212	751		PM - PEAK HR VOLUME	659	235	

AM PERIOD (00:00-12:00)				PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM			PM - PEAK HR TIME	03:30 PM to 04:30 PM		
AM - PEAK HR VOLUME	104	751	855	PM - PEAK HR VOLUME	659	160	819
AM - K FACTOR (%)			8.23	PM - K FACTOR (%)			7.88
AM - D (%)	12.16	87.84	100.00	PM - D (%)	80.46	19.54	100.00

NON-COMMUTER PERIOD (09:00-15:00)				6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
TWO DIRECTIONAL PEAK				AM 6-HR PERIOD (06:00-12:00)	1,073	2,679	3,752
PEAK HR TIME	02:00 PM to 03:00 PM			AM 12-HR PERIOD (00:00-12:00)	1,197	3,101	4,298
PEAK HR VOLUME	438	229	667	PM 6-HR PERIOD (12:00-18:00)	2,670	1,364	4,034
DIRECTIONAL PEAK				PM 12-HR PERIOD (12:00-24:00)	4,196	1,898	6,094
PEAK HR TIME	02:00 PM to 03:00 PM	09:15 AM to 10:15 AM		24 HOUR PERIOD	5,393	4,999	10,392
PEAK HR VOLUME	438	364		D (%)	51.90	48.10	100.00

Run Date: 2017/08/09

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2016 Program Count - Summary

Site ID: B71019800276 **Town:** Hawaii **DIR 1:** +MP **DIR 2:**-MP **Final AADT:** 10300
Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 198
Location: Kaiminani Dr - Ane Keohokalole Hwy to Laui St

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/27/2016															
12:00-12:15	16	3	19	06:00-06:15	15	120	135	12:00-12:15	79	55	134	06:00-06:15	88	58	146
12:15-12:30	11	2	13	06:15-06:30	16	143	159	12:15-12:30	69	64	133	06:15-06:30	95	43	138
12:30-12:45	4	2	6	06:30-06:45	28	167	195	12:30-12:45	73	74	147	06:30-06:45	104	42	146
12:45-01:00	1	2	3	06:45-07:00	35	180	215	12:45-01:00	67	65	132	06:45-07:00	97	25	122
01:00-01:15	5	4	9	07:00-07:15	28	198	226	01:00-01:15	72	61	133	07:00-07:15	64	35	99
01:15-01:30	5	4	9	07:15-07:30	28	217	245	01:15-01:30	67	66	133	07:15-07:30	102	38	140
01:30-01:45	3	3	6	07:30-07:45	32	132	164	01:30-01:45	87	66	153	07:30-07:45	93	32	125
01:45-02:00	4	4	8	07:45-08:00	37	87	124	01:45-02:00	73	81	154	07:45-08:00	72	26	98
02:00-02:15	3	2	5	08:00-08:15	46	111	157	02:00-02:15	97	82	179	08:00-08:15	63	25	88
02:15-02:30	3	2	5	08:15-08:30	46	102	148	02:15-02:30	109	52	161	08:15-08:30	86	25	111
02:30-02:45	2	2	4	08:30-08:45	61	106	167	02:30-02:45	107	67	174	08:30-08:45	71	17	88
02:45-03:00	1	4	5	08:45-09:00	51	91	142	02:45-03:00	125	67	192	08:45-09:00	68	15	83
03:00-03:15	3	3	6	09:00-09:15	56	94	150	03:00-03:15	131	61	192	09:00-09:15	53	27	80
03:15-03:30	5	4	9	09:15-09:30	57	87	144	03:15-03:30	146	51	197	09:15-09:30	70	24	94
03:30-03:45	3	15	18	09:30-09:45	45	98	143	03:30-03:45	151	39	190	09:30-09:45	55	26	81
03:45-04:00	1	11	12	09:45-10:00	44	91	135	03:45-04:00	167	39	206	09:45-10:00	59	23	82
04:00-04:15	7	11	18	10:00-10:15	55	71	126	04:00-04:15	178	29	207	10:00-10:15	56	15	71
04:15-04:30	3	16	19	10:15-10:30	52	69	121	04:15-04:30	166	49	215	10:15-10:30	46	16	62
04:30-04:45	2	23	25	10:30-10:45	60	92	152	04:30-04:45	159	51	210	10:30-10:45	45	5	50
04:45-05:00	4	31	35	10:45-11:00	60	76	136	04:45-05:00	123	64	187	10:45-11:00	34	11	45
05:00-05:15	9	45	54	11:00-11:15	45	72	117	05:00-05:15	123	45	168	11:00-11:15	38	7	45
05:15-05:30	9	62	71	11:15-11:30	52	58	110	05:15-05:30	140	58	198	11:15-11:30	23	6	29
05:30-05:45	7	79	86	11:30-11:45	52	69	121	05:30-05:45	124	50	174	11:30-11:45	12	4	16
05:45-06:00	13	97	110	11:45-12:00	52	52	104	05:45-06:00	118	52	170	11:45-12:00	6	1	7

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM			PM - PEAK HR TIME	03:45 PM to 04:45 PM		
AM - PEAK HR VOLUME	119	762	881	PM - PEAK HR VOLUME	670	168	838
AM - K FACTOR (%)			8.49	PM - K FACTOR (%)			8.08
AM - D (%)	13.51	86.49	100.00	PM - D (%)	79.95	20.05	100.00
DIRECTIONAL PEAK				DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	06:30 AM to 07:30 AM		PM - PEAK HR TIME	03:45 PM to 04:45 PM	04:30 PM to 05:30 PM	
AM - PEAK HR VOLUME	204	762		PM - PEAK HR VOLUME	670	218	

AM PERIOD (00:00-12:00)				PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM			PM - PEAK HR TIME	03:45 PM to 04:45 PM		
AM - PEAK HR VOLUME	119	762	881	PM - PEAK HR VOLUME	670	168	838
AM - K FACTOR (%)			8.49	PM - K FACTOR (%)			8.08
AM - D (%)	13.51	86.49	100.00	PM - D (%)	79.95	20.05	100.00

NON-COMMUTER PERIOD (09:00-15:00)				6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
TWO DIRECTIONAL PEAK				AM 6-HR PERIOD (06:00-12:00)	1,053	2,583	3,636
PEAK HR TIME	02:00 PM to 03:00 PM			AM 12-HR PERIOD (00:00-12:00)	1,177	3,014	4,191
PEAK HR VOLUME	438	268	706	PM 6-HR PERIOD (12:00-18:00)	2,751	1,388	4,139
DIRECTIONAL PEAK				PM 12-HR PERIOD (12:00-24:00)	4,251	1,934	6,185
PEAK HR TIME	02:00 PM to 03:00 PM	09:00 AM to 10:00 AM		24 HOUR PERIOD	5,428	4,948	10,376
PEAK HR VOLUME	438	370		D (%)	52.31	47.69	100.00

Run Date: 2017/08/09

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2016

Site ID: B71019800276 **Route No:** 198 **Date From:** 2016/04/26 0:00
Town: Hawaii **Direction:** +MP **Date To:** 2016/04/27 23:45
Location: Kaiminani Dr - Ane Keohokalole Hwy to Laui St

Functional Classification: 17 URBAN:COLLECTOR
REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	243	1.17%	486
PC	13916	67.01%	27832
2A-4T	6328	30.47%	12656
LIGHT VEHICLE TOTALS	20487	98.65%	40974
HEAVY VEHICLES			
Bus	57	0.27%	143
SINGLE UNIT TRUCK			
2A-6T	140	0.67%	280
3A-SU	48	0.23%	144
4A-SU	1	0.00%	4
SINGLE-TRAILER TRUCKS			
4A-ST	16	0.08%	64
5A-ST	6	0.03%	30
6A-ST	1	0.00%	6
MULTI-TRAILER TRUCKS			
5A-MT	0	0.00%	0
6A-MT	3	0.01%	18
7A-MT	10	0.05%	70
HEAVY VEHICLE TOTALS	282	1.36%	759
CLASSIFIED VEHICLES TOTALS	20769 (A)	100.00%	41732 (B)
UNCLASSIFIED VEHICLES TOTALS	-1	-0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.995

ROADTUBE EQUIVALENT(B/2) = 20866 (C)

PEAK HOUR VOLUME : 819 2016/04/27 16:00	PEAK HOUR TRUCK VOLUME	% TOTAL PEAK HOUR VOLUME	24 HOUR TRUCK VOLUME	AADT	% OF AADT	HPMS K-FACTOR (PEAK/AADT) (ITEM 66)
SINGLE UNIT TRUCKS (TYPE 4-7)	10	(65A-1) 1.22%	123	10300	(65A-2) 1.19%	7.95%
COMBINATION (TYPE 8-13)	1	(65B-1) 0.12%	18		(65B-2) 0.17%	7.95%

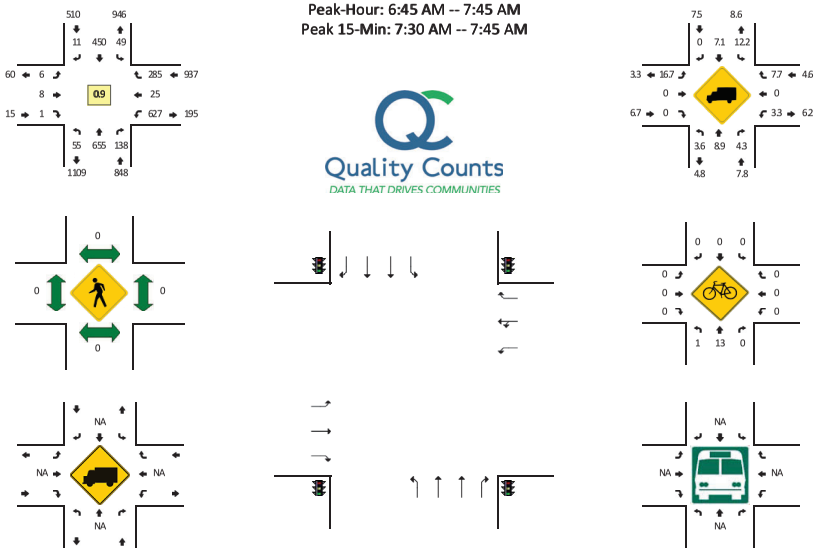
Type of peak hour being reported: System Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Queen Kaahumanu Hwy -- Kaiminani Dr
CITY/STATE: Kalaoa, HI

QC JOB #: 14962505
DATE: Tue, Apr 30 2019

Peak-Hour: 6:45 AM -- 7:45 AM
Peak 15-Min: 7:30 AM -- 7:45 AM



5-Min Count Period Beginning At	Queen Kaahumanu Hwy (Northbound)				Queen Kaahumanu Hwy (Southbound)				Kaiminani Dr (Eastbound)				Kaiminani Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	2	39	6	1	2	25	1	0	0	0	0	0	19	1	12	0	108	
6:05 AM	0	36	14	1	3	21	0	0	0	1	0	0	27	2	16	0	121	
6:10 AM	2	40	12	0	3	15	1	0	1	0	0	0	29	3	13	0	119	
6:15 AM	1	55	13	1	1	27	1	0	0	1	0	0	20	1	24	0	145	
6:20 AM	8	36	17	1	1	19	0	0	1	0	0	0	24	0	26	0	133	
6:25 AM	2	65	19	2	5	23	0	0	0	0	0	0	31	0	22	0	169	
6:30 AM	2	37	8	2	3	25	0	0	0	0	0	0	36	0	15	0	128	
6:35 AM	3	49	13	0	6	19	0	0	1	1	0	0	38	1	24	0	155	
6:40 AM	1	74	19	4	6	21	2	0	0	0	0	0	43	1	11	0	182	
6:45 AM	0	64	13	3	3	28	1	0	0	0	0	0	52	5	28	0	197	
6:50 AM	2	52	14	3	3	30	0	0	0	3	0	0	32	1	18	0	158	
6:55 AM	1	61	12	4	5	47	1	0	1	0	0	0	55	4	37	0	228	1843
7:00 AM	3	36	10	2	1	29	2	0	0	1	0	0	56	2	25	0	167	1902
7:05 AM	0	46	10	4	8	34	1	0	1	0	0	0	48	2	21	0	175	1956
7:10 AM	1	44	9	1	2	42	2	0	1	0	0	0	55	1	21	0	179	2016
7:15 AM	3	60	12	3	6	30	0	0	0	0	0	0	43	2	17	0	176	2047
7:20 AM	2	65	11	3	3	21	1	0	0	1	0	0	51	2	14	0	174	2088
7:25 AM	2	37	17	1	7	58	2	0	1	1	0	0	63	0	22	0	211	2130
7:30 AM	6	75	10	2	2	41	0	0	0	0	0	0	57	1	18	0	212	2214
7:35 AM	2	56	11	4	7	44	1	0	2	2	0	0	46	3	26	0	204	2263
7:40 AM	2	59	9	1	2	46	0	0	0	0	1	0	69	2	38	0	229	2310
7:45 AM	2	68	12	1	4	38	1	1	2	1	0	0	42	3	21	0	196	2309
7:50 AM	4	66	7	3	4	18	1	0	2	1	0	0	56	4	13	0	179	2330
7:55 AM	2	53	22	2	3	60	1	0	2	0	0	0	40	0	15	0	200	2302
8:00 AM	0	61	20	2	8	38	0	0	0	0	0	0	51	4	18	0	202	2337
8:05 AM	3	36	11	2	3	16	1	1	2	3	0	0	36	1	20	0	135	2297
8:10 AM	7	69	14	4	2	56	3	0	1	0	0	0	35	1	8	0	200	2318
8:15 AM	6	61	21	10	6	47	0	0	0	0	0	0	38	1	14	0	204	2346
8:20 AM	5	58	17	5	6	55	0	0	1	0	0	0	28	0	21	0	196	2368
8:25 AM	8	56	13	0	3	41	3	0	2	3	0	0	28	1	20	0	178	2335
8:30 AM	3	42	13	4	5	52	1	0	1	1	0	0	34	3	13	0	172	2295
8:35 AM	7	75	14	6	12	28	3	0	1	1	0	0	22	2	17	0	188	2279
8:40 AM	7	47	13	6	4	50	3	0	1	1	0	0	44	6	18	0	200	2250
8:45 AM	3	52	17	2	2	37	2	1	3	2	0	0	32	4	13	0	170	2224
8:50 AM	4	55	21	1	5	36	1	0	0	1	0	0	31	5	18	0	178	2223
8:55 AM	8	54	15	2	4	46	0	0	3	2	0	0	24	11	9	0	178	2201

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	40	760	120	28	44	524	4	0	8	8	4	0	688	24	328	0	2580
Heavy Trucks	8	72	4		8	24	0		0	0	0		32	0	8		156
Pedestrians		0				0				0				0			0
Bicycles	0	4	0		0	0	0		0	0	0		0	0	0		4
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/10/2019 2:49 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: System Peak

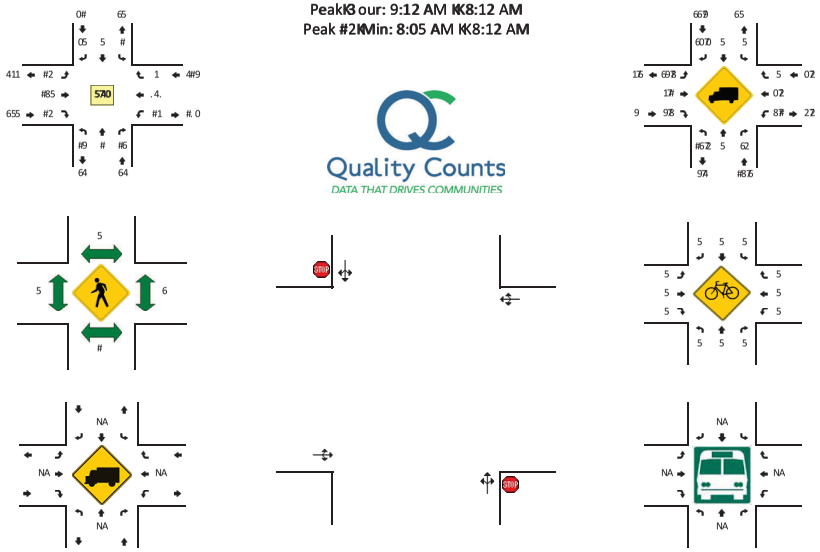
Method for determining peak hour: Total Entering Volume

LOCATION: PukiaQe St KKHaiminani wr — **- C DDJ B:** #1496250

CITY/STATE: Halaoa, 3 I — **wATE:** Tue, Apr 05 65#4

PeakK3our: 9:12 AM KK8:12 AM

Peak #2KMin: 8:05 AM KK8:12 AM



2KMin Count Period J eginning At	PukiaQe St (Northbound)				PukiaQe St (Southbound)				Haiminani wr (Eastbound)				Haiminani wr (Westbound)				Total	3ourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
9:55 AM	5	5	5	5	5	5	6	5	6	2	#	5	5	06	#	5	10	
9:52 AM	#	5	#	5	5	5	5	5	2	9	9	5	#	11	5	5	91	
9:#5 AM	5	5	6	5	5	5	0	5	1	.	6	5	6	15	6	5	90	
9:#2 AM	#	5	6	5	5	5	5	5	#	##	6	5	#	11	0	5	92	
9:65 AM	6	5	5	5	5	5	#	5	1	#5	1	5	#	14	6	5	80	
9:62 AM	0	5	5	5	5	5	#	5	#	6#	0	5	5	22	0	5	. 8	
9:05 AM	#	5	#	5	5	5	5	5	#	8	6	5	6	10	5	5	28	
9:02 AM	0	5	#	5	5	5	5	5	#	#.	#	5	5	9#	6	5	. 8	
9:15 AM	1	5	5	5	5	5	5	5	6	#.	5	5	5	18	5	5	8#	
9:12 AM	#	5	1	5	5	5	#	5	0	#9	5	5	6	. 6	#	5	##5	
9:25 AM	5	5	#	5	5	5	1	5	#	#8	0	5	#	9.	#	5	49	
9:22 AM	0	5	6	5	5	5	4	5	#	#9	6	5	6	85	#	5	#59	466
8:55 AM	0	5	5	5	5	5	2	5	5	#6	5	5	6	82	5	5	48	489
8:52 AM	6	#	5	5	5	5	6	5	1	#6	#	5	5	94	5	5	4#	#550
8:#5 AM	#	5	6	5	5	5	6	5	5	##	5	5	5	94	5	5	. 2	#562
8:#2 AM	5	5	5	5	5	5	6	5	5	#6	0	5	5	94	#	5	. 8	#518
8:65 AM	5	5	#	5	5	5	5	5	#	#0	6	5	5	96	5	5	84	#520
8:62 AM	#	5	5	5	5	5	#	5	6	#4	1	5	#	. 5	5	5	#5.	#581
8:05 AM	#	5	5	5	5	5	6	5	5	#6	5	5	6	8.	5	5	42	##6
8:02 AM	6	5	#	5	5	5	#	5	6	#8	5	5	6	86	5	5	48	##66
8:15 AM	6	5	#	5	#	5	#	5	#	#0	5	5	6	#51	5	5	#62	##89
8:12 AM	1	5	5	5	5	5	5	5	6	#1	5	5	6	86	5	5	41	##95
8:25 AM	5	5	#	5	5	5	#	5	6	8	5	5	5	90	5	5	81	##0.
8:22 AM	5	5	5	5	5	5	6	5	5	62	5	5	5	22	5	5	. 6	###1
. :55 AM	#	5	0	5	5	5	#	5	6	61	0	5	5	96	5	5	49	###0
. :52 AM	5	5	5	5	5	5	0	5	5	#9	5	5	5	2#	5	5	85	#546
. :#5 AM	5	5	5	5	5	5	5	5	6	#9	5	5	5	25	5	5	9.	#582
. :#2 AM	#	5	#	5	5	5	0	5	5	61	5	#	#	21	5	5	. 2	#580
. :65 AM	5	5	5	5	5	5	#	5	5	66	0	5	5	19	#	5	80	#598
. :62 AM	5	5	#	5	5	5	#	5	#	#8	5	5	5	1#	5	5	9#	#565
. :05 AM	#	5	5	5	5	5	#	5	#	#8	5	5	5	12	5	5	92	445
. :02 AM	6	5	5	5	5	5	#	5	#	60	6	5	5	10	5	5	86	492
. :15 AM	#	5	5	5	#	5	#	5	#	#.	#	5	#	98	5	5	4#	40#
. :12 AM	6	5	5	5	5	5	5	5	5	65	5	5	5	15	#	5	90	455
. :25 AM	5	5	5	5	5	5	5	5	6	61	#	5	5	92	5	5	46	4#.
. :22 AM	5	5	5	5	5	5	5	5	5	61	5	5	5	09	5	5	95	. 49

Peak #2KMin FloQrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	65	5	.	5	1	5	#9	5	#6	#9.	5	5	61	#5#9	5	5	#69.
3 eavy Trucks	1	5	5		5	5	1		1	#6	5		5	6.	5		26
Pedestrians		5				5				5				1			1
J icycles	5	5	5		5	5	5		5	5	5		5	5	5		5
Railroad																	
Stopped J uses																	

Comments:

Report generated on 2/#5/65#4 6:14 PM

SOURCE: - uality Counts, LLC (http://QQQ.7quality counts7net) #K 88K2. 5K66#6

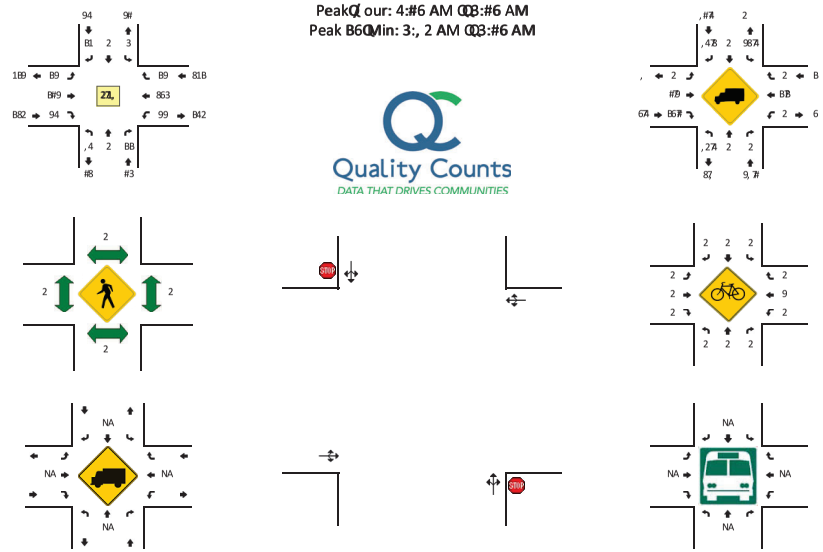
Type of peak hour being reported: System Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Laui St QQKaiminani Hr
CIT5OSTATE: KalaoaY/ I

wC -ODJ : B#14962B
HATE: TueYApr , 2 92B1

PeakQ(our: 4:#6 AM QQ3:#6 AM
Peak B6QMin: 3:, 2 AM QQ3:#6 AM



60Min Count Period Deginning At	Laui St .Northbound(				Laui St .Southbound(				Kaiminani Hr .Eastbound(				Kaiminani Hr .) estbound(				Total	/ourly Totals
	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R		
4:22 AM	2	2	2	2	2	2	2	2	2	9	9	2	B	, 3	B	2	#,	
4:26 AM	2	2	2	2	2	2	B	2	B	6	2	2	2	#2	2	2	#3	
4:B2 AM	,	2	2	2	B	2	2	2	2	1	B	2	B	#2	2	2	66	
4:B6 AM	9	2	2	2	2	2	2	2	B	8	,	2	2	#4	B	2	4B	
4:92 AM	2	2	2	2	2	2	B	2	2	B2	9	2	2	66	B	2	41	
4:96 AM	2	2	2	2	2	2	B	2	2	B9	,	2	B	61	2	2	34	
4:, 2 AM	B	2	B	2	B	2	2	2	9	8	6	2	9	#4	2	2	44	
4:, 6 AM	9	2	2	2	2	2	2	2	B	8	8	2	#	61	B	2	8,	
4:#2 AM	B	2	9	2	2	2	2	2	9	B2	3	2	,	6B	9	2	38	
4:#6 AM	B	2	2	2	2	2	2	2	9	8	6	2	3	31	B	2	B2,	
4:62 AM	9	2	,	2	2	2	B	2	9	B4	#	2	,	3B	9	2	B2#	
4:66 AM	#	2	9	2	2	2	B	2	,	B9	B	2	,	4,	9	2	1B	834
3:22 AM	4	2	,	2	B	2	B	2	2	BB	9	2	9	41	9	2	13	1, 2
3:26 AM	,	2	2	2	2	2	6	2	B	3	#	2	B	61	2	2	82	14,
3:B2 AM	#	2	B	2	B	2	B	2	B	BB	2	2	2	46	2	2	8#	119
3:B6 AM	,	2	2	2	2	2	9	2	2	B2	9	2	B	43	B	2	84	B2B3
3:92 AM	B	2	2	2	9	2	9	2	2	BB	B	2	B	43	B	2	84	B2, #
3:96 AM	B	2	B	2	9	2	9	2	2	92	9	2	9	36	B	2	B24	B24#
3:, 2 AM	6	2	B	2	B	2	B	2	B	4	9	2	B	39	2	2	12	B2B8
3:, 6 AM	B	2	2	2	2	2	2	2	B	B3	B	2	2	41	2	2	81	B2#8
3:#2 AM	6	2	2	2	2	2	,	2	B	B,	9	2	B	B2B	9	2	B98	BB##
3:#6 AM	9	2	2	2	2	2	2	2	2	B#	2	2	B	32	2	2	83	BB98
3:62 AM	B	2	2	2	2	2	2	2	2	4	B	2	2	68	2	2	44	B212
3:66 AM	B	2	2	2	2	2	B	2	2	9,	2	2	2	61	B	2	86	B28#
8:22 AM	2	2	2	2	2	2	2	2	2	96	9	2	2	61	2	2	84	B23,
8:26 AM	9	2	9	2	2	2	2	2	9	B,	9	2	2	#4	2	2	43	B242
8:B2 AM	2	2	9	2	2	2	B	2	2	B#	2	2	9	#4	B	2	44	B2#9
8:B6 AM	#	2	2	2	2	2	2	2	2	9#	9	2	B	6#	2	2	86	B2#B
8:92 AM	2	2	2	2	2	2	2	2	2	B#	B	2	2	#8	2	2	4,	B2B8
8:96 AM	B	2	2	2	2	2	2	2	2	9,	2	2	2	#B	B	2	44	138
8:, 2 AM	B	2	2	2	2	2	2	2	2	B8	2	2	B	#9	2	2	49	162
8:, 6 AM	2	2	9	2	2	2	B	2	2	9,	2	2	2	#6	B	2	39	1, ,
8:#2 AM	B	2	2	2	2	2	2	2	2	B1	B	2	2	43	2	2	88	81,
8:#6 AM	2	2	B	2	2	2	2	2	2	92	2	2	2	, 3	2	2	68	84#
8:62 AM	2	2	2	2	B	2	2	2	2	9B	9	2	2	46	2	2	81	883
8:66 AM	2	2	2	2	2	2	2	2	2	9,	2	2	2	#2	2	2	4,	846

Peak B6QMin UoF rates	Northbound				Southbound				Eastbound				) estbound				Total
	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R	
All Vehicles	##	2	#	2	#	2	B4	2	B9	B##	92	2	8	148	8	2	B998
/ eavy Trucks	#	2	2		#	2	#		2	#	8		2	B9	2		,4
Pedestrians		2				2				2				2			2
Dicycles	2	2	2		2	2	2		2	2	2		2	2	2		2
Wilroad																	
Stopped Duses																	

Comments:

Weport generated on 60B2092B1 9:#1 PM

SORWCE: wuality CountsYLLC .http:00F F F 7quality counts7net(BC33C6B2C9B9

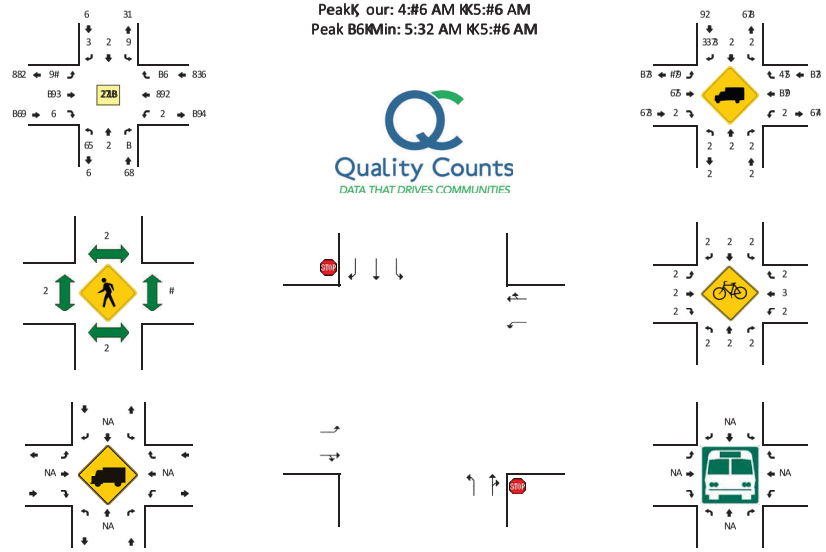
Type of peak hour being reported: System Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Ane Qeohokalole KKQaiminani Hr
CITOYSTATE: Qalaoa/, I

wC -ODJ : B#149625
HATE: Tue/Apr 32 92B1

PeakK our: 4:#6 AM KK5:#6 AM
Peak B6KMin: 5:32 AM KK5:#6 AM



6KMin Count Period Deginning At	Ane Qeohokalole .Northbound(				Ane Qeohokalole .Southbound(				Qaiminani Hr .Eastbound(				Qaiminani Hr .) estbound(				Total	,ourly Totals
	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R		
4:22 AM	B	2	2	2	2	2	2	2	2	B	2	2	2	39	2	2	3#	
4:26 AM	9	2	B	2	2	2	2	2	B	3	2	2	2	#9	2	2	#1	
4:B2 AM	9	2	2	2	B	2	2	2	B	1	2	2	2	#2	2	2	63	
4:B6 AM	B	2	2	2	2	2	B	2	B	8	B	2	2	##	2	2	64	
4:92 AM	9	2	2	2	2	2	2	2	2	8	B	2	2	42	2	2	5B	
4:96 AM	B	2	2	2	B	2	2	2	2	1	B	2	2	62	2	2	49	
4:32 AM	B	2	2	2	2	2	2	2	B	B2	2	2	2	69	2	2	4#	
4:36 AM	#	2	B	2	2	2	2	2	2	8	2	2	2	4#	2	2	55	
4:#2 AM	6	2	2	2	B	2	2	2	9	1	2	2	2	66	2	2	59	
4:#6 AM	6	2	2	2	B	2	2	2	2	1	2	2	2	56	B	2	1B	
4:62 AM	#	2	2	2	2	2	2	2	2	B9	B	2	2	59	2	2	81	
4:66 AM	9	2	2	2	2	2	2	2	2	B#	3	2	2	48	2	2	85	826
5:22 AM	4	2	2	2	2	2	2	2	9	1	2	2	2	4B	B	2	51	862
5:26 AM	#	2	2	2	2	2	B	2	B	1	2	2	2	64	B	2	59	853
5:B2 AM	4	2	2	2	2	2	2	2	3	8	2	2	2	6#	2	2	5B	81B
5:B6 AM	#	2	B	2	2	2	B	2	B	B9	2	2	2	59	B	2	19	195
5:92 AM	4	2	2	2	2	2	2	2	#	8	2	2	2	61	9	2	51	136
5:96 AM	4	2	2	2	B	2	2	2	6	B6	B	2	2	59	9	2	B29	156
5:32 AM	B	2	2	2	2	2	B	2	9	1	2	2	2	48	B	2	89	113
5:36 AM	4	2	2	2	2	2	2	2	#	1	2	2	2	59	#	2	16	B2BB
5:#2 AM	5	2	2	2	2	2	2	2	9	1	2	2	2	1B	9	2	BBB	B262
5:#6 AM	3	2	2	2	2	2	B	2	B	B5	2	2	2	44	4	2	1#	B263
5:62 AM	B	2	2	2	B	2	B	2	B	4	2	2	2	4B	3	2	5#	B238
5:66 AM	3	B	2	2	B	2	2	2	4	B6	B	2	B	61	#	2	1B	B2#9
8:22 AM	2	2	B	2	3	2	2	2	3	B5	B	2	2	65	B	2	83	B2#4
8:26 AM	3	2	2	2	2	2	B	2	9	B#	9	2	9	#2	B	2	46	B231
8:B2 AM	B	2	B	2	2	2	2	2	9	B5	2	2	2	#1	B	2	5B	B231
8:B6 AM	2	2	2	2	B	2	2	2	9	B8	B	2	2	63	B	2	54	B293
8:92 AM	#	2	2	2	2	2	B	2	3	B#	B	2	B	#2	9	2	44	B2B2
8:96 AM	3	2	2	2	9	2	2	2	B	B4	B	2	2	#9	B	2	44	15#
8:32 AM	9	2	2	2	2	2	2	2	3	B8	B	2	2	35	3	2	4#	164
8:36 AM	3	2	2	2	B	2	B	2	B	B5	B	2	B	63	9	2	82	1#B
8:#2 AM	6	2	2	2	B	2	2	2	3	B5	9	2	B	#1	B	2	51	121
8:#6 AM	3	2	2	2	9	2	3	2	B	99	B	2	2	39	2	2	4#	851
8:62 AM	4	2	2	2	B	2	B	2	3	B6	B	2	2	65	B	2	86	812
8:66 AM	3	2	2	2	2	2	B	2	3	92	B	2	2	#B	2	2	41	848

Peak B6MMin UoF rates	Northbound				Southbound				Eastbound				) estbound				Total
	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R	Left	Thru	Wight	R	
All Vehicles	64	2	2	2	2	2	#	2	39	B28	2	2	2	19#	98	2	BB69
, eavy Trucks	2	2	2		2	2	2		2	B9	2		2	B9	#		98
Pedestrians		2				2				2				#			#
Dicycles	2	2	2		2	2	2		2	2	2		2	2	2		2
Wailroad																	
Stopped Duses																	

Comments:

Weport generated on 6YB2Y92B1 9:#1 PM

SORWCE: wuality Counts/LLC .http:YYF F F 7quality counts7net(BK855K682K99B9

Type of peak hour being reported: Sntersemion Peak

Method for deterl ining peak hour: TotaEVntering LoEul e

CCAI TSCN: Queen Kaahul anu Hwy -- Kail inani Dr

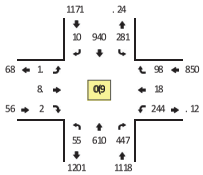
ASTY/, TI TV: Kal8oa3HS

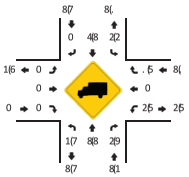
QAJCB #: 14962506

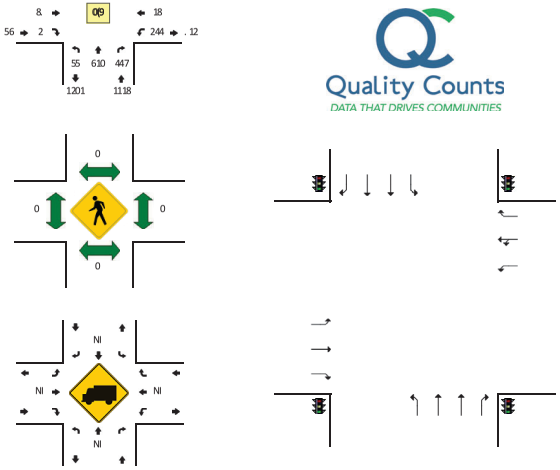
DI TV: Tue3I pr 80 2019

Peak-Hour: 8:80 PM -- 4:80 PM

Peak 15-Min: 8:80 PM -- 8:45 PM







5-Min Aount Period Beginning I t	Queen Kaahul anu Hwy)NorthboundW			F	Queen Kaahul anu Hwy), outhboundW				Kail inani Dr)VastboundW				Kail inani Dr)R estboundW				TotaE	Hour5y TotaE
	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F		
8:80 PM	.	49	8.	0	26	72	0	1	1	5	0	0	80	1	10	0	249	
8:85 PM	2	69	2.	2	19	78	2	2	4	5	0	0	29	4	12	0	260	
8:40 PM	2	52	80	1	24	99	1	0	0	4	0	0	20	8	6	0	242	
8:45 PM	8	84	51	0	16	. 8	1	0	2	2	0	0	21	0	4	0	20.	
8:50 PM	5	59	87	4	80	99	0	0	1	0	0	0	15	1	12	0	264	
8:55 PM	8	54	87	1	28	. 1	1	0	1	0	0	0	14	1	5	0	212	
4:00 PM	1	64	42	0	.	95	1	0	8	1	0	0	21	0	4	0	289	
4:05 PM	1	57	24	2	18	71	0	0	2	4	0	0	7	2	9	0	204	
4:10 PM	1	81	8.	0	17	. 2	2	0	1	4	1	0	27	1	5	0	201	
4:15 PM	8	42	42	0	15	. 0	0	0	0	6	1	0	1.	0	10	0	206	
4:20 PM	5	66	89	1	1.	65	2	0	1	2	0	0	17	0	10	0	226	
4:25 PM	.	82	48	4	19	50	0	1	1	4	0	0	28	0	6	0	190	2. 00
4:80 PM	8	48	84	1	19	66	0	0	4	2	0	0	26	4	2	0	204	2655
4:85 PM	0	49	84	0	19	. 8	0	0	0	1	0	0	29	2	6	0	218	2607
4:40 PM	8	52	46	0	1.	. 5	1	0	2	2	0	0	20	0	4	0	222	2577
4:45 PM	0	54	52	0	16	6.	1	0	1	1	0	0	17	8	6	0	219	2600
4:50 PM	8	40	47	1	15	85	1	0	0	1	0	0	2.	8	.	0	171	251.
4:55 PM	2	56	8.	1	11	44	0	0	1	1	0	0	19	2	2	0	1. 6	2471
5:00 PM	8	48	84	0	15	46	0	0	1	1	0	0	17	1	8	0	165	240.
5:05 PM	6	54	80	0	15	65	2	0	0	2	0	0	22	2	8	0	201	2404
5:10 PM	8	55	41	1	11	4.	0	0	2	0	0	0	16	0	7	0	174	287.
5:15 PM	2	. 2	48	0	1.	54	0	0	2	0	0	0	7	1	6	0	205	2876
5:20 PM	2	8.	58	0	18	8.	0	0	4	4	2	0	27	1	7	0	179	2849
5:25 PM	2	55	48	2	5	54	2	0	0	0	0	0	19	1	8	0	176	2845
5:80 PM	2	5.	81	2	12	89	0	0	1	2	0	0	22	2	8	0	1. 8	2814
5:85 PM	2	85	8.	0	17	59	0	0	1	.	0	0	21	0	.	0	17.	2277
5:40 PM	1	56	26	1	14	89	1	0	0	1	0	0	14	2	6	0	161	222.
5:45 PM	1	86	84	0	18	84	0	0	1	4	0	0	17	0	5	0	146	2154
5:50 PM	4	50	86	0	5	48	1	0	0	1	1	0	88	1	10	0	175	2157
5:55 PM	2	48	24	1	7	4.	0	0	8	2	0	0	12	0	9	0	151	2188
6:00 PM	1	61	27	0	7	44	0	0	2	0	0	0	.	1	5	0	15.	2125
6:05 PM	1	82	24	0	15	49	1	0	2	0	0	0	16	0	10	0	150	20. 4
6:10 PM	0	89	24	0	18	47	1	0	1	0	0	0	15	5	.	0	158	2048
6:15 PM	1	45	24	0	9	42	0	0	0	0	0	0	15	1	7	0	145	1978
6:20 PM	8	22	82	2	7	26	0	0	1	7	1	0	18	8	8	0	122	1916
6:25 PM	1	8.	2.	0	9	88	0	0	0	2	0	0	8	8	4	0	119	1749

Peak 15-Min ctowrates	Northbound				, outhbound				Vastbound				R estbound				TotaE
	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F	
I EEL ehinities	44	670	8. 6	12	2. 6	1056	12	12	20	56	0	0	816	82	112	0	8004
Heavy Trunks	0	82	7		7	86	0		0	0	0		4	0	7		96
Pedestrians		0				0				0				0			0
Binynies	0	0	0		0	0	0		0	0	0		0	0	0		0
UaiBroad																	
, topped Buses																	

Aol I ents:

Ueport generated on 5/10/2019 2:50 PM

, CF UAV: QuaBty Aounts3COA)http://www(qualitymounts(net\1-7. . -570-2212

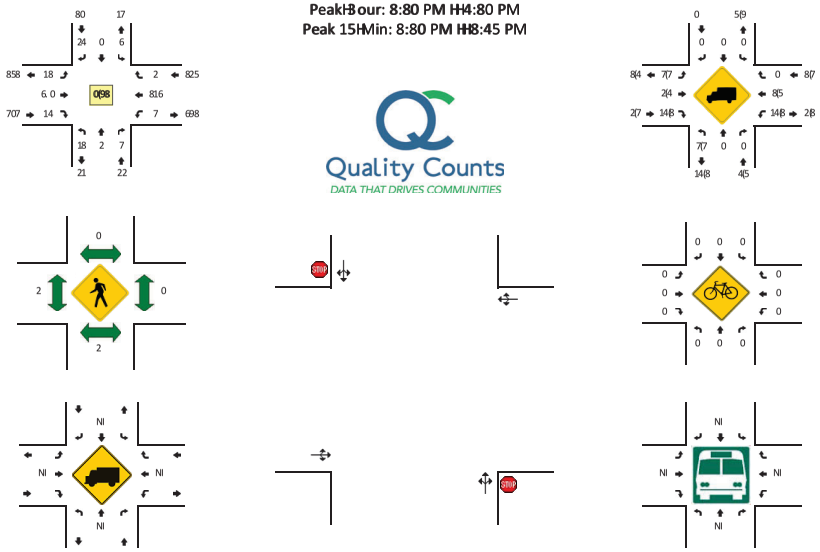
Type of peak hour being reported: Sntersemion Peak

Method for deterl ining peak hour: TotaEVntering LoEul e

CCAI TSCN: PukiaQe Kt HHwail inani - r
ASTY/KTI TV: wafaoa, 3 S

DAJCB #: 14962504
- I TV: Tue, I pr 80 2019

PeakHBour: 8:80 PM HH4:80 PM
Peak 15HMin: 8:80 PM HH8:45 PM



5HMin Aount Period Beginning I t	PukiaQe Kt)NorthboundW				PukiaQe Kt)KouthboundW				wail inani - r)VastboundW				wail inani - r)R estboundW				TotaE	3 our Y TotaE
	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F		
8:80 PM	0	0	0	0	0	0	1	0	1	66	2	0	0	86	0	0	106	
8:85 PM	8	0	1	0	1	0	6	0	1	49	1	0	0	86	1	0	99	
8:40 PM	1	2	1	0	0	0	4	0	1	49	4	0	0	24	0	0	. 6	
8:45 PM	1	0	1	0	2	0	8	0	8	67	0	0	1	19	0	0	97	
8:50 PM	2	0	0	0	0	0	0	0	2	67	2	0	1	27	1	0	102	
8:55 PM	0	0	0	0	1	0	8	0	1	52	0	0	1	19	0	0	77	
4:00 PM	0	0	0	0	1	0	2	0	1	57	1	0	0	26	0	0	. .	
4:05 PM	0	0	1	0	0	0	0	0	0	40	1	0	0	22	0	0	68	
4:10 PM	8	0	1	0	0	0	2	0	2	56	1	0	0	21	0	0	. 6	
4:15 PM	0	0	0	0	0	0	2	0	0	60	0	0	2	88	0	0	97	
4:20 PM	1	0	1	0	0	0	1	0	1	54	2	0	1	21	0	0	. 2	
4:25 PM	2	0	2	0	1	0	0	0	0	68	0	0	1	82	0	0	101	10. 4
4:80 PM	0	0	0	0	0	0	1	0	1	57	0	0	2	81	0	0	92	1070
4:85 PM	2	0	0	0	0	0	0	0	1	58	0	1	0	82	0	1	90	1061
4:40 PM	1	0	0	0	0	0	1	0	1	66	0	0	0	28	0	0	92	1067
4:45 PM	0	0	0	0	0	0	0	0	0	69	0	0	0	29	0	0	9.	106.
4:50 PM	1	0	0	0	0	0	2	0	0	60	0	0	0	2.	1	0	92	105.
4:55 PM	0	0	0	0	0	0	0	0	1	52	0	0	0	24	0	0	77	105.
5:00 PM	0	0	0	0	0	0	0	0	0	54	0	0	0	22	2	0	7.	104.
5:05 PM	0	0	0	0	0	0	1	0	0	41	0	0	0	80	0	0	72	1057
5:10 PM	2	0	1	0	0	0	1	0	2	51	2	0	0	1.	0	0	77	104.
5:15 PM	0	0	0	0	0	0	1	0	2	57	0	0	0	19	0	0	79	1080
5:20 PM	1	0	0	0	0	0	1	0	1	70	0	0	0	80	0	0	108	1051
5:25 PM	0	0	0	0	0	0	0	0	8	46	2	0	0	21	1	0	78	1028
5:80 PM	1	0	1	0	0	0	0	0	0	45	0	0	0	27	0	0	74	1005
5:85 PM	0	0	0	0	0	0	0	0	0	59	1	0	0	25	0	0	. 5	1000
5:40 PM	1	0	0	0	0	0	2	0	2	87	1	0	0	27	1	0	71	979
5:45 PM	2	0	1	0	0	0	0	0	2	44	2	0	0	25	0	0	76	957
5:50 PM	1	0	0	0	1	0	0	0	0	47	0	0	1	85	0	0	. 5	950
5:55 PM	1	0	0	0	0	0	2	0	0	29	1	1	0	16	0	0	50	928
6:00 PM	0	0	0	0	0	0	0	0	1	87	1	0	0	12	0	0	51	. 96
6:05 PM	1	0	1	0	0	0	0	0	0	87	2	0	0	2.	0	0	69	. 98
6:10 PM	0	0	0	0	0	0	1	0	0	86	0	0	0	24	0	0	61	. 77
6:15 PM	0	0	0	0	0	0	1	0	2	88	0	0	0	22	0	0	5.	. 56
6:20 PM	1	0	0	0	0	0	0	0	1	48	0	0	0	21	0	0	66	. 19
6:25 PM	0	0	0	0	0	0	0	0	0	8.	1	0	0	10	0	0	49	795

Peak 15-Min ciloQrates	Northbound				Kouthbound				Vastbound				R estbound				TotaE
	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F	Œft	Thru	Uight	F	
I EEL ehinities	16	.	.	0	4	0	44	0	12	656	2.	0	0	8. 4	4	0	1164
3 eavy Trunks	4	0	0		0	0	0		4	.	.		0	4	0		2.
Pedestrians		.				0				.				0			16
Binymies	0	0	0		0	0	0		0	0	0		0	0	0		0
UaiBroad Ktopped Buses																	

Aol l ents:

Ueport generated on 5/10/2019 2:50 PM

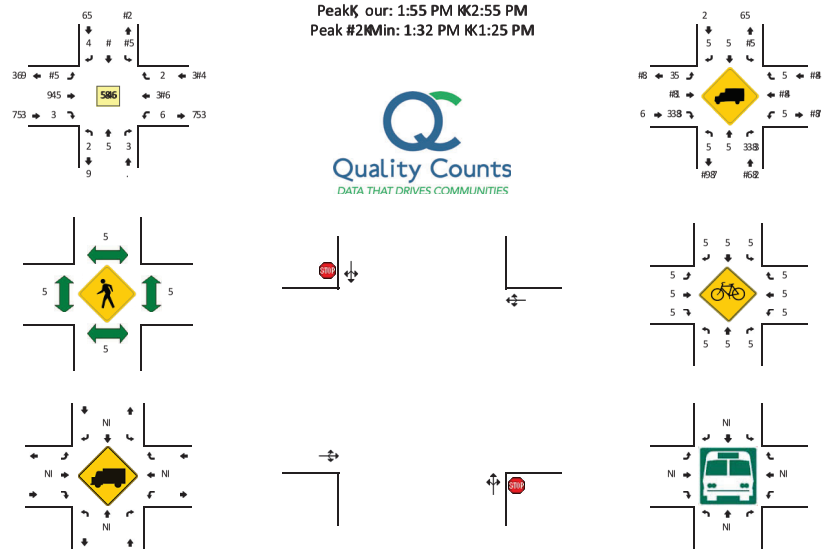
KC F UAV: D ua Bty Aounts, CCA)http://Q.Q.Q.(qualitymounts(net VLH 77H5. 0H2212

Type of peak hour being reported: Sntersemion Peak

Method for deterl ining peak hour: TotaEVntering L oEul e

CC AI TSC N: Qaui Qt KKHail inani wr
ASTOYQTI TV: Haßaoa/, S

- A DCJ B: #1496256
wl TV: Tue/I pr 35 65#4



2KMin Aount Period J eginning I t	Qaui Qt (Northbound)				Qaui Qt (Cputhbound)				Hail inani wr (Vastbound)				Hail inani wr (Westbound)				TotaE	ourly TotaE
	Œft	Thru	Right	U	Œft	Thru	Right	U	Œft	Thru	Right	U	Œft	Thru	Right	U		
3:35 PM	5	5	1	5	5	5	#	5	5	95	#	5	5	31	5	5	#55	
3:32 PM	1	5	6	5	#	5	5	5	5	27	#	5	5	31	5	5	44	
3:15 PM	6	5	5	5	#	#	6	5	5	13	5	5	5	#4	5	5	9.	
3:12 PM	5	5	#	5	#	5	#	5	5	7#	5	5	5	66	5	5	49	
3:25 PM	5	5	#	5	5	5	#	5	#	97	#	5	5	67	5	5	4.	
3:22 PM	5	5	5	5	5	5	5	5	6	12	5	5	5	#7	5	5	91	
1:55 PM	5	5	5	5	5	5	#	5	#	92	5	5	5	61	5	5	4#	
1:52 PM	5	5	5	5	5	#	5	5	5	34	5	5	5	63	5	5	93	
1:#5 PM	#	5	6	5	6	5	#	5	5	95	5	5	5	65	5	5	. 9	
1:#2 PM	5	5	#	5	#	5	5	5	5	21	5	5	5	33	5	5	. 4	
1:65 PM	#	5	5	5	#	5	#	5	5	22	5	5	5	63	5	5	. #	
1:62 PM	5	5	5	5	#	5	6	5	6	91	5	5	5	69	5	5	42	#535
1:35 PM	5	5	5	5	5	5	#	5	3	29	5	5	#	31	5	5	42	#562
1:32 PM	5	5	5	5	3	5	#	5	#	21	5	5	#	35	#	5	4#	#5#7
1:15 PM	5	5	5	5	5	5	6	5	#	91	5	5	5	65	3	5	45	#534
1:12 PM	5	5	5	5	#	5	5	5	5	92	3	5	5	33	#	5	#53	#519
1:25 PM	#	5	5	5	#	5	5	5	6	27	5	5	5	62	5	5	. 9	#531
1:22 PM	6	5	5	5	5	5	5	5	5	27	5	5	5	6#	5	5	. 5	#525
2:55 PM	#	5	#	5	#	5	#	5	#	25	5	5	5	62	#	5	. #	#515
2:52 PM	5	5	5	5	5	5	6	5	#	39	#	5	5	67	5	5	97	#511
2:#5 PM	#	5	5	5	5	5	#	5	6	23	3	5	5	#9	#	5	77	#532
2:#2 PM	6	5	#	5	#	5	6	5	5	27	5	5	5	#.	5	5	. #	#567
2:65 PM	5	5	5	5	5	#	5	5	5	9.	5	5	#	64	3	5	#56	#51.
2:62 PM	5	5	#	5	3	5	5	5	6	19	#	5	#	61	3	5	. #	#531
2:35 PM	#	5	5	5	5	5	5	5	#	13	5	5	5	62	5	5	75	#554
2:32 PM	5	5	5	5	3	5	5	5	3	27	#	5	5	69	#	5	4#	#554
2:15 PM	5	6	#	5	5	5	#	5	#	36	5	5	#	69	5	5	91	4. 3
2:12 PM	5	5	5	5	5	#	5	5	5	13	5	5	5	61	5	5	9.	41.
2:25 PM	5	5	5	5	6	5	#	5	5	25	5	5	5	31	#	5	. .	425
2:22 PM	5	5	5	5	5	5	5	5	5	64	#	5	5	#7	5	5	17	4#7
9:55 PM	5	5	#	5	5	#	#	5	5	39	#	5	5	##	5	5	2#	. . 7
9:52 PM	#	#	#	5	5	5	5	5	5	32	5	5	5	36	#	5	7#	. 4#
9:#5 PM	5	5	5	5	#	5	6	5	5	33	#	5	5	65	6	5	24	. 73
9:#2 PM	#	5	5	5	5	5	5	5	5	31	#	5	5	61	5	5	95	. 26
9:65 PM	5	5	5	5	5	5	5	5	5	19	5	5	5	#7	5	5	93	. #3
9:62 PM	5	5	5	5	5	5	5	5	5	3.	5	5	5	##	#	5	25	7. 6

Peak #2KMin Flow rates	Northbound				Southbound				Eastbound				Westbound				TotalE
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
Vehicles	5	5	5	5	#9	5	#6	5	.	736	#6	5	1	336	65	5	##39
Heavy Trucks	5	5	5		5	5	5		5	1	1		5	.	5		#9
Pedestrians		5				5				5				5			5
Bicycles	5	5	5		5	5	5		5	5	5		5	5	5		5
Railroad Stopped Buses																	
Additional Comments:																	

Report generated on 2Y#5Y65#4 6:25 PM

CLICURAV: - uality Counts/CCA (http:Yc c c &qualitycounts&net) #K 77K2. 5K66#6

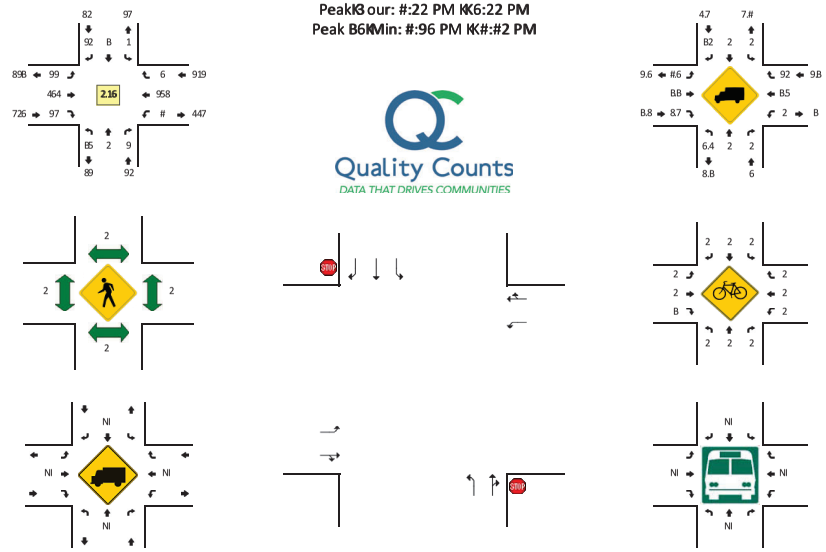
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: TotalEntering Volume

CLIENT: Intersection Count
LOCATION: Capitol Avenue, 3 S

WALKER: B#149625
DATE: Tue, Apr 82 92B1

Peak Hour: #:22 PM KK6:22 PM
Peak 6KMin: #:96 PM KK#:#2 PM



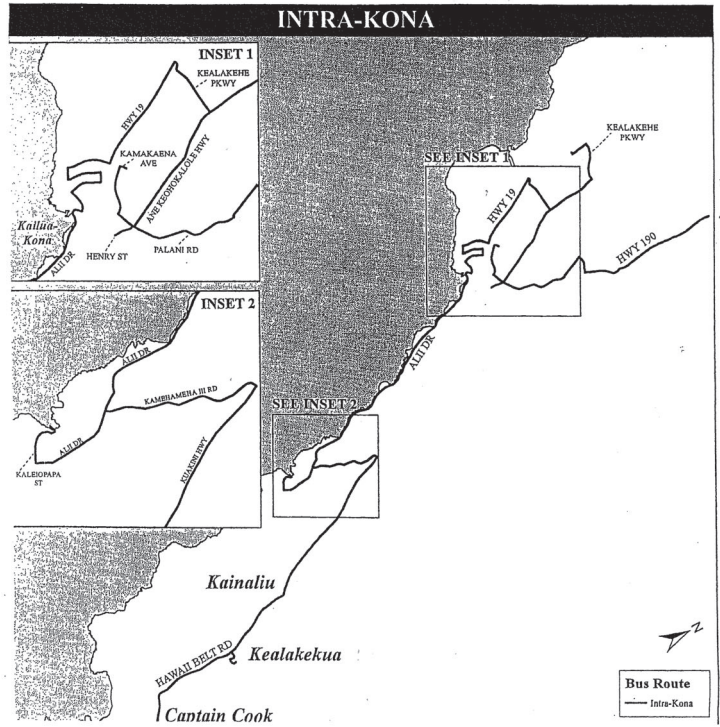
6KMin Count Period Beginning At	Intersection (Northbound)				Intersection (Southbound)				Capitol Avenue (Eastbound)				Capitol Avenue (Westbound)				TotalE	3 Hour Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
8:82 PM	8	2	2	2	B	2	9	2	2	68	B	2	2	91	2	2	51	
8:86 PM	B	2	2	2	B	2	9	2	B	66	4	2	2	97	2	2	18	
8:#2 PM	2	2	2	2	8	2	9	2	B	62	9	2	2	B5	2	2	74	
8:#6 PM	9	2	2	2	9	2	2	2	B	44	#	2	2	B5	B	2	1#	
8:62 PM	B	2	2	2	9	2	B	2	B	4B	8	2	2	98	B	2	18	
8:66 PM	2	2	2	2	9	2	2	2	B	#2	8	2	2	B5	B	2	46	
#:22 PM	B	2	2	2	B	2	9	2	B	46	6	2	B	92	2	2	14	
#:26 PM	9	2	B	2	9	2	2	2	2	91	8	2	2	98	2	2	42	
#:B2 PM	2	2	2	2	B	2	2	2	9	4B	B	2	2	9B	2	2	54	
#:B6 PM	9	2	B	2	2	2	B	2	9	#6	#	2	2	82	B	2	54	
#:92 PM	2	2	2	2	2	2	2	2	9	47	2	2	2	B1	2	2	55	
#:96 PM	B	2	2	2	B	B	8	2	2	61	8	2	2	9#	2	2	19	B2B5
#:82 PM	9	2	2	2	9	2	B	2	B	#7	9	2	2	86	2	2	12	B2B1
#:86 PM	B	2	2	2	2	2	8	2	9	65	B	2	2	95	B	2	1#	B292
#:#2 PM	9	2	2	2	B	2	9	2	8	48	9	2	B	B4	9	2	19	B284
#:#6 PM	B	2	2	2	2	2	#	2	#	6B	B	2	B	97	B	2	12	B289
#:62 PM	8	2	2	2	B	2	9	2	8	67	9	2	B	99	2	2	1B	B282
#:66 PM	8	2	2	2	2	2	9	2	9	6#	8	2	2	B5	2	2	59	B2#7
6:22 PM	B	2	2	2	2	2	B	2	B	#4	9	2	2	92	9	2	78	B29#
6:26 PM	2	2	2	2	2	2	2	2	B	81	B	2	2	94	2	2	47	B28B
6:B2 PM	B	2	2	2	9	2	2	2	2	#1	2	2	B	B4	B	2	72	B2B6
6:B6 PM	9	2	B	2	B	2	B	2	2	64	9	2	B	9B	B	2	54	B2B6
6:92 PM	2	2	2	2	8	2	2	2	B	46	2	2	2	95	9	2	11	B294
6:96 PM	#	2	2	2	8	2	2	2	9	68	B	2	B	95	B	2	18	B297
6:82 PM	9	2	2	2	2	B	B	2	2	86	6	2	2	92	B	2	46	B229
6:86 PM	B	2	2	2	2	2	2	2	2	#7	5	2	B	95	B	2	54	11#
6:#2 PM	B	2	2	2	B	2	2	2	2	85	9	2	2	99	B	2	46	147
6:#6 PM	2	2	2	2	2	2	2	2	2	#7	#	2	2	98	B	2	76	169
6:62 PM	2	2	2	2	2	2	#	2	2	#B	8	2	2	82	9	2	52	1#B
6:66 PM	B	2	2	2	2	2	2	2	2	88	6	2	2	B5	2	2	67	1B4
4:22 PM	B	2	2	2	2	2	2	2	2	88	#	2	2	B9	2	2	62	518
4:26 PM	B	2	2	2	B	2	9	2	2	89	B	2	2	9#	B	2	49	555
4:B2 PM	B	2	2	2	B	2	B	2	B	82	9	2	2	98	9	2	61	577
4:B6 PM	9	2	2	2	8	2	2	2	9	85	8	2	2	B5	2	2	44	567
4:92 PM	2	B	2	2	2	2	9	2	2	86	6	2	2	B5	2	2	4B	5B1
4:96 PM	2	2	2	2	2	2	B	2	2	84	8	2	2	B2	B	2	6B	777

Peak B6MMin Flbc rates	Northbound				/outhbound				Vastbound				Westbound				TotaE
	Œft	Thru	Right	U	Œft	Thru	Right	U	Œft	Thru	Right	U	Œft	Thru	Right	U	
I EEL ehinfies	B4	2	2	2	B9	#	95	2	B9	464	9#	2	2	8#5	#	2	BB2#
3 eavy Trunks	2	2	2		2	2	2		2	5	2		2	#	2		B9
Pedestrians		2				2				2				2			2
Dinynfies	2	2	2		2	2	2		2	2	2		2	2	2		2
RailBroad /topped Duses																	

Aol l ents:

Report generated on 6YB2Y92B1 9:62 PM /CURAV: wuaBty Aounts, CCA (http:Yc c c .qualityrnounts.net) BKS77K652K99B9

APPENDIX B
Bus Route Schedule and Map



COUNTY OF HAWAII
MASS TRANSIT AGENCY
961-8744

INTRA-KONA
BUS SCHEDULE

In consideration of others and for your safety:
1. Shirts and footwear are required.
2. Remain seated.

The following are prohibited on transit buses:
1. Obstructing or interfering with operator.
2. Smoking.
3. Refusing to vacate priority seating for the elderly and disabled passengers.
4. Consumption of food and beverage.
5. Talking on cell phones.
6. The playing of radios, tape players, dvd players, without headphones/earphones.
7. Horseplaying, yelling or talking loudly.
8. Surfboards and bodyboards.
9. Flammable, explosive or toxic materials.
10. Expectorating or spitting.

The following will be charged $1.00:
1. Pets provided they are kept in an enclosed pet carrier or cage (except service animals.)
2. Any item larger than 16" x 10" and/or more than one item ($1.00 per item.)
3. Bicycle
4. Skateboard

How to board the bus:
1. Please utilize designated bus stops zones whenever possible.
2. Wait on the proper side of the roadway for the bus.
3. Flag the bus (please call for bus stop information).
4. Wait until the bus makes a complete stop.

How to exit the bus:
1. Before reaching your desired "get off" spot, pull cord located by the window of the bus.
2. Remain seated until the bus comes to a complete stop.
3. Exit from front of bus.

DISCLAIMER: The County of Hawai'i will not b responsible for any inconvenience, expense, or damages resulting from the failure to depart or arrive at stated times or for any items brought on the bus.

For more information visit **www.heleonbus.org**

County of Hawai'i is an Equal Opportunity Employer and Provid

INTRA-KONA BUS SCHEDULE

Effective 8/24/2015

NORTHBOUND

Fujihara store	Honaunau	Capt. Cook Yano Hall	Kealakekua (Konawaena)	Kona Hospital	Kainaliu Honalo	Sheraton Keauhou Resort	Keauhou Shopping Center	Alii Drive	The Friendly Place Campus	Old Airport/ Kona Commons	Kaiser Permanente	HCC Palamanui Campus	Lokahi Apartments	Costco/Uluwai Housing	West Hawaii Civic Center	Kmart/ Macy's	Walmart	Kealakehe	Matsuyama Store	Airport	
5:00	5:03	5:05	5:07	---	5:20	---	---	---	---	---	---	---	---	---	---	5:30	---	---	---	---	Daily
5:45	5:55	6:00	6:05	---	6:10	(6:20)	----	6:30	---	---	---	---	---	---	---	*6:45	---	---	6:55	---	Mon.- Sat.
7:10	7:12	7:15	7:20	---	7:30	---	7:45	7:50	---	---	8:10	8:20	---	---	---	8:05	---	---	---	8:35	Mon.- Sat.
---	---	8:10	8:15	(8:20)	8:25	(8:35)	8:40	8:45	9:00	9:05	9:10	9:25	9:30	9:40	9:45	9:50	9:55	10:00	10:05	---	Mon.- Sat.
9:20	9:23	9:25	9:30	---	9:40	---	9:55	10:00	---	10:05	---	---	---	---	---	10:10	---	---	---	---	Mon.- Sat.
---	---	12:00	12:05	(12:10)	12:15	(12:25)	12:30	12:35	12:50	12:55	1:00	1:15	---	1:25	1:30	1:35	1:40	1:45	1:50	---	Mon.- Sat.
---	---	1:40	1:45	(1:50)	1:55	(2:05)	2:10	2:15	2:30	2:35	---	2:50	2:55	3:05	3:10	3:15	3:20	3:25	3:30	---	Mon.- Sat.
---	---	3:20	3:25	(3:30)	3:35	---	3:50	3:55	4:10	4:15	4:20	4:35	4:40	4:50	4:55	5:00	5:05	5:10	5:15	---	Mon.- Fri.
---	---	5:35	5:40	(5:45)	5:50	---	6:00	6:05	6:20	6:25	---	---	---	6:35	---	6:40	6:45	6:50	6:55	---	Mon.- Sat.
---	---	7:15	(7:20)	(7:25)	7:30	---	7:40	7:45	8:00	8:05	---	---	---	---	---	8:10	8:15	8:20	8:25	---	Mon.- Fri.

SOUTHBOUND

Airport	Corner of Palisades (above Matsuyama)	Kealakehe	Walmart	Kmart Macy's	Kaiser Permanente	HCC Palamanui Campus	Lokahi Apartments	Costco Uluwai Housing	West Hawaii Civic Center	The Friendly Place Campus	Kona Commons	Alii Drive	Keauhou Shopping Center	Sheraton Keauhou Resort	Honalo Kainaliu	Kona Hospital	Kealakekua (Konawaena)	Capt. Cook Yano Hall	Honaunau	Kealia	
---	6:30	6:35	6:40	*6:45	---	---	---	6:55	7:00	7:10	7:12	7:17	7:30	(7:35)	7:45	(7:50)	7:55	8:10	---	---	Mon.- Sat.
				#6:45	---	7:05	---	---	---	---	6:40	#6:35	---	---	---	---	---	---	---	---	
8:30	---	---	---	8:50	---	---	---	---	---	---	8:55	9:00	9:10	---	9:25	---	9:30	9:40	9:43	9:45	Mon.- Sat.
---	10:05	10:10	10:15	10:20	10:25	10:40	10:45	10:55	11:00	11:10	11:12	11:17	11:30	(11:35)	11:45	(11:50)	11:55	12:00	---	---	Mon.- Sat.
	11:45	11:50	11:55	12:00	12:05	12:20	12:25	12:40	12:45	12:55	12:57	1:02	1:15	---	1:25	(1:30)	1:35	1:40	---	---	Mon.- Sat.
---	1:30	1:35	1:40	1:45	---	2:00	---	2:15	2:20	2:30	2:32	2:37	2:50	(2:55)	3:05	(3:10)	3:15	3:20	---	---	Mon.- Fri.
	3:35	3:40	3:45	3:50	3:55	4:10	4:15	4:25	4:30	4:40	4:42	4:47	5:00	(5:05)	5:15	(5:20)	5:25	5:30	---	---	Mon.- Sat.
---	---	---	---	3:55	---		---	---	---	---	---	---	---	---	4:05	---	4:10	4:20	4:23	4:25	Daily
---	4:15	4:20	---	4:25	---		---	---	---	---	---	4:30	---	---*	5:05	---	5:10	5:15	5:20	5:30	Mon.- Sat.
---	5:30	5:35	5:40	5:45	---	6:00	6:05	6:15	---	6:30	6:32	6:37	6:50	---*	7:00	(7:05)	7:10	7:15	---	---	Mon.- Fri.
4:35	---	---	---	5:15	5:05	4:50	---	---	5:00	---	5:20	5:25	5:40	---	5:55	---	(6:00)	6:10	6:15	6:20	Mon.- Sat.

() = ENTER INTO
BOLD = MORNINGS
--- Service Not Available
*By Request Only

6:45 a.m. riders requesting to go to the West Hawaii Civic Center must transfer at Kmart to the Intra-Kona bus

#6:35 Alii Drive (King Kamehameha Hotel)

#6:45 a.m. riders requesting to go to the HCC Palamanui Campus must transfer at Kmart to the South Kohala to Hilo bus

APPENDIX C
Analysis Reports Existing (2019) Conditions

HCM Signalized Intersection Capacity Analysis — 2019 AM
1: Queen K & Kaiminani Drive — 06/05/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	8	1	627	25	285	55	655	138	49	450	11
Future Volume (vph)	6	8	1	627	25	285	55	655	138	49	450	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1863	1495	1466	1489	1583	1736	3312	1500	1612	3374	1583
Flt Permitted	1.00	1.00	1.00	0.95	0.96	1.00	0.40	1.00	1.00	0.26	1.00	1.00
Satd. Flow (perm)	1845	1863	1495	1466	1489	1583	730	3312	1500	434	3374	1583
Peak-hour factor, PHF	0.75	0.75	0.75	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	8	11	1	697	28	317	60	712	150	54	500	12
RTOR Reduction (vph)	0	0	1	0	0	214	0	0	99	0	0	8
Lane Group Flow (vph)	8	11	0	362	363	103	60	712	51	54	500	4
Confl. Bikes (#/hr)									13			
Heavy Vehicles (%)	3%	2%	8%	17%	2%	2%	4%	9%	4%	12%	7%	2%
Turn Type	Perm	NA	Perm	Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Actuated Green, G (s)	3.2	3.2	3.2	23.0	23.0	23.0	26.4	23.8	23.8	26.4	23.8	23.8
Effective Green, g (s)	3.2	3.2	3.2	23.0	23.0	23.0	26.4	23.8	23.8	26.4	23.8	23.8
Actuated g/C Ratio	0.05	0.05	0.05	0.33	0.33	0.33	0.37	0.34	0.34	0.37	0.34	0.34
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	83	84	67	477	485	515	310	1116	505	205	1137	533
v/s Ratio Prot		c0.01		c0.25	0.24		0.01	c0.21		c0.01	0.15	
v/s Ratio Perm	0.00		0.00			0.07	0.07		0.03	0.09		0.00
v/c Ratio	0.10	0.13	0.00	0.76	0.75	0.20	0.19	0.64	0.10	0.26	0.44	0.01
Uniform Delay, d1	32.3	32.4	32.2	21.3	21.2	17.2	14.4	19.8	16.1	14.8	18.2	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.7	0.0	6.8	6.2	0.2	0.3	2.8	0.4	0.7	1.2	0.0
Delay (s)	32.8	33.1	32.2	28.1	27.5	17.4	14.7	22.6	16.4	15.5	19.4	15.6
Level of Service	C	C	C	C	C	B	B	C	B	B	B	B
Approach Delay (s)		32.9			24.6			21.1			19.0	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	70.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	170	15	14	898	4	16	1	12	1	0	30
Future Vol, veh/h	15	170	15	14	898	4	16	1	12	1	0	30
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	88	88	88	93	93	93	93	93	93
Heavy Vehicles, %	27	4	7	7	4	2	12	2	25	2	2	23
Mvmt Flow	16	183	16	16	1020	5	17	1	13	1	0	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1025	0	0	200	0	0	1295	1281	194	1287	1287	1023
Stage 1	-	-	-	-	-	-	224	224	-	1055	1055	-
Stage 2	-	-	-	-	-	-	1071	1057	-	232	232	-
Critical Hdwy	4.37	-	-	4.17	-	-	7.22	6.52	6.45	7.12	6.52	6.43
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.443	-	-	2.263	-	-	3.608	4.018	3.525	3.518	4.018	3.507
Pot Cap-1 Maneuver	589	-	-	1343	-	-	133	166	792	141	164	261
Stage 1	-	-	-	-	-	-	756	718	-	273	302	-
Stage 2	-	-	-	-	-	-	256	302	-	771	713	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	589	-	-	1342	-	-	111	156	790	132	154	261
Mov Cap-2 Maneuver	-	-	-	-	-	-	111	156	-	132	154	-
Stage 1	-	-	-	-	-	-	732	695	-	265	294	-
Stage 2	-	-	-	-	-	-	218	294	-	732	690	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0.1	30	21.4
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	175	589	-	-	1342	-	-	253
HCM Lane V/C Ratio	0.178	0.027	-	-	0.012	-	-	0.132
HCM Control Delay (s)	30	11.3	0	-	7.7	0	-	21.4
HCM Lane LOS	D	B	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	142	26	22	857	12	36	0	11	7	0	19
Future Vol, veh/h	12	142	26	22	857	12	36	0	11	7	0	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	91	91	91	93	93	93	93	93	93
Heavy Vehicles, %	2	4	15	2	2	2	31	2	2	29	2	37
Mvmt Flow	13	153	28	24	942	13	39	0	12	8	0	20

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	955	0	0	181	0	0	1200	1196	167	1196	1204	949
Stage 1	-	-	-	-	-	-	193	193	-	997	997	-
Stage 2	-	-	-	-	-	-	1007	1003	-	199	207	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.41	6.52	6.22	7.39	6.52	6.57
Critical Hdwy Stg 1	-	-	-	-	-	-	6.41	5.52	-	6.39	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.41	5.52	-	6.39	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.779	4.018	3.318	3.761	4.018	3.633
Pot Cap-1 Maneuver	720	-	-	1394	-	-	142	186	877	144	184	272
Stage 1	-	-	-	-	-	-	746	741	-	263	322	-
Stage 2	-	-	-	-	-	-	257	320	-	745	731	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	720	-	-	1394	-	-	126	176	877	136	174	272
Mov Cap-2 Maneuver	-	-	-	-	-	-	126	176	-	136	174	-
Stage 1	-	-	-	-	-	-	731	726	-	258	310	-
Stage 2	-	-	-	-	-	-	229	308	-	720	716	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	0.2	38.1	24.3
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	158	720	-	-	1394	-	-	214
HCM Lane V/C Ratio	0.32	0.018	-	-	0.017	-	-	0.131
HCM Control Delay (s)	38.1	10.1	0	-	7.6	0	-	24.3
HCM Lane LOS	E	B	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1.3	0.1	-	-	0.1	-	-	0.4

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	123	5	0	820	15	57	0	1	2	0	3
Future Vol, veh/h	24	123	5	0	820	15	57	0	1	2	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	4	4	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	450	-	-	425	-	-	170	-	-	425	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	88	88	88	91	91	91	91	91	91
Heavy Vehicles, %	4	6	2	2	2	7	2	2	33	2	2	2
Mvmt Flow	26	135	5	0	932	17	63	0	1	2	0	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	949	0	0	140	0	0	1131	1139	142	1135	1133	941
Stage 1	-	-	-	-	-	-	190	190	-	941	941	-
Stage 2	-	-	-	-	-	-	941	949	-	194	192	-
Critical Hdwy	4.14	-	-	4.12	-	-	7.12	6.52	6.53	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.236	-	-	2.218	-	-	3.518	4.018	3.597	3.518	4.018	3.318
Pot Cap-1 Maneuver	715	-	-	1443	-	-	181	201	830	179	203	319
Stage 1	-	-	-	-	-	-	812	743	-	316	342	-
Stage 2	-	-	-	-	-	-	316	339	-	808	742	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	715	-	-	1443	-	-	174	194	827	173	196	319
Mov Cap-2 Maneuver	-	-	-	-	-	-	174	194	-	173	196	-
Stage 1	-	-	-	-	-	-	783	716	-	305	342	-
Stage 2	-	-	-	-	-	-	313	339	-	775	715	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	36.4	20.3
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	174	827	715	-	-	1443	-	-	173	-	319
HCM Lane V/C Ratio	0.36	0.001	0.037	-	-	-	-	-	0.013	-	0.01
HCM Control Delay (s)	36.9	9.4	10.2	-	-	0	-	-	26.1	0	16.4
HCM Lane LOS	E	A	B	-	-	A	-	-	D	A	C
HCM 95th %tile Q(veh)	1.5	0	0.1	-	-	0	-	-	0	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	37	2	244	13	93	55	610	448	231	940	10
Future Volume (vph)	17	37	2	244	13	93	55	610	448	231	940	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1681	1694	1495	1770	3505	1535	1770	3471	1583
Flt Permitted	0.57	1.00	1.00	0.95	0.96	1.00	0.21	1.00	1.00	0.25	1.00	1.00
Satd. Flow (perm)	1064	1863	1583	1681	1694	1495	399	3505	1535	470	3471	1583
Peak-hour factor, PHF	0.74	0.74	0.74	0.76	0.76	0.76	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	23	50	3	321	17	122	60	663	487	262	1068	11
RTOR Reduction (vph)	0	0	3	0	0	101	0	0	312	0	0	6
Lane Group Flow (vph)	23	50	0	170	168	21	60	663	175	263	1068	5
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	8%	2%	3%	3%	2%	4%	2%
Turn Type	Perm	NA	Perm	Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Actuated Green, G (s)	7.0	7.0	7.0	12.8	12.8	12.8	29.9	27.3	27.3	42.8	35.7	35.7
Effective Green, g (s)	7.0	7.0	7.0	12.8	12.8	12.8	29.9	27.3	27.3	42.8	35.7	35.7
Actuated g/C Ratio	0.09	0.09	0.09	0.17	0.17	0.17	0.39	0.36	0.36	0.56	0.47	0.47
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	97	171	145	282	284	251	203	1257	550	452	1628	742
v/s Ratio Prot		c0.03		c0.10	0.10		0.01	0.19		c0.08	c0.31	
v/s Ratio Perm	0.02		0.00			0.01	0.11		0.11	0.24		0.00
v/c Ratio	0.24	0.29	0.00	0.60	0.59	0.08	0.30	0.53	0.32	0.58	0.66	0.01
Uniform Delay, d1	32.1	32.2	31.4	29.3	29.2	26.7	14.7	19.3	17.7	10.0	15.5	10.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	1.0	0.0	3.6	3.3	0.1	0.8	1.6	1.5	1.9	2.1	0.0
Delay (s)	33.3	33.2	31.4	32.9	32.5	26.8	15.6	20.9	19.2	11.9	17.6	10.8
Level of Service	C	C	C	C	C	C	B	C	B	B	B	B
Approach Delay (s)		33.2			31.2			19.9			16.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	76.1	Sum of lost time (s)	18.0
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	680	14	7	316	2	13	2	7	6	0	24
Future Vol, veh/h	13	680	14	7	316	2	13	2	7	6	0	24
Conflicting Peds, #/hr	0	0	2	2	0	0	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	84	84	84	69	69	69	63	63	63
Heavy Vehicles, %	8	2	14	14	4	2	8	2	2	2	2	2
Mvmt Flow	14	739	15	8	376	2	19	3	10	10	0	38

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	378	0	0	756	0	0	1191	1171	749	1174	1177	379
Stage 1	-	-	-	-	-	-	777	777	-	393	393	-
Stage 2	-	-	-	-	-	-	414	394	-	781	784	-
Critical Hdwy	4.18	-	-	4.24	-	-	7.18	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.272	-	-	2.326	-	-	3.572	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1148	-	-	803	-	-	160	193	412	169	191	668
Stage 1	-	-	-	-	-	-	381	407	-	632	606	-
Stage 2	-	-	-	-	-	-	604	605	-	388	404	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1148	-	-	801	-	-	146	186	411	159	184	667
Mov Cap-2 Maneuver	-	-	-	-	-	-	146	186	-	159	184	-
Stage 1	-	-	-	-	-	-	372	398	-	619	598	-
Stage 2	-	-	-	-	-	-	561	597	-	368	395	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	28	15
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	188	1148	-	-	801	-	-	407
HCM Lane V/C Ratio	0.17	0.012	-	-	0.01	-	-	0.117
HCM Control Delay (s)	28	8.2	0	-	9.5	0	-	15
HCM Lane LOS	D	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	690	3	2	312	5	5	0	3	10	1	9
Future Vol, veh/h	10	690	3	2	312	5	5	0	3	10	1	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	90	90	90	92	92	92	71	71	71
Heavy Vehicles, %	30	2	33	2	2	2	2	2	33	10	2	2
Mvmt Flow	11	742	3	2	347	6	5	0	3	14	1	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	353	0	0	745	0	0	1127	1123	744	1121	1121	350
Stage 1	-	-	-	-	-	-	766	766	-	354	354	-
Stage 2	-	-	-	-	-	-	361	357	-	767	767	-
Critical Hdwy	4.4	-	-	4.12	-	-	7.12	6.52	6.53	7.2	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.2	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.2	5.52	-
Follow-up Hdwy	2.47	-	-	2.218	-	-	3.518	4.018	3.597	3.59	4.018	3.318
Pot Cap-1 Maneuver	1066	-	-	863	-	-	182	206	368	177	206	693
Stage 1	-	-	-	-	-	-	395	412	-	647	630	-
Stage 2	-	-	-	-	-	-	657	628	-	383	411	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1066	-	-	863	-	-	175	202	368	173	202	693
Mov Cap-2 Maneuver	-	-	-	-	-	-	175	202	-	173	202	-
Stage 1	-	-	-	-	-	-	388	405	-	635	628	-
Stage 2	-	-	-	-	-	-	642	626	-	373	404	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	22.2	20.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	218	1066	-	-	863	-	-	264
HCM Lane V/C Ratio	0.04	0.01	-	-	0.003	-	-	0.107
HCM Control Delay (s)	22.2	8.4	0	-	9.2	0	-	20.3
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	656	27	4	283	5	18	0	2	9	1	20
Future Vol, veh/h	22	656	27	4	283	5	18	0	2	9	1	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	450	-	-	425	-	-	170	-	-	425	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	83	83	83	92	92	92	68	68	68
Heavy Vehicles, %	4	2	4	2	2	20	6	2	2	2	2	10
Mvmt Flow	24	713	29	5	341	6	20	0	2	13	1	29

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	347	0	0	742	0	0	1131	1133	728	1131	1144	344
Stage 1	-	-	-	-	-	-	776	776	-	354	354	-
Stage 2	-	-	-	-	-	-	355	357	-	777	790	-
Critical Hdwy	4.14	-	-	4.12	-	-	7.16	6.52	6.22	7.12	6.52	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.236	-	-	2.218	-	-	3.554	4.018	3.318	3.518	4.018	3.39
Pot Cap-1 Maneuver	1201	-	-	865	-	-	177	203	423	181	200	681
Stage 1	-	-	-	-	-	-	384	407	-	663	630	-
Stage 2	-	-	-	-	-	-	654	628	-	390	402	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1201	-	-	865	-	-	165	198	423	176	195	681
Mov Cap-2 Maneuver	-	-	-	-	-	-	165	198	-	176	195	-
Stage 1	-	-	-	-	-	-	376	399	-	650	626	-
Stage 2	-	-	-	-	-	-	621	624	-	380	394	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.1	28.1	15.9
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	165	423	1201	-	-	865	-	-	176	195	681
HCM Lane V/C Ratio	0.119	0.005	0.02	-	-	0.006	-	-	0.075	0.008	0.043
HCM Control Delay (s)	29.7	13.6	8.1	-	-	9.2	-	-	27.1	23.6	10.5
HCM Lane LOS	D	B	A	-	-	A	-	-	D	C	B
HCM 95th %tile Q(veh)	0.4	0	0.1	-	-	0	-	-	0.2	0	0.1

APPENDIX D
Analysis Reports Future (2026) Without Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	9	1	671	27	305	59	701	148	52	482	12
Future Volume (vph)	6	9	1	671	27	305	59	701	148	52	482	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1863	1495	1466	1489	1583	1736	3312	1499	1612	3374	1583
Flt Permitted	1.00	1.00	1.00	0.95	0.96	1.00	0.37	1.00	1.00	0.22	1.00	1.00
Satd. Flow (perm)	1845	1863	1495	1466	1489	1583	674	3312	1499	378	3374	1583
Peak-hour factor, PHF	0.75	0.75	0.75	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	8	12	1	746	30	339	64	762	161	58	536	13
RTOR Reduction (vph)	0	0	1	0	0	225	0	0	107	0	0	9
Lane Group Flow (vph)	8	12	0	388	388	114	64	762	54	58	536	4
Confl. Bikes (#/hr)									13			
Heavy Vehicles (%)	3%	2%	8%	17%	2%	2%	4%	9%	4%	12%	7%	2%
Turn Type	Perm	NA	Perm	Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Actuated Green, G (s)	3.3	3.3	3.3	24.5	24.5	24.5	27.1	24.4	24.4	27.1	24.4	24.4
Effective Green, g (s)	3.3	3.3	3.3	24.5	24.5	24.5	27.1	24.4	24.4	27.1	24.4	24.4
Actuated g/C Ratio	0.05	0.05	0.05	0.34	0.34	0.34	0.37	0.33	0.33	0.37	0.33	0.33
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	83	84	67	492	500	532	289	1108	501	186	1129	529
v/s Ratio Prot		c0.01		c0.26	0.26		0.01	c0.23		c0.01	0.16	
v/s Ratio Perm	0.00		0.00			0.07	0.07		0.04	0.10		0.00
v/c Ratio	0.10	0.14	0.00	0.79	0.78	0.21	0.22	0.69	0.11	0.31	0.47	0.01
Uniform Delay, d1	33.4	33.4	33.2	21.9	21.7	17.3	15.1	21.0	16.7	15.6	19.2	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.8	0.0	8.2	7.4	0.2	0.4	3.5	0.4	1.0	1.4	0.0
Delay (s)	33.9	34.2	33.2	30.1	29.1	17.5	15.5	24.4	17.2	16.6	20.6	16.2
Level of Service	C	C	C	C	C	B	B	C	B	B	C	B
Approach Delay (s)		34.0			25.9			22.7			20.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	72.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	182	16	15	961	4	17	1	13	1	0	32
Future Vol, veh/h	16	182	16	15	961	4	17	1	13	1	0	32
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	88	88	88	93	93	93	93	93	93
Heavy Vehicles, %	27	4	7	7	4	2	12	2	25	2	2	23
Mvmt Flow	17	196	17	17	1092	5	18	1	14	1	0	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1097	0	0	214	0	0	1386	1371	208	1377	1377	1095
Stage 1	-	-	-	-	-	-	240	240	-	1129	1129	-
Stage 2	-	-	-	-	-	-	1146	1131	-	248	248	-
Critical Hdwy	4.37	-	-	4.17	-	-	7.22	6.52	6.45	7.12	6.52	6.43
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.443	-	-	2.263	-	-	3.608	4.018	3.525	3.518	4.018	3.507
Pot Cap-1 Maneuver	552	-	-	1327	-	-	115	146	778	122	145	236
Stage 1	-	-	-	-	-	-	742	707	-	248	279	-
Stage 2	-	-	-	-	-	-	232	278	-	756	701	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	552	-	-	1326	-	-	93	136	776	113	135	236
Mov Cap-2 Maneuver	-	-	-	-	-	-	93	136	-	113	135	-
Stage 1	-	-	-	-	-	-	715	682	-	239	270	-
Stage 2	-	-	-	-	-	-	192	269	-	714	676	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.1	35.7	23.7
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	150	552	-	-	1326	-	-	228
HCM Lane V/C Ratio	0.222	0.031	-	-	0.013	-	-	0.156
HCM Control Delay (s)	35.7	11.7	0	-	7.8	0	-	23.7
HCM Lane LOS	E	B	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.5

Intersection												
Int Delay, s/veh	2.8											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	152	28	24	917	13	39	0	12	7	0	20
Future Vol, veh/h	13	152	28	24	917	13	39	0	12	7	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	91	91	91	93	93	93	93	93	93
Heavy Vehicles, %	2	4	15	2	2	2	31	2	2	29	2	37
Mvmt Flow	14	163	30	26	1008	14	42	0	13	8	0	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1022	0	0	193	0	0	1284	1280	178	1280	1288	1015
Stage 1	-	-	-	-	-	-	206	206	-	1067	1067	-
Stage 2	-	-	-	-	-	-	1078	1074	-	213	221	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.41	6.52	6.22	7.39	6.52	6.57
Critical Hdwy Stg 1	-	-	-	-	-	-	6.41	5.52	-	6.39	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.41	5.52	-	6.39	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.779	4.018	3.318	3.761	4.018	3.633
Pot Cap-1 Maneuver	679	-	-	1380	-	-	123	166	865	125	164	248
Stage 1	-	-	-	-	-	-	734	731	-	239	299	-
Stage 2	-	-	-	-	-	-	233	296	-	732	720	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	679	-	-	1380	-	-	107	155	865	117	153	248
Mov Cap-2 Maneuver	-	-	-	-	-	-	107	155	-	117	153	-
Stage 1	-	-	-	-	-	-	717	714	-	234	286	-
Stage 2	-	-	-	-	-	-	203	283	-	704	703	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	0.2	48.8	27.1
HCM LOS			E	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	135	679	-	-	1380	-	-	192
HCM Lane V/C Ratio	0.406	0.021	-	-	0.019	-	-	0.151
HCM Control Delay (s)	48.8	10.4	0	-	7.7	0	-	27.1
HCM Lane LOS	E	B	A	-	A	A	-	D
HCM 95th %tile Q(veh)	1.7	0.1	-	-	0.1	-	-	0.5

Intersection												
Int Delay, s/veh	2.8											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	132	5	0	877	16	61	0	1	2	0	3
Future Vol, veh/h	26	132	5	0	877	16	61	0	1	2	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	4	4	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	450	-	-	425	-	-	170	-	-	425	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	88	88	88	91	91	91	91	91	91
Heavy Vehicles, %	4	6	2	2	2	7	2	2	33	2	2	2
Mvmt Flow	29	145	5	0	997	18	67	0	1	2	0	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1015	0	0	150	0	0	1212	1221	152	1216	1214	1006
Stage 1	-	-	-	-	-	-	206	206	-	1006	1006	-
Stage 2	-	-	-	-	-	-	1006	1015	-	210	208	-
Critical Hdwy	4.14	-	-	4.12	-	-	7.12	6.52	6.53	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.236	-	-	2.218	-	-	3.518	4.018	3.597	3.518	4.018	3.318
Pot Cap-1 Maneuver	676	-	-	1431	-	-	159	180	819	158	182	293
Stage 1	-	-	-	-	-	-	796	731	-	291	319	-
Stage 2	-	-	-	-	-	-	291	316	-	792	730	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	676	-	-	1431	-	-	152	172	816	152	174	293
Mov Cap-2 Maneuver	-	-	-	-	-	-	152	172	-	152	174	-
Stage 1	-	-	-	-	-	-	762	700	-	278	319	-
Stage 2	-	-	-	-	-	-	288	316	-	754	699	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	45.6	22
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	152	816	676	-	-	1431	-	-	152	-	293
HCM Lane V/C Ratio	0.441	0.001	0.042	-	-	-	-	-	0.014	-	0.011
HCM Control Delay (s)	46.2	9.4	10.6	-	-	0	-	-	29	0	17.4
HCM Lane LOS	E	A	B	-	-	A	-	-	D	A	C
HCM 95th %tile Q(veh)	2	0	0.1	-	-	0	-	-	0	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	40	2	261	14	100	59	653	479	247	1006	11
Future Volume (vph)	18	40	2	261	14	100	59	653	479	247	1006	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1681	1693	1495	1770	3505	1535	1770	3471	1583
Flt Permitted	0.45	1.00	1.00	0.95	0.96	1.00	0.15	1.00	1.00	0.21	1.00	1.00
Satd. Flow (perm)	847	1863	1583	1681	1693	1495	288	3505	1535	397	3471	1583
Peak-hour factor, PHF	0.74	0.74	0.74	0.76	0.76	0.76	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	24	54	3	343	18	132	64	710	521	281	1143	12
RTOR Reduction (vph)	0	0	3	0	0	109	0	0	346	0	0	7
Lane Group Flow (vph)	24	54	0	178	183	23	64	710	175	281	1143	6
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	8%	2%	3%	3%	2%	4%	2%
Turn Type	Perm	NA	Perm	Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Actuated Green, G (s)	8.8	8.8	8.8	13.3	13.3	13.3	29.9	26.1	26.1	42.1	33.8	33.8
Effective Green, g (s)	8.8	8.8	8.8	13.3	13.3	13.3	29.9	26.1	26.1	42.1	33.8	33.8
Actuated g/C Ratio	0.11	0.11	0.11	0.17	0.17	0.17	0.38	0.34	0.34	0.54	0.44	0.44
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	95	210	179	287	289	255	183	1177	515	418	1509	688
v/s Ratio Prot		c0.03		0.11	c0.11		0.02	0.20		c0.10	c0.33	
v/s Ratio Perm	0.03		0.00			0.02	0.12		0.11	0.26		0.00
v/c Ratio	0.25	0.26	0.00	0.62	0.63	0.09	0.35	0.60	0.34	0.67	0.76	0.01
Uniform Delay, d1	31.4	31.5	30.6	29.9	29.9	27.1	16.0	21.5	19.3	11.6	18.5	12.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.7	0.0	4.1	4.5	0.2	1.2	2.3	1.8	4.2	3.6	0.0
Delay (s)	32.9	32.1	30.6	34.0	34.4	27.3	17.1	23.8	21.1	15.9	22.1	12.5
Level of Service	C	C	C	C	C	C	B	C	C	B	C	B
Approach Delay (s)		32.3			32.3			22.4			20.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	77.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	728	15	7	338	2	14	2	7	6	0	26
Future Vol, veh/h	14	728	15	7	338	2	14	2	7	6	0	26
Conflicting Peds, #/hr	0	0	2	2	0	0	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	84	84	84	69	69	69	63	63	63
Heavy Vehicles, %	8	2	14	14	4	2	8	2	2	2	2	2
Mvmt Flow	15	791	16	8	402	2	20	3	10	10	0	41

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	404	0	0	809	0	0	1273	1251	801	1255	1258	405
Stage 1	-	-	-	-	-	-	831	831	-	419	419	-
Stage 2	-	-	-	-	-	-	442	420	-	836	839	-
Critical Hdwy	4.18	-	-	4.24	-	-	7.18	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.272	-	-	2.326	-	-	3.572	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1123	-	-	766	-	-	140	172	384	148	171	646
Stage 1	-	-	-	-	-	-	355	384	-	612	590	-
Stage 2	-	-	-	-	-	-	583	589	-	362	381	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1123	-	-	765	-	-	127	165	383	138	164	645
Mov Cap-2 Maneuver	-	-	-	-	-	-	127	165	-	138	164	-
Stage 1	-	-	-	-	-	-	346	374	-	597	582	-
Stage 2	-	-	-	-	-	-	538	581	-	341	371	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	32.5	15.9
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	164	1123	-	-	765	-	-	382
HCM Lane V/C Ratio	0.203	0.014	-	-	0.011	-	-	0.133
HCM Control Delay (s)	32.5	8.2	0	-	9.8	0	-	15.9
HCM Lane LOS	D	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.7	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	738	3	2	334	5	5	0	3	11	1	10
Future Vol, veh/h	11	738	3	2	334	5	5	0	3	11	1	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	90	90	90	92	92	92	71	71	71
Heavy Vehicles, %	30	2	33	2	2	2	2	2	33	10	2	2
Mvmt Flow	12	794	3	2	371	6	5	0	3	15	1	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	377	0	0	797	0	0	1206	1201	796	1199	1199	374
Stage 1	-	-	-	-	-	-	820	820	-	378	378	-
Stage 2	-	-	-	-	-	-	386	381	-	821	821	-
Critical Hdwy	4.4	-	-	4.12	-	-	7.12	6.52	6.53	7.2	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.2	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.2	5.52	-
Follow-up Hdwy	2.47	-	-	2.218	-	-	3.518	4.018	3.597	3.59	4.018	3.318
Pot Cap-1 Maneuver	1043	-	-	825	-	-	160	185	342	156	185	672
Stage 1	-	-	-	-	-	-	369	389	-	628	615	-
Stage 2	-	-	-	-	-	-	637	613	-	357	389	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1043	-	-	825	-	-	153	181	342	152	181	672
Mov Cap-2 Maneuver	-	-	-	-	-	-	153	181	-	152	181	-
Stage 1	-	-	-	-	-	-	361	381	-	615	613	-
Stage 2	-	-	-	-	-	-	620	611	-	346	381	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	24.5	22.5
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	193	1043	-	-	825	-	-	237
HCM Lane V/C Ratio	0.045	0.011	-	-	0.003	-	-	0.131
HCM Control Delay (s)	24.5	8.5	0	-	9.4	0	-	22.5
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	702	29	4	303	5	19	0	2	10	1	21
Future Vol, veh/h	24	702	29	4	303	5	19	0	2	10	1	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	450	-	-	425	-	-	170	-	-	425	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	83	83	83	92	92	92	68	68	68
Heavy Vehicles, %	4	2	4	2	2	20	6	2	2	2	2	10
Mvmt Flow	26	763	32	5	365	6	21	0	2	15	1	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	371	0	0	795	0	0	1210	1212	779	1210	1225	368
Stage 1	-	-	-	-	-	-	831	831	-	378	378	-
Stage 2	-	-	-	-	-	-	379	381	-	832	847	-
Critical Hdwy	4.14	-	-	4.12	-	-	7.16	6.52	6.22	7.12	6.52	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.236	-	-	2.218	-	-	3.554	4.018	3.318	3.518	4.018	3.39
Pot Cap-1 Maneuver	1177	-	-	826	-	-	156	182	396	159	179	660
Stage 1	-	-	-	-	-	-	358	384	-	644	615	-
Stage 2	-	-	-	-	-	-	635	613	-	363	378	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1177	-	-	826	-	-	145	177	396	155	174	660
Mov Cap-2 Maneuver	-	-	-	-	-	-	145	177	-	155	174	-
Stage 1	-	-	-	-	-	-	350	376	-	630	611	-
Stage 2	-	-	-	-	-	-	600	609	-	353	370	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.1	32	17.4
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	145	396	1177	-	-	826	-	-	155	174	660
HCM Lane V/C Ratio	0.142	0.005	0.022	-	-	0.006	-	-	0.095	0.008	0.047
HCM Control Delay (s)	33.9	14.1	8.1	-	-	9.4	-	-	30.6	25.9	10.7
HCM Lane LOS	D	B	A	-	-	A	-	-	D	D	B
HCM 95th %tile Q(veh)	0.5	0	0.1	-	-	0	-	-	0.3	0	0.1

APPENDIX E
Analysis Reports Future (2026) With Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	9	1	673	27	307	59	701	151	54	482	12
Future Volume (vph)	6	9	1	673	27	307	59	701	151	54	482	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1752	1863	1495	1466	1489	1583	1736	3312	1499	1612	3374	1583
Flt Permitted	1.00	1.00	1.00	0.95	0.96	1.00	0.37	1.00	1.00	0.22	1.00	1.00
Satd. Flow (perm)	1845	1863	1495	1466	1489	1583	674	3312	1499	378	3374	1583
Peak-hour factor, PHF	0.75	0.75	0.75	0.90	0.90	0.90	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	8	12	1	748	30	341	64	762	164	60	536	13
RTOR Reduction (vph)	0	0	1	0	0	226	0	0	109	0	0	9
Lane Group Flow (vph)	8	12	0	389	389	115	64	762	55	60	536	4
Confl. Bikes (#/hr)									13			
Heavy Vehicles (%)	3%	2%	8%	17%	2%	2%	4%	9%	4%	12%	7%	2%
Turn Type	Perm	NA	Perm	Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Actuated Green, G (s)	3.3	3.3	3.3	24.5	24.5	24.5	27.1	24.4	24.4	27.1	24.4	24.4
Effective Green, g (s)	3.3	3.3	3.3	24.5	24.5	24.5	27.1	24.4	24.4	27.1	24.4	24.4
Actuated g/C Ratio	0.05	0.05	0.05	0.34	0.34	0.34	0.37	0.33	0.33	0.37	0.33	0.33
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	83	84	67	492	500	532	289	1108	501	186	1129	529
v/s Ratio Prot		c0.01		c0.27	0.26		0.01	c0.23		c0.01	0.16	
v/s Ratio Perm	0.00		0.00			0.07	0.07		0.04	0.11		0.00
v/c Ratio	0.10	0.14	0.00	0.79	0.78	0.22	0.22	0.69	0.11	0.32	0.47	0.01
Uniform Delay, d1	33.4	33.4	33.2	21.9	21.8	17.3	15.1	21.0	16.7	15.6	19.2	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.8	0.0	8.4	7.5	0.2	0.4	3.5	0.4	1.0	1.4	0.0
Delay (s)	33.9	34.2	33.2	30.3	29.2	17.5	15.5	24.4	17.2	16.6	20.6	16.2
Level of Service	C	C	C	C	C	B	B	C	B	B	C	B
Approach Delay (s)		34.0			26.0			22.7			20.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	72.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	187	16	15	965	4	17	1	13	1	0	32
Future Vol, veh/h	16	187	16	15	965	4	17	1	13	1	0	32
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	88	88	88	93	93	93	93	93	93
Heavy Vehicles, %	27	4	7	7	4	2	12	2	25	2	2	23
Mvmt Flow	17	201	17	17	1097	5	18	1	14	1	0	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1102	0	0	219	0	0	1396	1381	213	1387	1387	1100
Stage 1	-	-	-	-	-	-	245	245	-	1134	1134	-
Stage 2	-	-	-	-	-	-	1151	1136	-	253	253	-
Critical Hdwy	4.37	-	-	4.17	-	-	7.22	6.52	6.45	7.12	6.52	6.43
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.443	-	-	2.263	-	-	3.608	4.018	3.525	3.518	4.018	3.507
Pot Cap-1 Maneuver	549	-	-	1321	-	-	113	144	773	120	143	235
Stage 1	-	-	-	-	-	-	737	703	-	246	278	-
Stage 2	-	-	-	-	-	-	230	277	-	751	698	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	549	-	-	1320	-	-	91	134	771	111	133	235
Mov Cap-2 Maneuver	-	-	-	-	-	-	91	134	-	111	133	-
Stage 1	-	-	-	-	-	-	710	678	-	237	269	-
Stage 2	-	-	-	-	-	-	190	268	-	709	673	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.1	36.5	23.8
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	147	549	-	-	1320	-	-	227
HCM Lane V/C Ratio	0.227	0.031	-	-	0.013	-	-	0.156
HCM Control Delay (s)	36.5	11.8	0	-	7.8	0	-	23.8
HCM Lane LOS	E	B	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	157	28	24	921	13	39	0	12	7	0	20
Future Vol, veh/h	13	157	28	24	921	13	39	0	12	7	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	91	91	91	93	93	93	93	93	93
Heavy Vehicles, %	2	4	15	2	2	2	31	2	2	29	2	37
Mvmt Flow	14	169	30	26	1012	14	42	0	13	8	0	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1026	0	0	199	0	0	1294	1290	184	1290	1298	1019
Stage 1	-	-	-	-	-	-	212	212	-	1071	1071	-
Stage 2	-	-	-	-	-	-	1082	1078	-	219	227	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.41	6.52	6.22	7.39	6.52	6.57
Critical Hdwy Stg 1	-	-	-	-	-	-	6.41	5.52	-	6.39	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.41	5.52	-	6.39	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.779	4.018	3.318	3.761	4.018	3.633
Pot Cap-1 Maneuver	677	-	-	1373	-	-	121	163	858	123	162	247
Stage 1	-	-	-	-	-	-	728	727	-	238	297	-
Stage 2	-	-	-	-	-	-	232	295	-	726	716	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	677	-	-	1373	-	-	105	152	858	115	151	247
Mov Cap-2 Maneuver	-	-	-	-	-	-	105	152	-	115	151	-
Stage 1	-	-	-	-	-	-	711	710	-	233	284	-
Stage 2	-	-	-	-	-	-	202	282	-	699	700	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	0.2	50.4	27.3
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	132	677	-	-	1373	-	-	190
HCM Lane V/C Ratio	0.415	0.021	-	-	0.019	-	-	0.153
HCM Control Delay (s)	50.4	10.4	0	-	7.7	0	-	27.3
HCM Lane LOS	F	B	A	-	A	A	-	D
HCM 95th %tile Q(veh)	1.8	0.1	-	-	0.1	-	-	0.5

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	133	5	0	903	16	61	0	1	2	0	3
Future Vol, veh/h	26	133	5	0	903	16	61	0	1	2	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	4	4	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	450	-	-	425	-	-	170	-	-	425	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	88	88	88	91	91	91	91	91	91
Heavy Vehicles, %	4	6	2	2	2	7	2	2	33	2	2	2
Mvmt Flow	29	146	5	0	1026	18	67	0	1	2	0	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1044	0	0	151	0	0	1242	1251	153	1246	1244	1035
Stage 1	-	-	-	-	-	-	207	207	-	1035	1035	-
Stage 2	-	-	-	-	-	-	1035	1044	-	211	209	-
Critical Hdwy	4.14	-	-	4.12	-	-	7.12	6.52	6.53	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.236	-	-	2.218	-	-	3.518	4.018	3.597	3.518	4.018	3.318
Pot Cap-1 Maneuver	659	-	-	1430	-	-	152	172	818	151	174	282
Stage 1	-	-	-	-	-	-	795	731	-	280	309	-
Stage 2	-	-	-	-	-	-	280	306	-	791	729	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	659	-	-	1430	-	-	145	164	815	145	166	282
Mov Cap-2 Maneuver	-	-	-	-	-	-	145	164	-	145	166	-
Stage 1	-	-	-	-	-	-	760	699	-	268	309	-
Stage 2	-	-	-	-	-	-	277	306	-	752	697	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	49	22.8
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	145	815	659	-	-	1430	-	-	145	-	282
HCM Lane V/C Ratio	0.462	0.001	0.043	-	-	-	-	-	0.015	-	0.012
HCM Control Delay (s)	49.6	9.4	10.7	-	-	0	-	-	30.2	0	17.9
HCM Lane LOS	E	A	B	-	-	A	-	-	D	A	C
HCM 95th %tile Q(veh)	2.1	0	0.1	-	-	0	-	-	0	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	40	2	263	14	101	59	653	480	248	1006	11
Future Volume (vph)	18	40	2	263	14	101	59	653	480	248	1006	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1681	1693	1495	1770	3505	1535	1770	3471	1583
Flt Permitted	0.46	1.00	1.00	0.95	0.96	1.00	0.16	1.00	1.00	0.21	1.00	1.00
Satd. Flow (perm)	856	1863	1583	1681	1693	1495	293	3505	1535	389	3471	1583
Peak-hour factor, PHF	0.74	0.74	0.74	0.76	0.76	0.76	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	24	54	3	346	18	133	64	710	522	282	1143	12
RTOR Reduction (vph)	0	0	3	0	0	110	0	0	350	0	0	7
Lane Group Flow (vph)	24	54	0	180	184	23	64	710	172	282	1143	6
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	8%	2%	3%	3%	2%	4%	2%
Turn Type	Perm	NA	Perm	Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Actuated Green, G (s)	8.7	8.7	8.7	13.3	13.3	13.3	29.3	25.5	25.5	41.9	33.6	33.6
Effective Green, g (s)	8.7	8.7	8.7	13.3	13.3	13.3	29.3	25.5	25.5	41.9	33.6	33.6
Actuated g/C Ratio	0.11	0.11	0.11	0.17	0.17	0.17	0.38	0.33	0.33	0.54	0.43	0.43
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	96	209	177	288	290	256	183	1154	505	422	1506	687
v/s Ratio Prot		c0.03		0.11	c0.11		0.02	0.20		c0.10	c0.33	
v/s Ratio Perm	0.03		0.00			0.02	0.12		0.11	0.26		0.00
v/c Ratio	0.25	0.26	0.00	0.62	0.63	0.09	0.35	0.62	0.34	0.67	0.76	0.01
Uniform Delay, d1	31.4	31.4	30.5	29.7	29.8	27.0	16.2	21.8	19.6	11.7	18.5	12.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.7	0.0	4.2	4.5	0.2	1.2	2.5	1.8	4.0	3.6	0.0
Delay (s)	32.7	32.1	30.5	33.9	34.3	27.1	17.3	24.3	21.4	15.6	22.1	12.5
Level of Service	C	C	C	C	C	C	B	C	C	B	C	B
Approach Delay (s)		32.2			32.2			22.8			20.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	77.4	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	730	15	7	341	2	14	2	7	6	0	26
Future Vol, veh/h	14	730	15	7	341	2	14	2	7	6	0	26
Conflicting Peds, #/hr	0	0	2	2	0	0	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	84	84	84	69	69	69	63	63	63
Heavy Vehicles, %	8	2	14	14	4	2	8	2	2	2	2	2
Mvmt Flow	15	793	16	8	406	2	20	3	10	10	0	41

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	408	0	0	811	0	0	1279	1257	803	1261	1264	409
Stage 1	-	-	-	-	-	-	833	833	-	423	423	-
Stage 2	-	-	-	-	-	-	446	424	-	838	841	-
Critical Hdwy	4.18	-	-	4.24	-	-	7.18	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.272	-	-	2.326	-	-	3.572	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1119	-	-	765	-	-	139	171	383	147	169	642
Stage 1	-	-	-	-	-	-	354	384	-	609	588	-
Stage 2	-	-	-	-	-	-	580	587	-	361	380	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1119	-	-	764	-	-	126	164	382	137	162	641
Mov Cap-2 Maneuver	-	-	-	-	-	-	126	164	-	137	162	-
Stage 1	-	-	-	-	-	-	345	374	-	594	580	-
Stage 2	-	-	-	-	-	-	534	579	-	340	370	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	32.9	16
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	162	1119	-	-	764	-	-	379
HCM Lane V/C Ratio	0.206	0.014	-	-	0.011	-	-	0.134
HCM Control Delay (s)	32.9	8.3	0	-	9.8	0	-	16
HCM Lane LOS	D	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.7	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	740	3	2	337	5	5	0	3	11	1	10
Future Vol, veh/h	11	740	3	2	337	5	5	0	3	11	1	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	90	90	90	92	92	92	71	71	71
Heavy Vehicles, %	30	2	33	2	2	2	2	2	33	10	2	2
Mvmt Flow	12	796	3	2	374	6	5	0	3	15	1	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	380	0	0	799	0	0	1211	1206	798	1204	1204	377
Stage 1	-	-	-	-	-	-	822	822	-	381	381	-
Stage 2	-	-	-	-	-	-	389	384	-	823	823	-
Critical Hdwy	4.4	-	-	4.12	-	-	7.12	6.52	6.53	7.2	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.2	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.2	5.52	-
Follow-up Hdwy	2.47	-	-	2.218	-	-	3.518	4.018	3.597	3.59	4.018	3.318
Pot Cap-1 Maneuver	1041	-	-	824	-	-	159	184	342	155	184	670
Stage 1	-	-	-	-	-	-	368	388	-	625	613	-
Stage 2	-	-	-	-	-	-	635	611	-	356	388	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1041	-	-	824	-	-	152	180	342	151	180	670
Mov Cap-2 Maneuver	-	-	-	-	-	-	152	180	-	151	180	-
Stage 1	-	-	-	-	-	-	360	380	-	612	611	-
Stage 2	-	-	-	-	-	-	618	609	-	345	380	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	24.6	22.5
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	192	1041	-	-	824	-	-	236
HCM Lane V/C Ratio	0.045	0.011	-	-	0.003	-	-	0.131
HCM Control Delay (s)	24.6	8.5	0	-	9.4	0	-	22.5
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	710	29	4	304	5	19	0	2	10	1	21
Future Vol, veh/h	24	710	29	4	304	5	19	0	2	10	1	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	450	-	-	425	-	-	170	-	-	425	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	83	83	83	92	92	92	68	68	68
Heavy Vehicles, %	4	2	4	2	2	20	6	2	2	2	2	10
Mvmt Flow	26	772	32	5	366	6	21	0	2	15	1	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	372	0	0	804	0	0	1220	1222	788	1220	1235	369
Stage 1	-	-	-	-	-	-	840	840	-	379	379	-
Stage 2	-	-	-	-	-	-	380	382	-	841	856	-
Critical Hdwy	4.14	-	-	4.12	-	-	7.16	6.52	6.22	7.12	6.52	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.236	-	-	2.218	-	-	3.554	4.018	3.318	3.518	4.018	3.39
Pot Cap-1 Maneuver	1176	-	-	820	-	-	154	180	391	157	176	659
Stage 1	-	-	-	-	-	-	354	381	-	643	615	-
Stage 2	-	-	-	-	-	-	634	613	-	359	374	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1176	-	-	820	-	-	143	175	391	153	171	659
Mov Cap-2 Maneuver	-	-	-	-	-	-	143	175	-	153	171	-
Stage 1	-	-	-	-	-	-	346	373	-	629	611	-
Stage 2	-	-	-	-	-	-	599	609	-	349	366	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.1	32.5	17.5
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	143	391	1176	-	-	820	-	-	153	171	659
HCM Lane V/C Ratio	0.144	0.006	0.022	-	-	0.006	-	-	0.096	0.009	0.047
HCM Control Delay (s)	34.4	14.3	8.1	-	-	9.4	-	-	31	26.2	10.7
HCM Lane LOS	D	B	A	-	-	A	-	-	D	D	B
HCM 95th %tile Q(veh)	0.5	0	0.1	-	-	0	-	-	0.3	0	0.1

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APPENDIX F

Information from Previously Prepared Environmental Assessments

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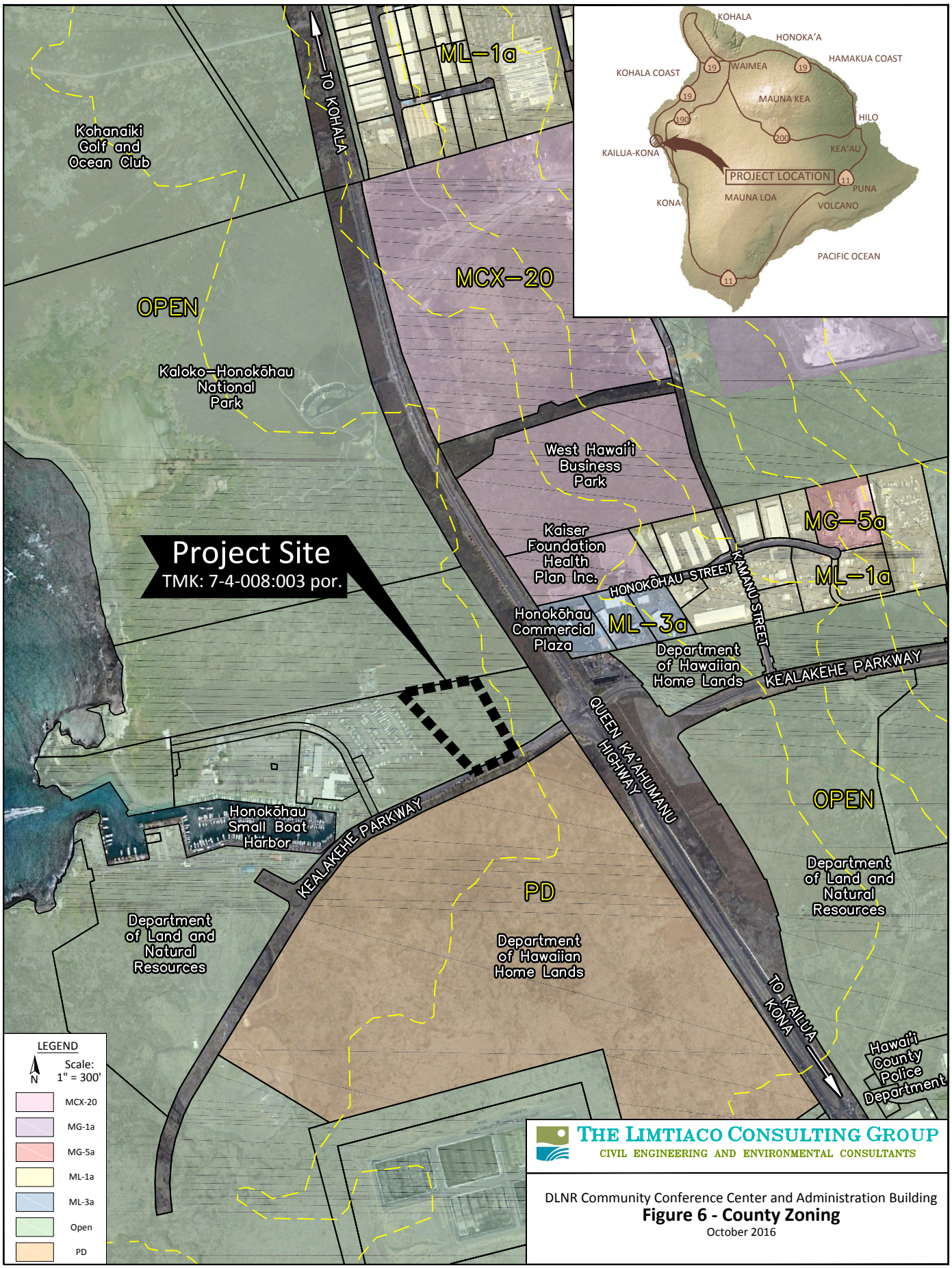


THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

DLNR Community Conference Center and Administration Building

Figure 6 - County Zoning

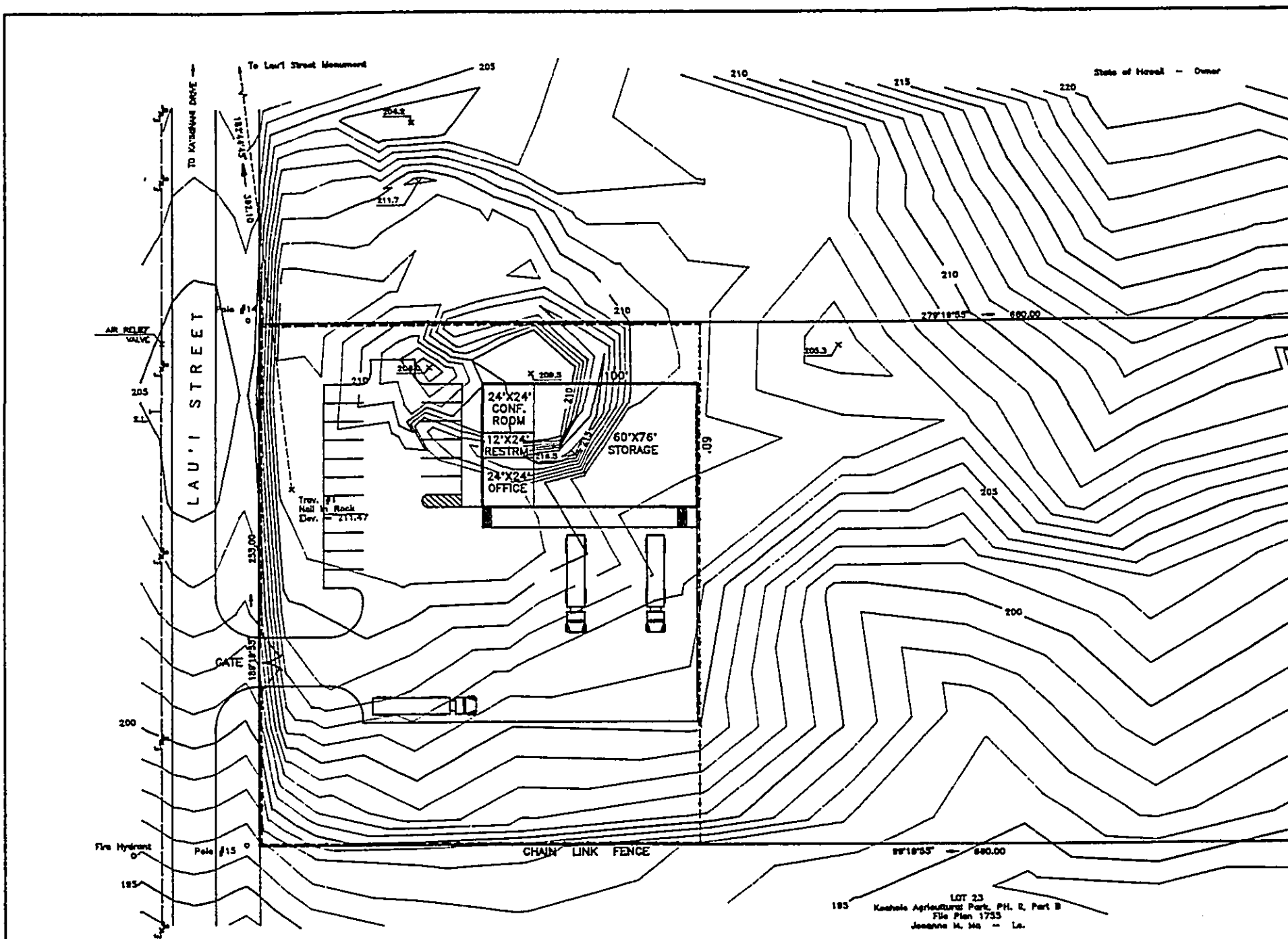
October 2016

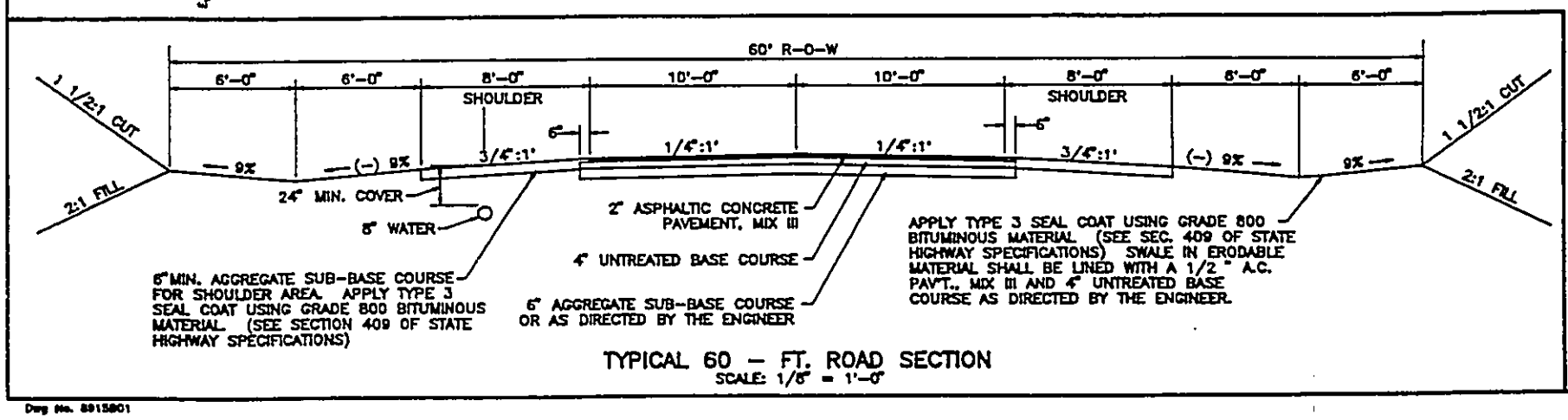
THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

DLNR Community Conference Center and Administration Building

Figure 10 - Alternative Sites

October 2016





TYPICAL 60 – FT. ROAD SECTION
SCALE: 1/8" = 1'-0"

Dwg No. 8915801
Job No. 7-3-89-15

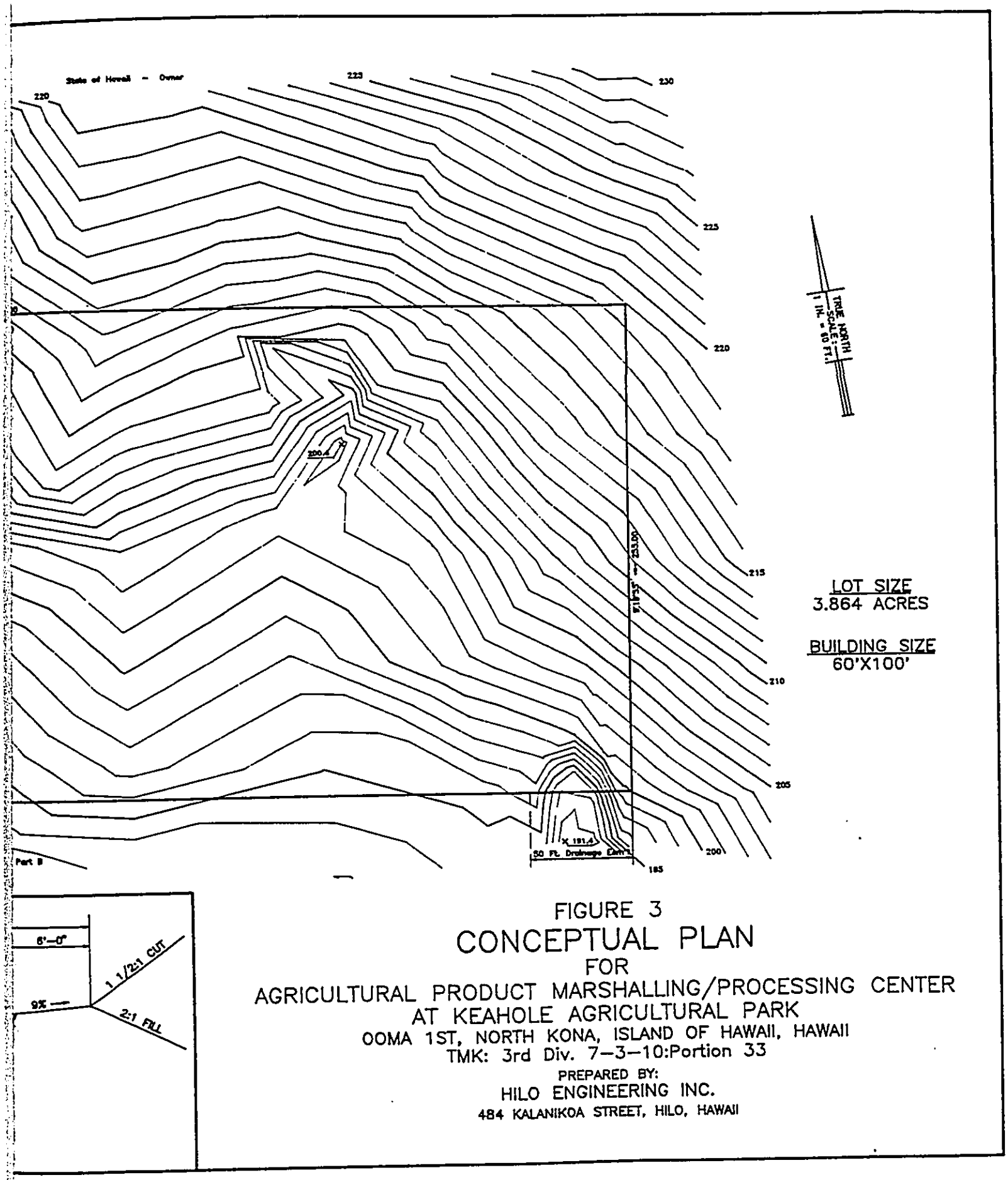


FIGURE 3

CONCEPTUAL PLAN

FOR

AGRICULTURAL PRODUCT MARSHALLING/PROCESSING CENTER
AT KEAHOLE AGRICULTURAL PARK
OOMA 1ST, NORTH KONA, ISLAND OF HAWAII, HAWAII
TMK: 3rd Div. 7-3-10:Portion 33

PREPARED BY:
HILO ENGINEERING INC.
484 KALANIKOA STREET, HILO, HAWAII

APPENDIX G

Consultation and Comments

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sample

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2020

Subject: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Sir or Madam,

On behalf of the Department of Land and Natural Resources (DLNR), The Limtiaco Consulting Group is preparing a Draft Environmental Assessment (EA) for the proposed construction of a new DLNR Administration Facility consisting of offices, secure base yards, and storage areas on approximately five (5) acres of a 79-acre state-owned site in North Kona that is approximately one mile from the Kona International Airport on the Island of Hawai'i. We are soliciting comments on behalf of DLNR for the pre-assessment consultation phase of the EA pursuant to Chapter 343, Hawai'i Revised Statutes and Title 11, Chapter 200.1, Hawai'i Administrative Rules of the Department of Health.

A previously prepared EA and Finding of No Significant Impact (FONSI) for the DLNR Community Conference Center and Administration Facility in Kealakehe was published in the June 8, 2017 issue of The Environmental Notice. The state-owned site near the existing Honokōhau Small Boat Harbor Facility was determined to be infeasible during the design phase of the project and will not be developed for DLNR's administrative functions. Consequently, DLNR has reduced the scope of its project and proposes to site its new administration facility within the parcel identified as Tax Map Key (TMK) 7-3-010: 061, which is located *mauka* (or landward) of the Queen Ka'ahumanu Highway and near the intersection of Kaiminani Drive and Laui Street (see Figure 1).

DLNR is proposing the development of a modern, energy efficient facility that, upon full build-out, will be composed of three, separate, but similar buildings and associated baseyard/storage areas. The project will likely be phased, with one building constructed per phase based upon need and funding availability. The first building will accommodate the administrative functions of State Parks (SP) and include warehouse space for SP. The first phase of the project will also include a secured storage area for the Commission on Water Resource Management (CWRM). A second building will accommodate the administrative functions and secure storage areas for the Division of Aquatic Resources (DAR) and State Historic Preservation Division (SHPD). The third building will accommodate another division or divisions of the DLNR to be determined based on strategic operational needs.

The project site encompasses land that has experienced lava flow events from the Hualalai volcano and there are no known concerns with respect to plant, avian or mammalian species. The project site does not contain and is not near federally delineated critical habitat for protected species. Proposed buildings and parking areas will be sited to avoid documented archaeological sites and resources.

sample

DLNR's new facility will require the installation of infrastructure (e.g., water, wastewater, electrical/communication systems, and a driveway for access and egress from Kaiminani Drive) during the earliest phase of development. Secure base yards and storage areas will have access controls to protect government vessels, vehicles, equipment, tools, records, and other storage items. Site security with respect to theft and vandalism is a high priority due to the enforcement functions and missions of DLNR's divisions. Parking areas for staff and the public will be developed within the project site.

We would greatly appreciate input from you or your organization that will assist us and project stakeholders in determining appropriate mitigation measures that may be warranted due to DLNR's project. The enclosed location map is provided for your reference. You are welcome to provide input at this time or be a consulted party while the EA is being prepared. We would appreciate your response to this pre-assessment consultation letter by Friday, February 21, 2020.

Please send comments to:

Brandon Kim, Project Manager
DLNR, Engineering Division
P.O. Box 373
Honolulu, HI 96809
Fax: (808) 587-0283
email: brandon.j.kim@hawaii.gov

And please provide a copy to:

Claire Oshiro, Environmental Planner
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, HI 96817
email: claire@tlcghawaii.com

Thank you for your interest and participation in the environmental review process. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro, Environmental Planner
Project Manager

LEGEND

PROPERTY LINE

PROJECT LIMITS

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

DLNR Administration Facility in North Kona District
Project Location and Vicinity Map

FIGURE 1

SCALE: 1"=2000'

DATE: January 2020

DAVID Y. IGE
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

February 7, 2020

Mr. Brandon Kim
DLNR, Engineering Division
P. O. Box 373
Honolulu, HI 96809

Dear Mr. Kim:

Thank you for your submittal requesting comments to the Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawaii, Tax Map Key (3) 7-3-010:061 (por.)

Project activities shall comply with the following Administrative Rules of the Department of Health:

- Chapter 11-46 Community Noise Control

Should you have any questions, please contact me at (808) 586-4700.

Sincerely,

Jeffrey M. Eckerd
Program Manager
Indoor and Radiological Health Branch

C: Claire Oshiro, The Limtiaco Consulting Group

Solid and Hazardous Waste Branch Standard Comments

November 26, 2018

The Solid and Hazardous Waste Branch administers programs in the areas of:

1) Management of hazardous waste;
2) Management of solid waste; and
3) Regulation of underground storage tanks.

Our general comments on projects are below. For further information about these programs, please contact the Solid and Hazardous Waste Branch at (808) 586-4226. All chapters of the Hawaii Revised Statutes (HRS) are at https://www.capitol.hawaii.gov/hrscurrent/.

Hazardous Waste Program

- The state regulations for hazardous waste and used oil are in chapters 11-260.1 to 11-279.1, Hawaii Administrative Rules (HAR) [http://health.hawaii.gov/shwb/hwrules/]. These rules apply to the identification, handling, transportation, storage and disposal of regulated hazardous waste and used oil. Generators, transporters and treatment, storage, and disposal facilities of hazardous waste and used oil must adhere to these requirements. Violations are subject to penalties under chapter 342J, HRS.

Solid Waste Section

- The Solid Waste Section (SWS) enforces laws and regulations contained in chapters 342H and 342I, HRS, and chapter 11-58.1, HAR, "Solid Waste Management Control" [http://health.hawaii.gov/shwb/solid-waste/].

- The purpose of the rules is to establish minimum standards governing the design, construction, installation, operation, and maintenance of solid waste disposal, recycling, reclamation and transfer systems.

- All facilities that accept solid wastes are required to obtain a solid waste management permit from the SWS. Examples of the types of facilities governed by these regulations include landfills, transfer stations and convenience centers, recycling facilities, composting facilities, and salvage facilities. Medical waste, infectious waste, and foreign waste treatment facilities are also included.

- Generators of solid waste are required to ensure that their wastes are properly delivered to permitted solid waste management facilities. Managers of construction and demolition projects should require their waste contractors to submit disposal receipts and invoices to ensure proper disposal of wastes.

Office of Solid Waste Management

- The Office of Solid Waste Management (OSWM) administers statewide integrated solid waste management planning activities, which apply to the counties, as well as various recycling programs, e.g. the Glass Advance Disposal Fee (ADF) and Deposit Beverage Container (DBC) Programs. Management of the DBC Program is conducted pursuant to chapter 342G, HRS, which contains compliance and enforcement provisions, and chapter 11-282, HAR, "Deposit Beverage Recycling" [http://health.hawaii.gov/hi5/rules-regulations-additional-links/]. OSWM is also responsible for limited enforcement and compliance of solid waste management facilities that operate primarily as certified DBC redemption centers pursuant to chapter 342H, HRS, and chapter 11-58.1, HAR, "Solid Waste Management Control" [http://health.hawaii.gov/shwb/solid-waste/]. Authority for the integrated solid waste management planning and ADF programs is contained in chapter 342G, HRS.

- Glass Advance Disposal Fee Program: Businesses that import glass containers into Hawaii are required to register with the Department of Health and pay a 1.5 cent per container fee. Fee revenue is distributed to the counties for the operation of glass recycling programs.

- Deposit Beverage Container Program: Business that manufacture or import deposit beverage containers into Hawaii are required to register with the Department of Health and pay the five cent deposit and one cent container fee on each deposit container. Deposits and fees are deposited into a special fund and are used to reimburse DBC redemption center refunds paid to consumers; and to pay handling fees to redemption/recycling companies to process and recycle collected deposit beverage containers; and to pay program administrative costs.

- The Department of Health reimburses and pays an associated handling fee for the redemption of deposit beverage containers (DBC). These transactions are conducted only with certified redemption centers. Certification requires obtaining a solid waste management permit from the SWS (which addresses environmental issues) and a certification from the DBC program (which standardizes the redemption process).

- Chapter 342G, HRS, encourages the reduction of waste generation, reuse of discarded materials, and the recycling of solid waste. Businesses, property managers and developers, and government entities are highly encouraged to develop solid waste management plans to ensure proper handling of wastes and divert recyclables from being landfilled.

- Solid waste management plans seek to maximize waste diversion and minimize disposal. Such plans should include designated areas to promote the collection of reusable and recyclable materials.

Underground Storage Tank Program

- The state's underground storage tank (UST) regulations, found in chapter 11-280.1, HAR [http://health.hawaii.gov/shwb/underground-storage-tanks/], include specific requirements that UST owners and operators must meet when installing, operating, and permanently closing their UST systems and addressing releases from USTs. Violations are subject to penalties under chapter 11-280.1, HAR, and chapter 342L, HRS.

- A permit is required prior to the installation and operation of a UST. Any new UST system that will be installed must have secondary containment with interstitial monitoring. Refer to subchapters 2, 3, 4, and 12 of chapter 11-280.1, HAR. The installation permit expires 1 year from the date of issuance. The operation permit expires 5 years from the date of issuance.

- §11-280.1-50, HAR, requires owners and operators of USTs or tank systems to notify DOH within twenty-four (24) hours and follow the procedures in §11-280.1-52, HAR, if any of the following occur, with specific exceptions found in the rules:
  1) The discovery by any person of evidence of regulated substances which may have been released at the UST site or in the surrounding area (such as the presence of free product or vapors in soils, basements, sewer and utility lines, or nearby surface water);
  2) Unusual UST system operating conditions observed or experienced (such as the erratic behavior of product dispensing equipment, the sudden loss of product from the UST, or an unexplained presence of water in the tank); or
  3) Monitoring results from a release detection method required under §§11-280.1-41 or 11-280.1-42 indicate a release may have occurred.

- For release response actions, responsible parties and their consultants and contractors should follow the applicable guidance in the Department of Health Hazard Evaluation Emergency (HEER) Office Technical Guidance Manual, HEER Environmental Action Level (EAL) guidance, and other guidance documents on the DOH HEER Office website [http://eha-web.doh.hawaii.gov/eha-cma/Org/HEER/], including those pertaining to Multi-Increment Sampling of soil, low flow groundwater sampling, soil vapor sampling, and Environmental Hazard Evaluations (EHE)/Environmental Hazard Management Plans (EHMP).

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

[Via Email]

Ms. Sheri Uchima, Branch Chief
Department of Health
Indoor and Radiological Health Branch
99-945 Halawa Valley Street
Aeia, HI 96701
ATTN: Mr. Jeffrey M. Eckerd, Program Manager

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Ms. Uchima,

Thank you for the letter dated February 7, 2020 from Mr. Eckerd. We acknowledge the statement that project activities shall comply with the Hawai'i Administrative Rules, Title 11, Chapter 46, "Community Noise Control." We also appreciate the standard comments from the Solid and Hazardous Waste Branch.

Your participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

1622 Kanakanui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcghawaii.com

DAVID Y. IGE
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

LUD – 3 7 3 010 061 Pre Asmnt Cons
DLNR Admin Fac ID5018

February 13, 2020

Mr. Brandon Kim, Project Manager
DLNR, Engineering Division
P.O. Box 373
Honolulu, Hawaii 96809
Email: brandon.j.kim@hawaii.gov

Dear Mr. Kim:

Subject: Pre-Assessment Consultation, Preparation for an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawaii, TMK (3) 7-3-010: 061 (portion)

Thank you for allowing us the opportunity to provide comments for the subject project. All proposed wastewater systems shall conform to applicable provisions of the Hawaii Administrative Rules, Chapter 11-62, "Wastewater Systems." At this time, we are unable to offer additional comments as domestic wastewater treatment and disposal have not been thoroughly addressed in the subject document. Information about the project will be required to be submitted to our office before we will be able to determine what type of wastewater treatment system will be allowed, if a sewer connection to a private or County sewer system is not available for the project.

Please be informed that the proposed wastewater systems for the development may have to include design considerations to address any effects associated with the construction of and/or discharges from the wastewater systems to any public trust, Native Hawaiian resources or the exercise of traditional cultural practices. In addition, all wastewater plans must conform to applicable provisions of the Hawaii Administrative Rules, Chapter 11-62, "Wastewater Systems."

Should you have any questions, please call Mr. Mark Tomomitsu of my staff at 586-4294.

Sincerely,

SINA PRUDER, P.E., CHIEF
Wastewater Branch

LM/MST

c: Ms. Claire Oshiro, TLCG, via email: claire@tlcghawaii.com
Mr. Dane Hiromasa, DOH-WWB, via email: dane.hiromasa@doh.hawaii.gov

---

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Ms. Sina Pruder, P.E., Chief
Department of Health - Wastewater Branch
2827 Waimano Home Road
Hale Ola Room 207
Pearl City, HI 96782

[Via Email]

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)
Ref. LUD - 3 7 3 010 061 Pre Asmnt Cons DLNR Admin Fac ID5018

Dear Ms. Pruder,

Thank you for your agency's letter dated February 13, 2020. Since there are no municipal sewer facilities in the vicinity of the project site, the proposed project will utilize an on-site individual wastewater system. We acknowledge the statement that proposed wastewater plans and systems shall conform to applicable provisions of Hawai'i Administrative Rules, Title 11, Chapter 62, "Wastewater Systems." We also recognize the importance of including design considerations to address any effects associated with the construction of and/or discharges from the proposed wastewater system to any public trust, Native Hawaiian resources or the exercise of traditional cultural practices.

Your participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov
Mr. Dane Hiromasa, DOH-WWB, via email: dane.hiromasa@doh.hawaii.gov

1622 Kanakanui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcghawaii.com

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT. GOVERNOR
STATE OF HAWAII

WILLIAM J. AILA, JR
CHAIRMAN
HAWAIIAN HOMES COMMISSION

TYLER I. GOMES
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

February 14, 2020

In reply refer to:
PO-20-020

Mr. Brandon Kim, Project Manager
DLNR, Engineering Division
PO Box 373
Honolulu, Hawai'i 96809
Brandon.j.kim@hawaii.gov

Subject: Pre-Assessment Consultation for a HRS Chapter 343 Environmental Assessment (EA) for the Department of Land and Natural Resources (DLNR) Administration Facility in North Kona District, Island of Hawai'i, TMK (3) 7-3-010:061(por)

Dear Mr. Kim

The Department of Hawaiian Home Lands acknowledges receiving the request for comments on the above-cited project. After reviewing the provided material, this project is located approximately ¼ mile north of DHHL's Kolaoa land holdings in the Kona Moku on Hawai'i Island. DHHL offers the following comments:

The Draft EA should include and evaluation of the project's consistency with DHHL's General Plan, Hawai'i Island Plan, West Hawai'i Island Plan Update, Kealakehe-La'i 'Ōpua Regional Plan.

As DLNR develops its environmental assessment documents, it is important that DHHL's beneficiaries are informed of potential impacts, proposed mitigations, and evaluation of alternatives to the location and scope proposed. DHHL and homestead associations located in the Villages of La'i 'Ōpua should be included in future consultation conducted regarding this project. A state-wide list of DHHL homesteads is located at https://dhhl.hawaii.gov/homestead-associations/. In addition, DHHL encourages DLNR and its agents to consult with (N)native Hawaiian organizations when preparing environmental assessments in order to better assess potential impacts to cultural and natural resources, access and other rights of Native Hawaiians.

Mahalo for the opportunity to provide comments. DHHL looks forward to seeing a more detailed evaluation of the project when the draft Environmental Assessment is released. If you have any questions, please call Malia Cox, at 620-9485 or contact via email at malia.m.cox@hawaii.gov.

Aloha,

William J. Ailā Jr., Chairman
Hawaiian Homes Commission

C: Claire Oshiro, The Limtiaco Consulting Group – claire@tlcghawaii.com

Claire Oshiro

From: Kim, Brandon J
Sent: Friday, February 14, 2020 10:04 AM
To: Claire Oshiro
Subject: FW: DLNR Admin Facility pre-assessment EA prep

Hi Claire,

Forwarding for your information and use.

Thank you,
Brandon J. Kim
Department of Land & Natural Resources
Engineering Division
1151 Punchbowl St., Rm 221
Honolulu, HI 96813
Ph: (808) 587-0248
Fax: (808) 587-0283

From: Cox, Malia M
Sent: Friday, February 14, 2020 9:50 AM
To: Kim, Brandon J
Subject: FW: DLNR Admin Facility pre-assessment EA prep

Aloha e Brandon,

Attached are links to the plans identified in the letter for your reference.

- General Plan
- Hawai'i Island Plan
- West Hawai'i Island Plan Update, (Plan starts on page 46 of the commission submittal document)
- Kealakehe-La'i 'Ōpua Regional Plan
- https://dhhl.hawaii.gov/homestead-associations/

Mahalo for allowing DHHL to be a part of DLNR's early consultation process.

Mahalo,

Malia Cox, LEED AP BD+C
Planner
Department of Hawaiian Home Lands
Physical Address: 91-5420 Kapolei Parkway, Kapolei, HI 96707
Mailing Address: P.O. Box 1879, Honolulu, HI 96805
Phone: (808)620-9485
Fax: (808) 620-9559
Email: malia.m.cox@hawaii.gov

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Mr. William Aila Jr., Chairman, Hawaiian Homes Commission **[Via Email]**
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, HI 96805
ATTN: Malia Cox, Planner

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.) Ref. PO-20-020

Dear Chairman Aila,

Thank you for the letter dated February 14, 2020 and for the email from Ms. Cox on February 14, 2020 that includes links to your agency's General Plan, Hawai'i Island Plan, West Hawai'i Island Plan Update and Kealakehe-La'i 'Ōpua Regional Plan. The facility proposed by the Department of Land and Natural Resources (DLNR) will be designed to avoid important resources including Site #50-10-27-262. This lava tube site will be preserved in place (avoidance and protection) in accordance with an archaeological preservation plan and a burial treatment plan to be written. The burial treatment plan preservation treatments will be determined through consultation with the Hawai'i Island Burial Council and recognized descendants.

Our understanding is that the project site is closest to the Department of Hawaiian Home Lands (DHHL) Kalaoa parcels located at southern terminus of Laui Street. Two of DHHL's parcels, which are designated for general agriculture and industrial uses, are located at least 0.4 miles south from DLNR's proposed facility. DHHL land that is at least one (1) mile from DLNR's proposed facility and beyond the northern terminus of Laui Street is designated for commercial and residential use. DHHL also has land designated for residential use that is at least 1.2 miles from DLNR's proposed facility and within the Kalaoa residential neighborhood that spans the area between Ane Keohokālole and Mamalahoa Highways. According to the Hawai'i Island Plan (2002), the Kalaoa developments are included in DHHL's high priority - phase two for the West Hawai'i region, which is described as the longer-term 7 to 20-year planning period. According to the Kealakehe -La'i 'Ōpua Regional Plan (2020), DHHL will need to develop additional potable water sources after the buildout of high priority - phase one projects in Kealakehe such as La'i 'Ōpua Village 4 Phase I 'Ākau and Phase II Hema.

We acknowledge the comments about including the Department of Hawaiian Home Lands and homestead associations located in the Villages of .La'i 'Ōpua in future consultations pertaining to the project to increase awareness of the potential impacts, proposed mitigations and project alternatives. The responses from (N)native Hawaiian organizations and cultural descendants to the outreach effort will be included in the Environmental Assessment.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov
Ms. Malia Cox, Planner, via email: malia.m.cox@hawaii.gov

GENTRY'S
KONA MARINA
HONOKOHAU HARBOR
74-425 Kealakehe Parkway, Kailua-Kona, Hawaii 96740 • Phone 808.329.7896 Fax 808.329.7372 • Toll Free 888.458.7896

February 17, 2020

Mr. Brandon Kim, Project Manager
DLNR Engineering Division
P.O. Box 373
Honolulu, HI 96809

Re: Pre-assessment Consultation – Department of Land and Natural Resources Administration Facility in North Kona District, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Mr. Kim:

We are in receipt of the letter dated January 29, 2020 from The Limtiaco Consulting Group regarding the Pre-Assessment Consultation of the above referenced property/project.

Thank you for much for including Gentry's Kona Marina (GKM) in this process. Due to its location, we do not believe it will have any impact at GKM located at the Honokohau Small Boat Harbor.

Sincerely,

Tina Prettyman
General Manager

cc: Claire Oshiro, Environmental Planner, The Limtiaco Consulting Group

Machine Shop • Metal Fabrication • Propeller Repair • Boat Park
Tackle Shop • Surf/Dive • Tournaments • 50-Ton Travelift • Open Yard Storage • Shipwrights • Fiberglass Repair • Engine Repair • Electrical Repair
Marine Hardware • Dining Facilities • Fish & Ice House • Fuel • Charter Activities • Yacht Brokerage • Deli & Convenience Store • Graphic Design • Marine Clothing & Accessories

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Ms. Tina Prettyman, General Manager
Gentry's Kona Marina Honokohau Harbor
Honokohau Boat Harbor
74-425 Kealakehe Parkway
Kailua-Kona, HI 96740

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Ms. Prettyman,

Thank you for the letter dated February 17, 2020. We acknowledge the statement that the project is not expected to have any impact on Gentry's Kona Marina located at Honokohau Small Boat Harbor because the proposed facility will be located approximately 5 miles from the harbor.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro
Environmental Planner

1622 Kanakanui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcghawaii.com

Harry Kim
Mayor

Roy Takemoto
Managing Director

David Yamamoto, P.E.
Director

Allan G. Simeon, P.E.
Deputy Director

County of Hawai'i
DEPARTMENT OF PUBLIC WORKS
Aupuni Center
101 Pauahi Street, Suite 7 · Hilo, Hawai'i 96720-4224
(808) 961-8321 · Fax (808) 961-8630
public_works@hawaiicounty.gov

February 18, 2020

Brandon Kim, Project Manager
DLNR, Engineering Division
PO Box 373
Honolulu, HI 96809
Via email to: brandon.j.kim@hawaii.gov

Subject: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010:061 (por.)

We have reviewed the subject request and our comments are as follows:

1. Kaiminani Drive is a County owned and maintained street. All work, including driveway access, within the County Right- of-Way shall conform to Chapter 22 – County Streets – of the Hawaii County Code.

2. The subject parcel is in an area designated as Zone X on the Flood Insurance Rate Map by the Federal Emergency Management Agency.

3. All development-generated runoff shall be disposed of on-site and shall not be directed toward any adjacent properties.

4. All earthwork and grading shall conform to Chapter 10 – Erosion and Sedimentation Control – of the Hawaii County Code.

Please provide a copy of the EA when it is completed for our review and comment.

Should there be any questions concerning this matter, please feel free to contact Natalie Whitworth of our Kona Engineering Division office at 323-4853.

for David Yamamoto, P.E.
Director

NW

Copy: Engineering - Hilo/Kona
Clair Oshiro, The Limtiaco Consulting Group – Via email

County of Hawai'i is an Equal Opportunity Provider and Employer.

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Mr. Steven Ikaika Rodenhurst, P.E., Director **[Via Email]**
County of Hawaii
Department of Public Works
Aupuni Center
101 Pauahi Street, Suite 7
Hilo, HI 96720
ATTN: Natalie Whitworth, Kona Engineering Division

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Director Rodenhurst,

Thank you for your agency's letter dated February 18, 2020 from Director Yamamoto. We acknowledge the comments about work that shall conform to Chapter 22 (County Streets) of the Hawaii County Code, the Zone X flood designation, on-site runoff disposal, and earthwork and grading that shall conform to Chapter 10 (Erosion and Sedimentation Control) of the Hawaii County Code. We also acknowledge the request to review the Environmental Assessment when it is completed.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov

1622 Kanakanui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcghawaii.com

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

February 18, 2020

RECEIVED FEB 24 2020

Mr. Brandon Kim
State of Hawai'i
Department of Land and Natural Resources
Engineering Division
P.O. Box 373
Honolulu, HI 96809

Dear Mr. Kim:

Subject: Pre-Environmental Assessment Consultation for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i Tax Map Key 7-3-010:061

This is in response to your Pre-Environmental Assessment Consultation request dated January 29, 2020.

Please be informed there is no existing service for the subject parcel. There is one (1) unit of water allocated to the parcel from the previous subdivision action (SUB-06-000301). For your information, one unit of water is equal to an average usage of 400 gallons per day. There is an existing 20-inch waterline along Ka'iminani Drive and an existing 12-inch waterline along Lau'i Street both fronting the subject parcel.

We request that an estimated maximum daily water usage calculation for the project, prepared by a professional engineer licensed in the State of Hawai'i, be submitted for review and approval. The water usage calculations should include the estimated peak-flow in gallons per minute and the total estimated maximum daily water usage in gallons per day.

Based on the water usage calculation provided, the Department will determine if additional water can be made available. If water is available, we will determine the necessary water system improvements required to support the project.

Please note that the Department of Water Supply acknowledges that potable water is Hawai'i Island's most precious resource and encourages our communities to promote water conservation and reserve the highest quality of water for the most valuable end use, which is the sustenance of life.

The Department recommends that the applicant consider appropriate landscape so that additional potable water is not required. Water for landscape irrigation should be provided by alternate methods (i.e. rainwater catchment, reclaimed or reuse water). The County of Hawaii, Department of Public

Works, and/or State of Hawai'i, Department of Health has guidelines, recommendations, or regulations regarding these types of systems.

Should there be any questions, please contact Mr. Ryan Quitoriano of our Water Resources and Planning Branch at 961-8070, extension 256.

Sincerely yours,

Keith K. Okamoto, P.E.
Manager-Chief Engineer

RQ:dfg

copy – Ms. Claire Oshiro, The Limtiaco Consulting Group

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

[Via Email]

Mr. Keith Okamoto, Manager
County of Hawaii
Department of Water Supply
345 Kekuanaoa Street, Suite 20
Hilo, HI 96720

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Mr. Okamoto,

Thank you for your agency's letter dated February 18, 2020. We acknowledge the following statements:

- there is no existing service for the affected parcel;
- one (1) unit of water, which is equivalent to an average usage of 400 gallons per day, is allocated to the parcel from the previous subdivision action (SUB-06-000301); and
- an existing 20-inch waterline is along Kaiminani Drive and an existing 12-inch waterline is along Laui Street.

We also acknowledge the request pertaining to the estimated maximum daily water usage calculation for the project and recommendations pertaining to landscape irrigation. It is our understanding that the water usage discussions with your department are in progress. We do recognize the importance of water conservation.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

1622 Kanakanui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcghawaii.com

Claire Oshiro

From: Fujio, Mary <Mary.Fujio@hawaiicounty.gov>
Sent: Wednesday, February 19, 2020 11:23 AM
To: brandon.j.kim@hawaii.gov; Claire Oshiro
Subject: new DLNR Admin Facility (TMK 7-3-010-061)

Re: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010:061 (por.)

Good morning –

The County of Hawai'i Department of Environmental Management has reviewed your January 29, 2020, letter regarding the above project.

The Wastewater Division has no comments. The Solid Waste Division has no comments at this time, but if a request for comments is received from the Planning or Public Works Department on a permit application, there may be comments.

Thank you.

Mary E. Fujio
Private Secretary to William Kucharski, Director
and Diane Noda, Deputy Director
Department of Environmental Management
County of Hawai'i
345 Kekūanāo'a Street, Suite 41
Hilo, Hawai'i 96720
Telephone: (808) 961-8099

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Mr. Ramzi I. Mansour, Director **[Via Email]**
County of Hawaii
Department of Environmental Management
West Hawaii Civic Center
74-5044 Ane Keohokalole Highway, Building D
Kailua Kona, HI 96740

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Director Mansour,

Thank you for the email transmitted on February 19, 2020 from Ms. Mary Fujio on behalf of Director Kucharski. We acknowledge that the Department's Wastewater Division and Solid Waste Division provided no comments. We also acknowledge that comments from the Solid Waste Division may be provided when there is a permit application to review.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
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

February 20, 2020

DLNR, Engineering Division
Attn: Mr. Brandon Kim, Project Manager
P.O. Box 373
Honolulu, Hawaii 96809

via email: brandon.j.kim@hawaii.gov

Dear Mr. Kim:

SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed **DLNR Administration Facility** located at **North Kona District**, Island of Hawaii; TMK: (3) 7-3-010: 061 (por.)

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division, (b) Division of Forestry & Wildlife, and (c) Land Division – Hawaii District on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: The Limtiaco Consulting Group, Inc. w/copies
Attn: Ms. Claire Oshiro, Project Manager (via email: claire@tlcghawaii.com)
Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
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

February 5, 2020

MEMORANDUM

TO:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation (via email: DLNR.Intake.SHPD@hawaii.gov)

FROM:
SUBJECT:
LOCATION:
APPLICANT:

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed **DLNR Administration Facility**
LOCATION: **North Kona District**, Island of Hawaii; TMK: (3) 7-3-010: 061 (por.)
APPLICANT: The Limtiaco Consulting Group on behalf of DLNR

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **February 19, 2020.**

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 Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Print Name: Carty S. Chang, Chief Engineer
Date: 2/18/20

Attachments
cc: Central Files

'20 FEB 5 AM 10:36 ENGINEERING
RECEIVED
LAND DIVISION

2020 FEB 18 PM 3:05
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed DLNR Administration Facility
TMK(s): (3) 7-3-010: 061 (por.)
Location: North Kona District, Island of Hawaii
Applicant: The Limtiaco Consulting Group on behalf of DLNR

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

The applicant should include water demands and infrastructure required to meet project needs. Please note that the projects within State lands requiring water service from their local Department/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 is required to provide water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update projections.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 2/12/20

DAVID Y. IGE
GOVERNOR OF HAWAII

2510

SUZANNE D. CASE
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

RECEIVED
LAND DIVISION
2020 FEB 13 AM 10:45
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

February 5, 2020

MEMORANDUM

~~TO:~~ From:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation (via email: DLNR.Intake.SHPD@hawaii.gov)

To:

~~FROM:~~ Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed **DLNR Administration Facility**
LOCATION: **North Kona District**, Island of Hawaii; TMK: (3) 7-3-010: 061 (por.)
APPLICANT: The Limtiaco Consulting Group on behalf of DLNR

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **February 19, 2020.**

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 Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

(✓) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed: _____

Print Name: **DAVID G. SMITH, Administrator**

Date: 2/12/20

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
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

RECEIVED
LAND DIVISION
2020 FEB 18 AM 11:32

DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII
RECEIVED
LAND DIVISION
2020 FEB 10 A 10:12
HILO, HAWAII

February 5, 2020

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation (via email: DLNR.Intake.SHPD@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed **DLNR Administration Facility**
LOCATION: **North Kona District**, Island of Hawaii; TMK: (3) 7-3-010: 061 (por.)
APPLICANT: The Limtiaco Consulting Group on behalf of DLNR

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **February 19, 2020.**

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 Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

(✓) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: [signature]

Print Name: GORDON C. HEIT

Date: 2/14/20

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
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

February 27, 2020

DLNR, Engineering Division
Attn: Mr. Brandon Kim, Project Manager via email: brandon.j.kim@hawaii.gov
P.O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Kim:

SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed **DLNR Administration Facility** located at **North Kona District**, Island of Hawaii; TMK: (3) 7-3-010: 061 (por.)

Thank you for the opportunity to review and comment on the subject matter. In addition to our previous comments dated February 20, 2020, enclosed are comments from the Commission on Water Resource Management on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: The Limtiaco Consulting Group, Inc. w/copies
Attn: Ms. Claire Oshiro, Project Manager (via email: claire@tlcghawaii.com)
Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
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

February 5, 2020

2020 FEB -5 AM 10: 43

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation (via email: DLNR.Intake.SHPD@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed **DLNR Administration Facility**
LOCATION: **North Kona District**, Island of Hawaii; TMK: (3) 7-3-010: 061 (por.)
APPLICANT: The Limtiaco Consulting Group on behalf of DLNR

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **February 19, 2020.**

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 Darlene Nakamura at 587-0417 or by email at darlene.k.nakamura@hawaii.gov. Thank you.

2020 FEB 25 PM 3: 12

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ M. Kaleo Manuel

Print Name: Deputy Director

Date: February 25, 2020

Attachments
cc: Central Files

FILE ID: RFD.5330.8
DOC ID: 22191

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

BRUCE S. ANDERSON, PH.D.
KAMANA BEAMER, PH.D.
MICHAEL G. BUCK
NEIL J. HANNAHS
WAYNE K. KATAYAMA
PAUL J. MEYER

M. KALEO MANUEL
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

February 25, 2020

REF: RFD.5330.8

TO: Mr. Russell Tsuji, Administrator
Land Division

FROM: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management

SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Proposed DLNR Administration Facility

FILE NO.: RFD.5330.8
TMK NO.: (3) 7-3-010:061 (por.)

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

[X] 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

[X] 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

[X] 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.

[X] 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/

[X] 6. We recommend the use of alternative water sources, wherever practicable.

[ ] 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.

[X] 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at

http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

☐ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

☐ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.

☐ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☐ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.

☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☒ OTHER: Planning - The proposed water source(s) and projected water demands for the project, both potable and non-potable, should be identified and the calculations used to estimate demands should be provided. A discussion of the potential impacts on water resources and other public trust uses of water should be included, and any proposed mitigation measures described. Water conservation and efficiency measures to be implemented should also be discussed.

If you have any questions, please contact Lenore Ohye of the Commission staff at 587-0216.

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Mr. Russell Y. Tsuji, Administrator **[Via Email]**
Department of Land and Natural Resources, Land Division
Kalanimoku Building
1151 Punchbowl Street, Room 220
Honolulu, HI 96813

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Mr. Tsuji,

Thank you for the letters dated February 20 and February 27, 2020 and for collecting comments from several divisions.

Engineering Division - February 18, 2020
We appreciate the information pertaining to the National Flood Insurance Program and Flood Hazard Zone designations. We acknowledge the statements about the resource development charge, the Water Facilities Charges for transmission and daily storage, and the requirement to provide water demands and calculations to the Department of Land and Natural Resources Engineering Division.

Division of Forestry and Wildlife - February 20, 2020
We acknowledge that the division has no objections.

Land Division - Hawaii District - February 14, 2020
We acknowledge that the division has no objections and no comments.

Commission on Water Resource Management - February 25, 2020, Ref. RFD.5330.8
We appreciate the comments pertaining to recommended coordination for incorporating the project into the county's Water Use and Development Plan and the State Water Projects Plan. We recognize the merits of utilizing water efficient fixtures and implementing water efficient practices.

The project will incorporate Low-Impact Development design practices and structural best management practices (BMPs) to control stormwater. The proposed facility will include passive landscaping, and drain inlets with drywells to enhance stormwater retention and minimize runoff. Dry wells with filter media and oil/water separators will be installed to catch and treat runoff.

Rainwater catchment and reclaimed water could be utilized for landscape irrigation instead of potable water; however, the project site is not connected to recycled water infrastructure

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at this time. We appreciate the suggestion to adopt landscape irrigation conservation BMPs. Information pertaining to water sources, the projected water demand, and potential impacts on water resources will be included in the Environmental Assessment. The use of on-site water catchment and water efficient features may help to reduce projected water demands for the project.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov

DAVID Y. IGE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

IN REPLY REFER TO:
DIR 0112
STP 8.2852

February 21, 2020

TO: SUZANNE D. CASE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

ATTN: BRANDON KIM, PROJECT MANAGER
ENGINEERING DIVISION
DEPARTMENT OF LAND AND NATURAL RESOURCES (DLNR)

FROM: JADE T. BUTAY
DIRECTOR OF TRANSPORTATION

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR PREPARATION OF AN ENVIRONMENTAL ASSESSMENT (EA)
DLNR ADMINISTRATION FACILITY IN NORTH KONA
NORTH KONA, HAWAII
TAX MAP KEY: (3) 7-3-010:061 (POR)

The Hawaii Department of Transportation (HDOT) understands that DLNR is proposing to construct a new DLNR Administration Facility consisting of offices, secure base yards, and storage areas on approximately five (5) acres of a 79-acre state-owned site in North Kona.

The project site is located at the intersection of Kaiminani Drive and Laui Street, both of which are under County of Hawaii jurisdiction, and is approximately 2,000 feet from the intersection of Kaiminani Drive and Queen Kaahumanu Highway (State Route 19).

HDOT has the following comments:

Airports Division (HDOT-A)

1. The proposed facility is approximately 0.41 miles from Ellison Onizuka Kona International Airport (KOA). All projects within 5 miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf.

2. The closest point of the proposed project area is approximately 1.38 miles from Runway 17-35 centerline at KOA. Federal Aviation Administration (FAA) regulation requires the submittal of FAA Form 7460-1 Notice of Proposed Construction or alteration pursuant to the Code of Federal Regulations, Title 14, Part 77.9, if the construction or alteration is within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet. Construction equipment and staging area heights, including heights of temporary construction cranes, need to be included in the submittal. The form and criteria for submittal can be found at the following website: https://oeaaa.faa.gov/oeaaa/external/portal.jsp.

3. The subject development does not lie under commonly used ingress and egress routes to KOA and lies outside the 55 DNL (Day-Night Average Noise Level) noise contour, however, the area of the proposed development may be subject to single occurrence noise events from flight operations at the airport.

4. Due to the proximity of the airport to the project location, there is a potential for fumes, smoke, vibrations, odors, etc., that may result from aircraft operations over the proposed development.

5. The site may provide opportunity for using solar energy. Photovoltaic (PV) systems that are located near the approach path of aircrafts, can create a hazardous condition for pilots because of possible glint and glare reflected from the PV array. If glint or glare PV arrays create hazardous condition for pilots, the PV system owners shall immediately mitigate the hazard upon notification by the HDOT-A and/or FAA.

   PV systems have also been known to emit radio frequency interference (RFI) to aviation-dedicated radio signals, thereby disrupting the reliability of air-to-ground communications. Again, PV system owners shall immediately mitigate the RFI hazard upon notification by the HDOT-A and/or FAA.

Highways Division (HDOT-HWY)

1. The Draft EA should include the following:

   a. Describe anticipated vehicle access routes to the site, location of the site driveway, jurisdiction of roads in the vicinity, and existing multimodal and transit facilities in the vicinity.

   b. Describe existing traffic conditions on Queen Kaahumanu Highway at the intersection with Kaiminani Drive.

   c. Present the characteristics of project construction/demolition and operations phases, include development timeline and anticipated year of full-build-out.

d. Describe the anticipated number and timing of project-related vehicle trips at full buildout, including employees, heavy maintenance vehicles, guests, and deliveries.

e. Assess the project's potential direct, secondary and cumulative impacts to State roadways (level of service and safety). Direct potential mitigation measures.

f. Include a Traffic Impact Assessment Report prepared by a licensed professional engineer, if the qualitative traffic assessment identifies a potential significant adverse impact on HDOT roadways.

g. Describe the location of proposed utility infrastructure, specifically as it relates to the HDOT right-of-way.

2. An HDOT permit is required to transport oversized equipment and overweight loads on HDOT roadways.

If there are any questions, please contact Mr. Blayne Nikaido of the HDOT Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

c: Claire Oshiro – The Limtiaco Consulting Group

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Mr. Jade Butay, Director **[Via Email]**
State of Hawaii
Department of Transportation
Aliiaimoku Building
869 Punchbowl Street, Suite 509
Honolulu, HI 96813

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)
Ref. DIR 0112 STP 8.2852

Dear Director Butay,

Thank you for the letter dated February 21, 2020 and for collecting comments from the divisions.

Airports Division (HDOT-A)
We appreciate the information pertaining to the Technical Assistance Memorandum, the Federal Aviation Administration Form 7460-1, ingress and egress routes, and noise contour. We acknowledge the statement about a potential for fumes, smoke, vibrations, odors, etc. that may result from aircraft operations over the proposed development. We also appreciate the information pertaining to the potentially hazardous conditions caused by glint, glare, and radio frequency interference from photovoltaic systems.

Highways Division (HDOT-HWY)
We acknowledge the request to provide information about vehicle access routes, location of driveways, jurisdiction of nearby roadways, existing multimodal and transit facilities, etc. in the Environmental Assessment (EA). The traffic impact assessment report (TIAR), which evaluated existing traffic conditions and assessed impacts in the surrounding areas, will also be included with the EA. We recognize that an HDOT permit is required to transport oversized equipment and overweight loads on HDOT roadways.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov

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National Park Service
U.S. Department of the Interior

Kaloko-Honokōhau
National Historical Park

73-4786 Kanalani Street # 14
Kailua-Kona, Hawai'i 96740

808 329-6881 Phone
808 329-2597 Fax

Kaloko-Honokōhau

IN REPLY REFER TO:
L7621 (2020-1)

February 21, 2020

Mr. Brandon Kim, Project Manager
DLNR, Engineering Division
P.O. Box 373
Honolulu, HI 96809

Ms. Claire Oshiro, Environmental Planner
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, HI 96817

Subject: Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Mr. Kim and Ms. Oshiro:

Thank you for providing the National Park Service (NPS) with the opportunity to provide input on the development of a Draft Environmental Assessment (DEA) for the Department of Land and Natural Resources (DLNR) Administration Facility in the North Kona on the island of Hawai'i.

The proposed DLNR Administration Facility consists of offices, secure base yards, and storage areas on approximately five acres within the 79-acre state-owned site in North Kona. The site is approximately 2 miles north of Kaloko-Honokōhau National Historical Park (Park).

While the proposed project is not immediately adjacent to the Park, contaminants, water, air, fish, birds, insects, etc. move; and our coastal natural, biocultural and cultural resources in West Hawai'i are fragile.

Kaloko-Honokōhau National Historical Park was authorized in 1978 by Congress to preserve, interpret, and perpetuate traditional native Hawaiian activities and culture (Public Law 95-625). The Park contains two large (11- and 15-acre) ancient Hawaiian fishponds with large associated wetlands, more than 180 known anchialine pools, and 596 acres of marine waters. The pools and fishponds are significant cultural resources that define the Park and also provide habitat for four federally listed species under the Endangered Species Act. The Park water resources are fed by, and in the case of the anchialine pools and `Aimakapa Fishpond, are solely dependent upon ground water inputs to maintain these ecosystems. `Aimakapa Fishpond and wetland is core habitat for

the recovery of two endangered waterbird species, the Hawaiian stilt (*Himantopus mexicanus Knudseni*) and the Hawaiian coot (*Fulica americana alai*),and is habitat for migratory waterfowl.

We know the DLNR shares the NPS's commitment and passion for protecting Hawai'i's unique and fragile natural, biocultural and cultural resources. To ensure the National Park's outstanding cultural and natural resources including fresh clean groundwater, ancient fishponds, anchialine pools, coastal waters, and coral reefs are protected from adverse impact, the NPS respectfully requests the following be addressed in the Draft EA:

Wastewater

For wastewater generated by this proposed facility, the NPS would prefer this project connect to the Kealakehe Wastewater Treatment Plant. If this project is unable to connect, and choses an onsite treatment facility, the Draft EA should describe in detail the treatment process and identify specific measures that will ensure the facility will function as described throughout the life of the facility.

Potable and Non-Potable Water Systems

The Draft EA should identify the sources of drinking and irrigation the water for the project and estimated usage. The NPS is highly concerned that the cumulative impacts of groundwater withdrawals could potentially impair the groundwater-dependent cultural and natural resources in the Park which are dependent upon ground-water flow. The NPS requests that the Draft EA for the project include information as to the amount of water required for the project and how that amount adds cumulatively to the current usage of ground water and the proposed needs of the surrounding developments. Although the water demand for this project withdrawal amount may be small given this project's size, and small relative to the recharge rate of the aquifer, we note that this project is one of many projects that are proposed in the vicinity, and that the cumulative impacts of these withdrawals may be significant.

Non-Point Source Pollution and Surface Water Drainage

The Draft EA should address, in detail, how polluted runoff from parking lots, driveways, and other surfaces will be controlled and treated. The proposed project is located in highly permeable lava with few accumulated soils. Rain and runoff carry pollutants quickly to groundwater, to coastal anchialine pools, and into nearshore waters. Although average rainfall is ~20 inches per year, rainfall accumulation is typically concentrated in a few intense events that cause a pulse of pollution flushing to drainage systems, to the water table, and into nearshore waters.

For over a decade, Hawai'i County and the Hawai'i Land Use Commission have recognized the need to implement additional measures to control nonpoint source pollution flowing into the Park's inland and nearshore waters and surrounding areas (LUC Docket A00-732; COH Ord 02-114 and 04-110). Standard county, state and federal regulations for drainage wells (i.e. dry wells) are designed to address flood control but not to prevent polluted surface water runoff from impacting the inland and coastal waters. Best management practices should therefore be discussed in the Draft EA.

Nighttime Lighting

The NPS Natural Sounds and Night Skies Division has six principles of sustainable lighting that go beyond minimizing and down-shielding. We would like to suggest that the project planners and designers consider a full suite of measures that would more fully protect resources and values from artificial light. Lights should be of a color, intensity, placement, directionality, and operational cycle to minimize both impacts to nocturnal species and the natural visual character of the night. In designing, selecting, and operating outdoor lighting, the following approaches can achieve fully a sustainable solution.

1) Light only where it is needed
2) Light only when it is needed
3) Shield lights and direct them downward
4) Use the minimum amount of light necessary
5) Select lamps with warmer colors (less blue light)
6) Select the most energy efficient lamps and fixture

Impacts to the natural night-sky from lighting should be addressed in the Draft EA. Natural lightscapes are fundamental to the historical and cultural context of the Park and critical for Park wildlife. This project's contribution to the cumulative night-sky impacts to Kaloko-Honokōhau NHP should be analyzed.

Cumulative Impacts

The proposed project will contribute to the growing cumulative impacts from development adjacent to the Park and in the surrounding area. Therefore, the Draft EA should thoroughly analyze how the proposed project will contribute to the cumulative impacts, especially for those topics listed above, from development near the Park and along the North Kona coast.

If you have any questions regarding this letter, please contact Dr. Jeff Zimpfer, Environmental Protection Specialist at 808-329-6881 ex 1500 or jeff_zimpfer@nps.gov.

Sincerely,

Leonel Arguello
Acting Superintendent

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Mr. John Broward, Superintendent **[Via Email]**
U.S. Department of the Interior
National Park Service
Kaloko-Honokohau National Historic Park
73-4786 Kanalani Street #14
Kailua Kona, HI 96740
ATTN: Dr. Jeff Zimpfer, Environmental Protection Specialist

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.) Ref. L762 (2020-1)

Dear Superintendent Broward,

Thank you for the letter dated February 21, 2020 that was signed by Acting Superintendent Arguello. We appreciate that there is a shared commitment from the U.S. Department of the Interior, National Park Service and the Department of Land and Natural Resources to protect Hawai'i's unique and fragile natural, biocultural and cultural resources.

Wastewater
We appreciate your recommendation to connect to the Kealakehe Wastewater Treatment Plant; however, municipal infrastructure and conveyance facilities are expected to remain limited in the project area. We acknowledge your concerns about on-site wastewater treatment and concerns about the reliability of on-site system to function as intended.

Potable and Non-Potable Water Systems
Information pertaining to water sources, the projected water demand, and potential impacts on groundwater resources will be included in the Environmental Assessment (EA). The use of on-site water catchment and water efficient fixtures may help to reduce projected water demands for the project.

Non-Point Source Pollution and Surface Water Drainage
We acknowledge your agency's concerns about non-point source pollution and surface water drainage. The project will incorporate Low-Impact Development design practices and structural best management practices (BMPs) to control stormwater. The proposed facility will include passive landscaping, and drain inlets with drywells to enhance stormwater retention and minimize runoff. Dry wells with filter media and oil/water separators will be installed to catch and treat runoff.

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Nighttime Lighting
We recognize your agency's concerns with regards to nighttime lighting. The six principles of sustainable lighting will be included as recommendations in the EA.

Cumulative Impacts
The cumulative impacts of the project will be discussed in the EA.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov
Dr. Jeff Zimpfer, Environmental Protection Specialist, via email: jeff_zimpfer@nps.gov

Harry Kim
Mayor

Darren J. Rosario
Fire Chief

Lance S. Uchida
Deputy Fire Chief

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County of Hawai'i

HAWAI'I FIRE DEPARTMENT
25 Aupuni Street • Suite 2501 • Hilo, Hawai'i 96720
(808) 932-2900 • Fax (808) 932-2928

February 21, 2020

Brandon Kim, Project Manager
DLNR, Engineering Division
P.O. Box 373
Honolulu, Hawai'i 96809

Dear Mr. Kim,

SUBJECT: Pre-Assessment Consultation, Preparation of an Environmental Assessment for Department of Land and Natural Resources Administration Facility in North Kona District TMK: (3) 7-3-010:061 (por.)

In regards to the above-referenced Environmental Assessment Pre-Assessment Consultation, the following shall be in accordance:

NFPA 1, UNIFORM FIRE CODE, 2006 EDITION
Note: Hawai'i State Fire Code, National Fire Protection Association 2006 version, with County of Hawaii amendments. County amendments are identified with a preceding "C~" of the reference code.

Chapter 18 Fire Department Access and Water Supply

18.1 General. Fire department access and water supplies shall comply with this chapter.

For occupancies of an especially hazardous nature, or where special hazards exist in addition to the normal hazard of the occupancy, or where access for fire apparatus is unduly difficult, or areas where there is an inadequate fire flow, or inadequate fire hydrant spacing, and the AHJ may require additional safeguards including, but not limited to, additional fire appliance units, more than one type of appliance, or special systems suitable for the protection of the hazard involved.

18.1.1 Plans.

18.1.1.1 Fire Apparatus Access. Plans for fire apparatus access roads shall be submitted to the fire department for review and approval prior to construction.

18.1.1.2 Fire Hydrant Systems. Plans and specifications for fire hydrant systems shall be submitted to the fire department for review and approval prior to construction.

C~ 18.1.1.2.1 Fire Hydrant use and Restrictions. No unauthorized person shall use or operate any Fire hydrant unless such person first secures permission or a permit from the owner or representative of the department, or company that owns or governs that water supply or system. Exception: Fire Department personnel conducting firefighting operations, hydrant testing, and/or maintenance, and the flushing and acceptance of hydrants witnessed by Fire Prevention Bureau personnel.

18.2 Fire Department Access.

18.2.1 Fire department access and fire department access roads shall be provided and maintained in accordance with Section 18.2.

18.2.2* Access to Structures or Areas.

18.2.2.1 Access Box(es). The AHJ shall have the authority to require an access box(es) to be installed in an accessible location where access to or within a structure or area is difficult because of security.

18.2.2.2 Access to Gated Subdivisions or Developments. The AHJ shall have the authority to require fire department access be provided to gated subdivisions or developments through the use of an approved device or system.

18.2.2.3 Access Maintenance. The owner or occupant of a structure or area, with required fire department access as specified in 18.2.2.1 or 18.2.2.2, shall notify the AHJ when the access is modified in a manner that could prevent fire department access.

18.2.3 Fire Department Access Roads. (*may be referred as FDAR)

18.2.3.1 Required Access.

18.2.3.1.1 Approved fire department access roads shall be provided for every facility, building, or portion of a building hereafter constructed or relocated.

18.2.3.1.2 Fire Department access roads shall consist of roadways, fire lanes, parking lots lanes, or a combination thereof.

18.2.3.1.3* When not more than two one- and two-family dwellings or private garages, carports, sheds, agricultural buildings, and detached buildings or structures 400ft^2 (37 m^2) or less are present, the requirements of 18.2.3.1 through 18.2.3.2.1 shall be permitted to be modified by the AHJ.

18.2.3.1.4 When fire department access roads cannot be installed due to location on property, topography, waterways, nonnegotiable grades, or other similar conditions, the AHJ shall be authorized to require additional fire protection features.

18.2.3.2 Access to Building.

18.2.3.2.1 A fire department access road shall extend to within in 50 ft (15 m) of at least one exterior door that can be opened from the outside that provides access to the interior of the building. Exception: 1 and 2 single-family dwellings.

18.2.3.2.1.1 When buildings are protected throughout with an approved automatic sprinkler system that is installed in accordance with NFPA 13, NFPA 13D, or NFPA 13R, the distance in 18.2.3.2.1 shall be permitted to be increased to 300 feet.

18.2.3.2.2 Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 ft (46 m) from fire department access roads as measured by an approved route around the exterior of the building or facility.

18.2.3.2.2.1 When buildings are protected throughout with an approved automatic sprinkler system that is installed in accordance with NFPA 13, NFPA 13D, or NFPA 13R, the distance in 18.2.3.2.2 shall be permitted to be increased to 450 ft (137 m).

18.2.3.3 Multiple Access Roads. More than one fire department access road shall be provided when it is determined by the AHJ that access by a single road could be impaired by vehicle congestion, condition of terrain, climatic conditions, or other factors that could limit access.

18.2.3.4 Specifications.

18.2.3.4.1 Dimensions.

C~ 18.2.3.4.1.1 FDAR shall have an unobstructed width of not less than 20ft with an approved turn around area if the FDAR exceeds 150 feet. **Exception:** FDAR for one and two family dwellings shall have an unobstructed width of not less than 15 feet, with an area of not less than 20 feet wide within 150 feet of the structure being protected. An approved turn around area shall be provided if the FDAR exceeds 250 feet.

C~ 18.2.3.4.1.2 FDAR shall have an unobstructed vertical clearance of not less then 13ft 6 in.

C~ 18.2.3.4.1.2.1 Vertical clearances may be increased or reduced by the AHJ, provided such increase or reduction does not impair access by the fire apparatus, and approved signs are installed and maintained indicating such approved changes.

18.2.3.4.1.2.2 Vertical clearances shall be increased when vertical clearances or widths are not adequate to accommodate fire apparatus.

C~ 18.2.3.4.2 Surface. Fire department access roads and bridges shall be designed and maintained to support the imposed loads (25 Tons) of the fire apparatus. Such FDAR and shall be comprised of an all-weather driving surface.

18.2.3.4.3 Turning Radius.

C~ 18.2.3.4.3.1 Fire department access roads shall have a minimum inside turning radius of 30 feet, and a minimum outside turning radius of 60 feet.

18.2.3.4.3.2 Turns in fire department access road shall maintain the minimum road width.

18.2.3.4.4 Dead Ends. Dead-end fire department access roads in excess of 150 ft (46 m) in length shall be provided with approved provisions for the fire apparatus to turn around.

18.2.3.4.5 Bridges.

18.2.3.4.5.1 When a bridge is required to be used as part of a fire department access road, it shall be constructed and maintained in accordance with county requirements.

18.2.3.4.5.2 The bridge shall be designed for a live load sufficient to carry the imposed loads of fire apparatus.

18.2.3.4.5.3 Vehicle load limits shall be posted at both entrances to bridges where required by the AHJ.

18.2.3.4.6 Grade.

C~ 18.2.3.4.6.1 The maximum gradient of a Fire department access road shall not exceed 12 percent for unpaved surfaces and 15 percent for paved surfaces. In areas of the FDAR where a Fire apparatus would connect to a Fire hydrant or Fire Department Connection, the maximum gradient of such area(s) shall not exceed 10 percent.

18.2.3.4.6.2* The angle of approach and departure for any means of fire department access road shall not exceed 1 ft drop in 20 ft (0.3 m drop in 6 m) or the design limitations of the fire apparatus of the fire department, and shall be subject to approval by the AHJ.

18.2.3.4.6.3 Fire department access roads connecting to roadways shall be provided with curb cuts extending at least 2 ft (0.61 m) beyond each edge of the fire lane.

18.2.3.4.7 Traffic Calming Devices. The design and use of traffic calming devices shall be approved the AHJ.

18.2.3.5 Marking of Fire Apparatus Access Road.

18.2.3.5.1 Where required by the AHJ, approved signs or other approved notices shall be provided and maintained to identify fire department access roads or to prohibit the obstruction thereof of both.

18.2.3.5.2 A marked fire apparatus access road shall also be known as a fire lane.

18.2.4* Obstruction and Control of Fire Department Access Road.

18.2.4.1 General.

18.2.4.1.1 The required width of a fire department access road shall not be obstructed in any manner, including by the parking of vehicles.

18.2.4.1.2 Minimum required widths and clearances established under 18.2.3.4 shall be maintained at all times.

18.2.4.1.3* Facilities and structures shall be maintained in a manner that does not impair or impede accessibility for fire department operations.

18.2.4.1.4 Entrances to fire departments access roads that have been closed with gates and barriers in accordance with 18.2.4.2.1 shall not be obstructed by parked vehicles.

18.2.4.2 Closure of Accessways.

18.2.4.2.1 The AHJ shall be authorized to require the installation and maintenance of gates or other approved barricades across roads, trails, or other accessways not including public streets, alleys, or highways.

18.2.4.2.2 Where required, gates and barricades shall be secured in an approved manner.

18.2.4.2.3 Roads, trails, and other access ways that have been closed and obstructed in the manner prescribed by 18.2.4.2.1 shall not be trespassed upon or used unless authorized by the owner and the AHJ.

18.2.4.2.4 Public officers acting within their scope of duty shall be permitted to access restricted property identified in 18.2.4.2.1.

18.2.4.2.5 Locks, gates, doors, barricades, chains, enclosures, signs, tags, or seals that have been installed by the fire department or by its order or under its control shall not be removed, unlocked, destroyed, tampered with, or otherwise vandalized in any manner.

18.3 Water Supplies and Fire Hydrants

18.3.1* A water supply approved by the county, capable of supplying the required fire flow for fire protection shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ. For on-site fire hydrant requirements see section 18.3.3.

EXCEPTIONS:

1. When facilities or buildings, or portions thereof, are completely protected with an approved automatic fire sprinkler system the provisions of section 18.3.1 may be modified by the AHJ.
2. When water supply requirements cannot be installed due to topography or other conditions, the AHJ may require additional fire protection as specified in section 18.3.2 as amended in the code.
3. When there are not more than two dwellings, or two private garage, carports, sheds and agricultural. Occupancies, the requirements of section 18.3.1 may be modified by AHJ.

18.3.2* Where no adequate or reliable water distribution system exists, approved reservoirs, pressure tanks, elevated tanks, fire department tanker shuttles, or other approved systems capable of providing the required fire flow shall be permitted.

18.3.3* The location, number and type of fire hydrants connected to a water supply capable of delivering the required fire flow shall be provided on a fire apparatus access road on the site of the premises or both, in accordance with the appropriate county water requirements.

18.3.4 Fire Hydrants and connections to other approved water supplies shall be accessible to the fire department.

18.3.5 Private water supply systems shall be tested and maintained in accordance with NFPA 25 or county requirements as determined by the AHJ.

18.3.6 Where required by the AHJ, fire hydrants subject to vehicular damage shall be protected unless located within a public right of way.

18.3.7 The AHJ shall be notified whenever any fire hydrant is placed out of service or returned to service. Owners of private property required to have hydrants shall maintain hydrant records of approval, testing, and maintenance, in accordance with the respective county water requirements. Records shall be made available for review by the AHJ upon request.

C~ 18.3.8 Minimum water supply for buildings that do not meet the minimum County water standards:

Buildings up to 2000 square feet, shall have a minimum of 3,000 gallons of water available for Firefighting.

Buildings 2001- 3000 square feet, shall have a minimum of 6,000 gallons of water available for Firefighting.

Buildings, 3001- 6000 square feet, shall have a minimum of 12,000 gallons of water available for Firefighting.

Buildings, greater than 6000 square feet, shall meet the minimum County water and fire flow requirements.

Multiple story buildings shall multiply the square feet by the amount of stories when determining the minimum water supply.

Commercial buildings requiring a minimum fire flow of 2000gpm per the Department of Water standards shall double the minimum water supply reserved for firefighting.

Fire Department Connections (FDC) to alternative water supplies shall comply with 18.3.8 (1)-(6) of *this code.*

NOTE: In that water catchment systems are being used as a means of water supply for firefighting, such systems shall meet the following requirements:

1) In that a single water tank is used for both domestic and firefighting water, the water for domestic use shall not be capable of being drawn from the water reserved for firefighting;

2) Minimum pipe diameter sizes from the water supply to the Fire Department Connection (FDC) shall be as follows:
   a) 4" for C900 PVC pipe;
   b) 4" for C906 PE pipe;
   c) 3" for ductile Iron;
   d) 3' for galvanized steel.

3) The Fire Department Connection (FDC) shall:
   a) be made of galvanized steel;
   b) have a gated valve with 2-1/2 inch, National Standard Thread male fitting and cap;
   c) be located between 8 ft and 16 ft from the Fire department access. The location shall be approved by the AHJ;
   d) not be located less than 24 inches, and no higher than 36 inches from finish grade, as measured from the center of the FDC orifice;
   e) be secure and capable of withstanding drafting operations. Engineered stamped plans may be required;
   f) not be located more than 150 feet of the most remote part, but not less than 20 feet, of the structure being protected;
   g) also comply with section 13.1.3 and 18.2.3.4.6.1 of *this code.*

4) Commercial buildings requiring a fire flow of 2000gpm shall be provided with a second FDC. Each FDC shall be independent of each other, with each FDC being capable of flowing 500gpm by engineered design standards. The second FDC shall be located in an area approved by the AHJ with the idea of multiple Fire apparatus'conducting drafting operations at once, in mind.

5) Inspection and maintenance shall be in accordance to NFPA 25.

6) The owner or lessee of the property shall be responsible for maintaining the water level, quality, and appurtenances of the system.

EXCEPTIONS TO SECTION 18.3.8:

1) Agricultural buildings, storage sheds, and shade houses with no combustible or equipment storage.

2) Buildings less than 800 square feet in size that meets the minimum Fire Department Access Road requirements.

3) For one and two family dwellings, agricultural buildings, storage sheds, and detached garages 800 to 2000 square feet in size, and meets the minimum Fire Department Access Road requirements, the distance to the Fire Department Connection may be increased to 1000 feet.

4) For one and two family dwellings, agricultural buildings, and storage sheds greater than 2000square feet, but less than 3000 square feet and meets the minimum Fire Department Access Road requirements, the distance to the Fire Department Connection may be increased to 500 feet.

5) For buildings with an approved automatic sprinkler system, the minimum water supply required may be modified.

If there are any questions regarding these requirements, please contact the Fire Prevention Bureau at (808) 932-2911.

DARREN J. ROSARIO
Fire Chief

CB:ds

cc: Claire Oshiro

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

[Via Email]

Fire Chief Darren J. Rosario
County of Hawaii Fire Department
Fire Prevention Bureau
74-5044 Ane Keohokalole Highway, Building E
Kailua Kona, HI 96740

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Fire Chief Rosario,

Thank you for the letter dated February 21, 2020 and for identifying the applicable sections of the National Fire Protection Association Uniform Fire Code and County of Hawaii amendments. It is our understanding that the civil drawings will be submitted for review and approval to ensure that fire department access, water supply for on-site fire protection, and life safety requirements are met.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro
Environmental Planner

1622 Kanakanui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcghawaii.com

Harry Kim
Mayor

Paul K. Ferreira
Police Chief

Kenneth Bugado, Jr.
Deputy Police Chief

County of Hawai'i

POLICE DEPARTMENT
349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

February 12, 2020

'20 FEB 21 AM10:34 ENGINEERING

Mr. Brandon Kim
Project Manager
DLNR, Engineering Division
P.O. Box 373
Honolulu, HI 96809
brandon.j.kim@hawaii.gov

Dear Mr. Kim:

SUBJECT: PRE-ASSESSMENT CONSULTATION, PREPARATION OF AN ENVIRONMENTAL ASSESSMENT FOR THE DEPARTMENT OF LAND AND NATURAL RESOURCES ADMINISTRATION FACILITY IN NORTH KONA DISTRICT, ISLAND OF HAWAI'I, TAX MAP KEY (3) 7-3-010: 061 (POR.)

The above-referenced Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.) has been reviewed and we offer no comments at this time.

Should you have any questions or concerns, please contact Captain Gilbert Gaspar Jr., Commander of the Kona District, at (808) 326-4646, extension 299.

Sincerely,

PAUL K. FERREIRA
POLICE CHIEF

R. Wagner

ROBERT WAGNER
ASSISTANT POLICE CHIEF
AREA II OPERATIONS

GG/jaj
20HQ0101

cc: Ms. Claire Oshiro
Environmental Planner
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, HI 96817
claire@tlcghawaii.com

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THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Chief Paul Ferreira
County of Hawaii Police Department
349 Kapiolani Street
Hilo, HI 96720

[Via Email]

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Chief Ferreira,

Thank you for the letter dated February 12, 2020. We acknowledge that the department provided no comments with regards to the project.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

1622 Kanakanui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcghawaii.com

From: j. ma <jomafarm@msn.com>
Sent: Sunday, April 12, 2020 6:23 PM
To: Kim, Brandon J <brandon.j.kim@hawaii.gov>
Subject: [EXTERNAL] Fw: DLNR Admin Facility - North Kona

From: j. ma
Sent: Sunday, April 12, 2020 6:22 PM
Cc: claire@ticghawaii.com <claire@ticghawaii.com>
Subject: DLNR Admin Facility - North Kona

Aloha,

Thank you for your informative letter outlining plans for the construction off the DLNR Admin Facilty on the corner of Kaiminani and Lau'i Street in North Kona.

One of my concern is that your letter indicates the access and egress from Kaiminani Drive. Kaiminani Drive is a busy road in the morning with vehicles speeding down that road. At certain times of the year the sun is very bright going up and in driver's eyes.
There are several landscaping business that use the road way for their employee vehicle parking causing addition traffic entering Kaiminani from the south side.

Also there are lava tubes - one next to my lot that have petroglyph drawings that maybe of cultural significance.
I was told by one person that he took the tube all the way to the airport.

Thank you,

Jo Ma

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

January 29, 2021

Jo Ma Farm
73-4353 Laui Street
Kailua Kona, HI 96740
ATTN: Josanne M. Ma

[Via Email]

Subject: Response to Pre-Assessment Consultation, Preparation of an Environmental Assessment for the Department of Land and Natural Resources Administration Facility in North Kona District, Island of Hawai'i, Tax Map Key (3) 7-3-010: 061 (por.)

Dear Ms. Ma,

Thank you for the email transmitted on April 12, 2020. We acknowledge your concerns about existing traffic conditions on Kaiminani Drive and parking along the roadway that causes additional traffic. The Environmental Assessment includes a discussion of the measures intended to protect the lava tubes and archaeological and cultural resources within the project site.

Your agency's participation in the environmental review process is appreciated. Should you have any questions, please contact me at (808) 687-8750.

Best regards,
The Limtiaco Consulting Group, Inc.

Claire Oshiro

Claire Oshiro
Environmental Planner

c: Mr. Brandon Kim, DLNR, via email: brandon.j.kim@hawaii.gov

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(808) 596-7790 • tlcghawaii.com

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