Harry Kim
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Director

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FILE COPY

APR 08 2018

County of Hawai`i

DEPARTMENT OF PARKS AND RECREATION
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OFC. OF ENVIRONMENTAL QUALITY CONTROL

March 16, 2018

Scott Glenn, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Subject: **Draft Environmental Assessment for La'aloa Avenue New Park Development, TMK (3rd.) 7-7-008:030, North Kona District, Island of Hawai'i**

Dean Mr. Glenn:

The County of Hawaii, Department of Parks and Recreation, has received and approved for release the draft environmental assessment for the subject project and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish notice of availability for the EA for this project in the next available edition of the Environmental Notice. We have enclosed the following:

- One paper copy of the Draft EA;
- A CD containing the .pdf file for the EA and a WORD File with the OEQC Environmental Notice Publication Form; and
- A hardcopy of the OEQC publication form

Please contact James Komata, Park Planner at 961-8311 if you have any questions.

Sincerely,

Roxcie L. Waltjen,
Director

Attachment
cc: Ron Terry, Ph.D., Project Environmental Consultant (w/o attach)

18-480

APPLICANT
PUBLICATION FORM

Project Name:	La'aloa Avenue New Park Development
Project Short Name:	La'aloa Avenue New Park
HRS §343-5 Trigger(s):	Use of County Land and Funds
Island(s):	Hawai'i
Judicial District(s):	North Kona
TMK(s):	3rd. 7-7-008:030
Permit(s)/Approval(s):	• National Pollutant Discharge Elimination System Permit (State DOH) • Grading, Grubbing, Driveway and Work Within County ROW Permits (County DPW) • Building Permits and Plan Approval (County DPW and Planning) • Special Management Area Permit (County Planning Commission; previously obtained)
Approving Agency:	County of Hawai`i Department of Parks and Recreation
Contact Name, Email, Telephone, Address	James Komata, James.Komata@HawaiiCounty.gov, 961-8311 101 Pauahi Street, Suite 6 Hilo, Hawai'i 96720
Applicant	Hawaii One1 Investors, LLC
Contact Name, Email, Telephone, Address	Ernie Mansi, ernie@aldersgagtehome.com, 805-988-4114 Hawaii One1 Investors, LLC 300 East Esplanade Avenue, Suite 1550 Oxnard, California 93036
Consultant:	Geometrician Associates
Contact Name, Email, Telephone, Address	Ron Terry, rterry@hawaii.rr.com (808) 969-7090 PO Box 396 Hilo HI 96721

Status (select one)	**Submittal Requirements**
_X__ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
__ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.
____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.

____	FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
	FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____	Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.
____	Withdrawal	Identify the specific document(s) to withdraw and explain in the project summary section.
____	Other	Contact the OEQC if your action is not one of the above items.

Project Summary. In a cooperative arrangement, Hawaii One1 Investors, LLC, and the County of Hawai'i are developing a new park on La'aloa Avenue in Kailua-Kona, on a site long planned for a park. There will be a new playing field, a comfort station with an attached lanai, a driveway, a parking lot for approximately 40 vehicles, various sidewalks and fencing. It also includes graded and graveled space ready for a tennis court and basketball court, as well as sufficient open space for a playground, which may be constructed by P&R in the future. Mitigation includes timing of clearing to avoid impacts to listed vertebrate species, NPDES and grading permits with BMPs to avoid erosion and sedimentation, and precautions for inadvertent finds of cultural materials. No impacts to archaeological or cultural resources would occur, as the area has been completely graded and no sensitive resources are present. Traffic impacts during construction can be avoided by scheduling, and permanent traffic impacts are unlikely because peak use will not coincide with work and school peak traffic.

La‘aloa Avenue New Park Development

Draft Environmental Assessment

TMK (3rd) 7-7-008:030
North Kona District, Hawai‘i Island, State of Hawai‘i

March 2018

Prepared for:
Hawai‘i County
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720

La‘aloa Avenue New Park Development

Draft Environmental Assessment

TMK (3rd) 7-7-008:030
North Kona District, Hawai‘i Island, State of Hawai‘i

APPLICANT:

Hawaii One1 Investors, LLC
300 East Esplanade Avenue, Suite 1550
Oxnard, California 93036

DETERMINING AGENCY:

County of Hawai‘i
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720

CONSULTANT:

Geometrician Associates LLC
P.O. Box 396
Hilo Hawai‘i 96721

CLASS OF ACTION:

Use of County Land and Funds

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

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SUMMARY OF THE PROPOSED ACTION, ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

In a cooperative arrangement, Hawaii One1 Investors, LLC, and the County of Hawaiʻi are developing a new park on Laʻaloa Avenue in the town of Kailua, in the North Kona District of the County of Hawaiʻi. The site has been planned as a park for several decades. The developer of the housing subdivisions that border Laʻaloa Avenue conveyed a 10.795-acre property to the County as a condition of change of zone and Special Management Area Use Permit approvals. The original larger property of which the subject 6.365-acre property is a portion was intended to be developed as a park by the Kona YMCA. After the park was not developed over the course of more than a decade, the County subdivided the 10.795-acre property into a 4.430-acre parcel retained by the YMCA, and then assumed ownership and control of the subject parcel, TMK 7-7-008:030. A proposed Planned Unit Development called Laʻipala Makai, located approximately a quarter mile south of Laʻaloa Avenue, was also required to contribute to regional recreational resources as part of its approvals. After studying the area's needs and opportunities, the County Department of Parks and Recreation (P&R) determined that there continued to be a need for a park on Laʻaloa Avenue at the subject property. Subsequently, the County has determined that the park-related requirements associated with Hawaiʻi County Change of Zone Ordinance No. 09-08 (REZ 07-000075) and Special Management Area (SMA) Use Permit No. 07-000024 (SMA 07-000024), undertaken for development of Laʻipala Makai by Hawaii One1 Investors, LLC, would be satisfied by construction of a new park meeting P&R's requirements and standards.

The project involves construction of a new playing field, a comfort station with an attached lanai, a driveway, a parking lot for approximately 40 vehicles, various sidewalks and fencing. It also includes graded and graveled space ready for a tennis court and basketball court, as well as sufficient open space for a playground, which may be constructed by P&R at a future date.

Mitigation for impacts includes timing of clearing to avoid impacts to listed vertebrate species, NPDES and grading permits with best management practices during construction to avoid erosion and sedimentation, and precautionary conditions related to inadvertent finds of cultural materials. No impacts to any known archaeological or cultural resources would occur, as the area has been completely graded in the past and no sensitive resources are present on or near the site. Traffic impacts during construction can be avoided by scheduling, and permanent traffic impacts are unlikely because peak use will not coincide with work and school peak traffic on adjacent major streets.

PART 1: PROJECT DESCRIPTION, PURPOSE AND NEED AND ENVIRONMENTAL ASSESSMENT PROCESS

1.1 Project Description and Location

In a cooperative arrangement, Hawaii One1 Investors, LLC, and the County of Hawai‘i are developing a new park on La‘aloa Avenue in the town of Kailua in the North Kona District of the County of Hawai‘i (Figures 1-5). The site has been planned as a park for several decades. The developer of the Keauhou View Estates subdivision that borders La‘aloa Avenue near the site, Towne Development of Hawai‘i, conveyed a 10.795-acre property to the County as part of satisfying fair share contributions for Change of Zone Ordinances No. 83-28 (1983) and 96-60 (1996), as well as the conditions of Special Management Area (SMA) Use Permit No. 385 (1998). This original larger property of which the subject 6.365-acre property is a portion was intended to be developed as a park by the Kona YMCA. After the park was not developed over the course of more than a decade, the County subdivided the 10.795-acre property into a 4.430-acre parcel retained by the YMCA (which is planned for eventual use as a passive park), and then assumed ownership and control of the subject parcel, TMK 7-7-008:030.

In 2008, a proposed Planned Unit Development called La‘ipala Makai, located approximately 0.25 miles south of La‘aloa Avenue, was also required to contribute to regional recreational resources as part of its Change of Zone fair share contributions and SMA approvals. The project was delayed for several years. In 2014, after studying the area’s needs and opportunities, the County Department of Parks and Recreation (P&R) determined that there continued to be a need for a park on La‘aloa Avenue at the subject property. Subsequently, the County determined that the park-related requirements of Condition C of Hawai‘i County Change of Zone Ordinance No. 09-08 and Special Management Area (SMA) Use Permit No. 07-000024, undertaken for development of La‘ipala Makai by Hawaii One1 Investors, LLC, would be satisfied by construction of a new park meeting P&R’s requirements and standards.

As shown in the Site Plan in Figure 5, the proposed action involves construction of a new playing field suitable for soccer and other activities, a comfort station with an attached lanai, a driveway, a parking lot for approximately 40 vehicles, various sidewalks and fencing. It also includes graded and graveled space ready for a tennis court and basketball court, as well as sufficient open space for a playground. The site plan also accommodates future gathering spaces near the covered lanai.

1.2 Purpose and Need

La‘aloa Avenue connects Ali‘i Drive to Kuakini Highway and serves as the central road for a neighborhood formed of the housing subdivisions of White Sands Beach Estates, Keauhou View Estates and Ali‘i Heights, which were developed in increments over the last several decades. Approximately 550 homes are present, including homes fronting Ali‘i Drive. This area grades into other neighborhoods north and south along the Kailua-to-Keauhou corridor. The heavily populated, 300-acre area currently contains only one developed recreational area, formed of three County parks: Magic Sands Beach Park, a popular area for bodysurfing, bodyboarding, volleyball, and sunbathing; adjacent La‘aloa Beach Park, which consists predominantly of cultural sites as well as a small parking lot in support of Magic Sands Beach

Figure 1. Location Map

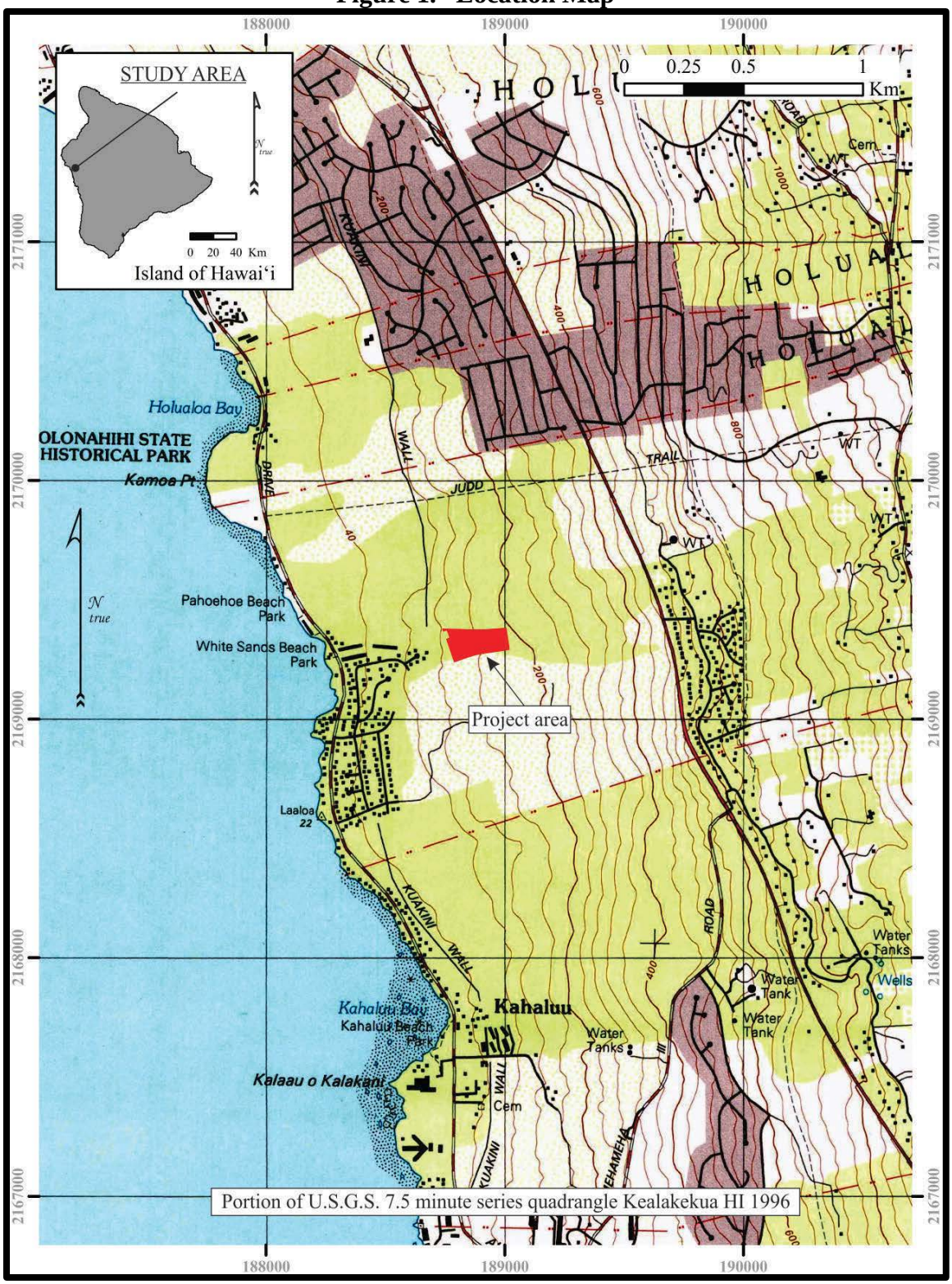

Figure 2. Aerial Image of Project Site

Figure 3. TMK Map

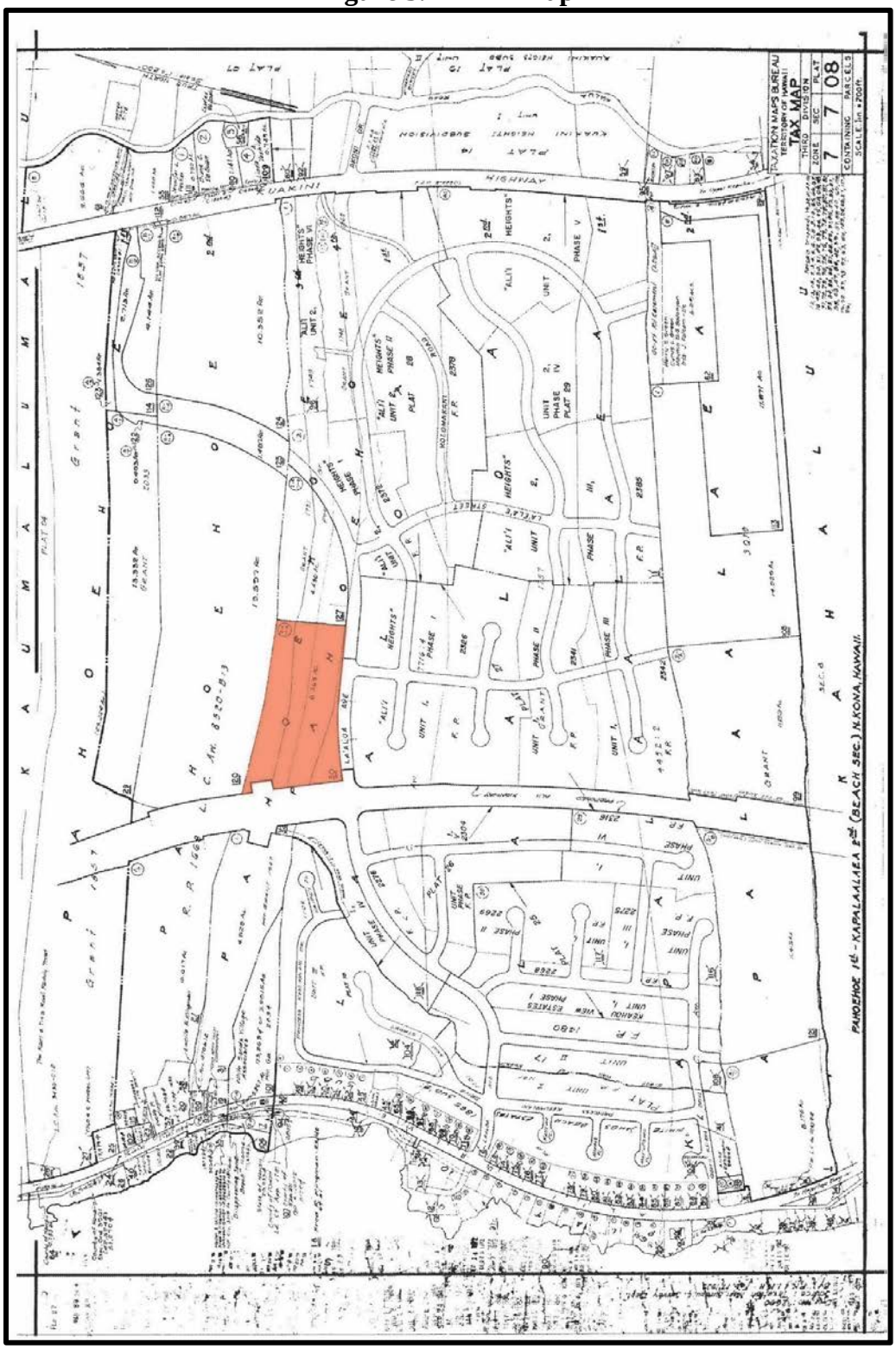

Figure 4. Project Site Photos

Graded condition over much of existing project site▲ ▼ Rock wall at far northern edge

Figure 4. Project Site Photos

View upslope along La‘aloa Avenue, with Kapukapu Street on right ▲ ▼ Typical weedy vegetation

Figure 5 Site Plan Proposed La`aloa Avenue New Park Development

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Park); and the mostly undeveloped and culturally sensitive "Kipapa" park site mauka of Ali‘i Drive, which has a large graveled area utilized as de facto parking in further support of Magic Sands Beach Park users. These facilities are oriented towards ocean recreation and cultural resource preservation, and do not support any active recreational activities such as playgrounds or field or court sports, nor do they have pavilions to support local gatherings. Because of the cultural and natural resources present, there is almost no potential for these sites to support active recreation. The nearest major active recreational facility is found at Kailua Park (aka "Old Kona Airport Recreation Area" or "Maka‘eo"). Active County facilities on this 100-acre site include baseball and soccer fields, the Kona Community Aquatic Center, and Kekuaokalani Gym. Minor facilities in the Kailua to Keauhou area include Lunalilo Playground, Ali‘i Kai Park, Kailua Playground, and Hillcrest Park.

Recreation Standards for the County of Hawai‘i contained in the *General Plan* recommend a park standard of 5 acres per 1,000 population for community and neighborhood parks. With 550 homes, the population of the La‘aloa Avenue area is likely over 1,000, indicating the need for a park.

1.3 Environmental Assessment Process

This Environmental Assessment (EA) is being conducted in accordance with Chapter 343 of the Hawai‘i Revised Statutes. This law, along with its implementing regulations, Title 11, Chapter 200, of the Hawai‘i Administrative Rules, is the basis for the environmental impact process in the State of Hawai‘i. According to Chapter 343, an EA is prepared to determine impacts associated with an action, to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to thirteen specific criteria. Part 4 of this document states the anticipated finding that no significant impacts are expected to occur; Part 5 lists each criterion and presents the preliminary findings for each made by the applicant and reviewed and concurred with by Hawai‘i County Department of Parks and Recreation, the determining agency. If, after considering comments to the Draft EA, the determining agency concludes that no significant impacts would be expected to occur, then the agency will issue a Finding of No Significant Impact (FONSI), and the action will be permitted to proceed to any necessary permits. If the agency concludes that significant impacts are expected to occur as a result of the proposed action, then an Environmental Impact Statement (EIS) will be prepared.

1.4 Public Involvement and Agency Coordination

The following agencies and organizations were consulted by letter during development of the EA:

<u>State</u>:

Department of Health, Environmental Health Administration
Department of Land and Natural Resources
Office of Hawaiian Affairs

<u>County</u>:

Civil Defense Agency	County Council	Department of Public Works
Fire Department	Planning Department	Police Department
Department of Water Supply		

Private:

Sierra Club	Kona Island YMCA	8 Neighboring Property Owners

Responses received are contained in Appendix 1a.

1.5 Cost and Schedule

Shortly after the EA is complete and permits are obtained, brush removal and grading and tree removal is expected to begin, and the Phase I improvements, valued at about $2 to $3 million, will begin to be constructed. The value of the park improvements will be credited against the required fair share contributions. If the full amount of the fair share requirement is not expended, the difference will be provided to the County for future recreational improvements in the area. Subsequent phases, which will be implemented by the County and have not yet been scheduled, include improvements whose cost has not yet been estimated.

PART 2: ALTERNATIVES

2.1 Alternative Locations

As background, a neighborhood park was proposed for this area as far back as the 1980s and 1990s, during planning for the Keauhou View Estates subdivision. Since that time, other potential sites in the La‘aloa Avenue area have been foreclosed from hosting a park as they have been developed for housing. Although other vacant parcels exist, they are not in County ownership and would require purchase or condemnation. Furthermore, many of the vacant parcels in the area either contain significant archaeological resources or have not been surveyed for archaeological resources. Finally, County rezoning ordinances and Special Management Area permits require construction of a park on this site.

The County of Hawai‘i is unaware of any other sites in the La‘aloa Avenue area that might be suitable for a County park, and none have been proposed to the County by any party. No known properties have the particular advantages of the proposed site, which include County ownership, history of a park purpose, road access, ease of pedestrian access by nearby residents, and availability of electrical and water utilities. There are other sites in urban Kona outside the La‘aloa Avenue area that could conceivably serve as a neighborhood park, but by definition they would not serve the community centered on La‘aloa Avenue. Therefore, no alternative sites have been advanced in this Environmental Assessment.

2.2 Alternative Strategies or Uses

Some of the recreational goals that would be met by providing a County Park in the area could be accomplished without development of additional park space, by having La‘aloa Avenue area residents utilize other facilities in West Hawai‘i for active sports, particularly those at Kailua Park (aka “Old Airport Recreation Area” or “Maka‘eo”). However, they would be obliged to drive at least five miles to these facilities (often with substantial traffic congestion) instead of walking, bicycling or taking short drives. Such an approach would not accomplish the main purpose of the project, providing a

neighborhood park convenient for local residents, including children. Furthermore, after careful consideration of the site, the County does not currently envision any plans for this site that would be worthy of consideration in this EA as an alternative to the proposed park development.

2.3 No Action Alternative

Under the No Action Alternative, the County of Hawaiʻi would not construct a park on this or any other site in the Laʻaloa Avenue area. The benefits provided by a park in terms of open space and public health, recreation and enjoyment would not occur, but there would be no disturbance of the existing ground surface or vegetation, and no impacts to neighbors from park use. The No Action Alternative provides a basis for comparing the impacts of the proposed project.

PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

Basic Geographic Setting

The location for the proposed action is referred to throughout this EA as the *project site*. The term *project area* is used to describe the general environs of this part of Kona.

The project site is a 6.365-acre property located on the north side of Laʻaloa Avenue across an intersection with Kapukapu Street (Figures 1- 4). It is bordered by undeveloped property to the north, the right-of-way of the future proposed Kahului to Keauhou Parkway to the west, a property designated for development by the Kona YMCA to the east, and Laʻaloa Avenue and a residential neighborhood to the south.

3.1 Physical Environment

3.1.1 Climate, Geology, Soils and Geologic Hazards

Environmental Setting

Temperatures are warm year-round at the project site, and annual rainfall is about 32 inches. Winds are generally light upslope sea breezes in the daytime and light downslope land breezes at night (UH Hilo Dept. of Geography 1998; Giambelluca et al. 2013).

The geologic substrate in this area is lava flows from Hualālai Volcano dated to more than 10,000 years before the present (Wolfe and Morris 1996). The soils on the project site are classified by the U.S. Natural Resources Conservation Service as Punaluu highly decomposed plant material and Waiaha-Punaluu-Lava flow complex (U.S. Soil Conservation Service 1973). These soils are fairly similar and consist of varying amounts of decomposed organic material over lava flows. Although well drained, runoff potential is variable. This type of soil is generally marginal for farming but can support grazing uses. The entire Big Island is subject to geologic hazards, especially lava flows and earthquakes. The U.S. Geological Survey assesses volcanic hazard in this area of Kona, which is on the slopes of the inactive volcano Hualālai, as

Lava Flow Hazard Zone 4, on a scale of ascending risk 9 to 1 (Heliker 1990:23). The hazard risk is based on the fact that Hualālai has steep slopes and is historically the third most active volcano on the island. In volcanic hazard Zone 4, about 5 percent of the area has been covered with lava since 1800, with less than 15 percent covered in the past 750 years.

The Island of Hawai‘i experiences high seismic activity and is at risk from major earthquake damage (USGS 2000), especially to structures that are poorly designed or built. On Sunday, October 15, 2006, two damaging earthquakes of magnitude 6.7 and 6.0 struck the west side of Hawai‘i Island. These earthquakes caused no known damage to the road infrastructure or slopes in this area. The project site has steep slopes as a result of grading, but these will be mitigated as part of grading plans, and there is little to no potential for subsidence, rockfall or landslides after site preparation is complete.

Lava tubes, which are the long cavities left behind by underground channels of lava, are common on pahoehoe lava flows in Hawai‘i, but can also be present on ‘a‘a flows. Some lava tubes have openings large enough for human entry and may thus be classified as caves. Lava tube caves in Hawai‘i may have value as historic sites, recreation areas, as unique geological features, or for other reasons. No lava tubes were observed during the course of biological survey in the area, which covered the entire property but did not investigate adjacent properties. It is likely that any lava tube that existed would have been previously breached by grading on the site as it was used for staging and stockpiling, and also during construction of La‘aloa Avenue, as that street curves north just *mauka* of the project site and was thus excavated within the lava flow directly upslope from the park (see Figures 1-2).

Impacts and Mitigation Measures

Geologic conditions impose no constraints on the proposed action, and development of the park is not imprudent to undertake. Most of the surface of Hawai‘i Island is subject to eventual lava inundation, and any recreational facilities in Kona face risk. Given the need for recreation in the area, the County has determined that it is sensible to expand its facilities on the project site. Project design will take the seismic setting into account, and no mitigation measures are expected to be required.

3.1.2 Drainage, Water Features and Water Quality

Existing Environment

The nearest mapped surface water body is the Pacific Ocean, located about 2,000 feet *makai*. The Flood Insurance Rate Maps (FIRM) show that the project site is in Flood Zone X, outside of the 100-year or 500-year floodplain (see FHAT report at end of Appendix 1a).

Impacts and Mitigation Measures

Land clearing and construction activities, including parking, would occur in an area greater than one acre, and thus will require a National Pollutant Discharge Elimination System (NPDES) permit. Project design plans are expected to include shallow drywells to handle the net increase in onsite drainage generated by development. Plans submitted as part of the application for this permit and a County grading permit will

specify practices to minimize the potential for sedimentation, erosion and pollution of coastal waters. The contractor will be required by permit to perform all earthwork and grading in conformance with:

(a) "Storm Drainage Standards," County of Hawai‘i, October, 1970, and as revised.
(b) Applicable standards and regulations of Chapter 27, "Flood Control," of the Hawai‘i County Code.
(c) Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation Control," of the Hawai‘i County Code.
(d) Applicable standards of and regulations of Department of Health Water Quality rules at Chapter 11-55 and 11-54, Hawai‘i Administrative Rules.

Specific Best Management Practices will include, but may not be limited to, the following practices:

- Silt fences and biosocks in various areas of the construction site
- Gravel bag filters/biosocks around stockpiles, debris areas, and vehicle & equipment storage areas
- Construction equipment wash sediment basin with an impermeable liner
- Emplacement of hydro-seed mulch with bonded fiber matrix and fertilizer for areas of exposed soil created by grading
- Block and gravel filter protection at the drywells
- Construction entrance stabilized with gravel

3.1.3 Flora, Fauna and Ecosystems

Existing Environment

The pre-human vegetation was Lowland or Coastal Dry Forest (per Gagne and Cuddihy 1990). This consisted of an open canopy forest dominated by a wide variety of trees, shrubs, herbs, vines and ferns. However, the general landscape of the Kailua-Keauhou area has been radically altered by centuries of settlements, over a century of grazing, and particularly by the development since 1960 of hotels, condominiums, resort homes, commercial facilities and associated infrastructure. Most of the property was heavily graded and cleared for use as a construction staging and stockpiling area in the early 2000s by the previous landowner as part of the Keauhou View Estates subdivision. Some uncleared land is present on the northern margin. Throughout urban Kona, the vegetation in even undisturbed areas is typically fundamentally altered by alien species invasion such that few native species survive. This property is typical, dominated by the aliens kiawe (*Prosopis pallida*), opiuma *(Pithecellobium dulce*) and koa haole (*Leucaena leucocephala*), with an understory of Guinea grass (*Megathyrsus maximus*), pigweed (*Portulaca oleracea*), fameflower (*Talinum fruticosum*) and a host of other non-native herbs, vines, and shrubs. Table 1 contains a full list of plants observed on the property during a July 2017 reconnaissance by Dr. Ron Terry.

Only one common native species, ‘uhaloa (*Waltheria indica*), was observed. No plant species classified as threatened or endangered (USFWS 2017) is present or would be expected on the project site.

Table 1 Plant Species Observed on Project Site

Scientific Name	Family	Common Name	Life Form	Status*
Abutilon grandifolium	Malvaceae	Hairy Abutilon	Shrub	A
Alternanthera sessilis	Amaranthaceae	Sessile Joyweed	Herb	A
Asystasia gangetica	Acanthaceae	Chinese Violet	Herb	A
Bidens pilosa	Asteraceae	Bidens	Herb	A
Boerhavia coccinea	Nyctaginaceae	Boerhavia	Herb	A
Chamaecrista nictitans	Fabaceae	Partridge Pea	Herb	A
Catharanthus roseus	Apocynaceae	Madagascar Periwinkle	Herb	A
Cenchrus setaceus	Poaceae	Fountain Grass	Herb	A
Chloris barbata	Poaceae	Swollen Fingergrass	Grass	A
Cleome gynandra	Capparaceae	Spider Wisp	Herb	A
Clusia rosea	Clusiaceae	Autograph Tree	Tree	A
Coccinea grandis	Cucurbitaceae	Ivy Gourd	Vine	A
Convolvulus arvensis	Convolvulaceae	Field Bindweed	Vine	A
Crotalaria sp.	Fabaceae	Crotalaria	Herb	A
Desmodium tortuosum	Fabaceae	Desmodium	Herb	A
Digitaria insularis	Poaceae	Sourgrass	Herb	A
Emilia fosbergii	Asteraceae	Pualele	Herb	A
Euphorbia heterophylla	Euphorbiaceae	Kaliko	Shrub	A
Euphorbia hirta	Euphorbiaceae	Hairy Spurge	Herb	A
Ficus microcarpa	Moraceae	Chinese Banyan	Tree	A
Hyptis pectinata	Lamiaceae	Hyptis	Shrub	A
Indigofera suffruticosa	Fabaceae	Indigo	Shrub	A
Leonotis nepetifolia	Lamiaceae	Lion's Ear	Herb	A
Leucaena leucocephala	Fabaceae	Haole Koa	Shrub	A
Macroptilium atropurpureum	Fabaceae	Macroptilium	Shrub	A
Megathyrsus maximus	Poaceae	Guinea Grass	Herb	A
Melinis repens	Poaceae	Natal Redtop	Herb	A
Momordica charantia	Cucurbitaceae	Bitter Melon	Vine	A
Pithecellobium dulce	Fabaceae	Opiuma	Tree	A
Plumbago auriculata	Plumbaginaceae	Leadwort	Shrub	A
Portulaca oleracea	Portulacaceae	Pigweed	Herb	A
Portulaca pilosa	Portulacaceae	Portulaca	Herb	A
Prosopis pallida	Fabaceae	Kiawe	Tree	A
Ricinus communis	Euphorbiaceae	Castor Bean	Shrub	A
Sansevieria trifasciata	Agavaceae	Mother-In-Law's Tongue	Shrub	A
Senna occidentalis	Fabaceae	Coffee Senna	Herb	A
Sida rhombifolia	Malvaceae	Sida	Shrub	A
Talinum fruticosum	Portulacaceae	Fameflower	Herb	A
Tridax procumbens	Asteraceae	Coat Buttons	Herb	A
Waltheria indica	Sterculiaceae	'Uhaloa	Herb	I

A = alien, E = endemic, I = indigenous, End = Federal and State listed Endangered Species

The suburban project site provides very poor habitat for native fauna. Typical expected birds include common myna (*Acridotheres tristis*), northern cardinal (*Cardinalis cardinalis*), saffron finch (*Sicalis flaveola*), spotted dove (*Streptopelia chinensis*), zebra dove (*Geopelia striata*), Japanese white-eye (*Zosterops japonicus*), melodious laughing thrush (*Leucodioptron canorum*), and house finch (*Carpodacus mexicanus*). During the mid-afternoon July 2017 reconnaissance, the two dove species, saffron finch, Japanese white-eyes and northern cardinals were seen. Increasing numbers of parakeets (*Aratinga* sp.) are also seen in this area of Kona, and one was heard during the reconnaissance.

No native birds were identified during site visits. Native forest birds would not be expected on the project site due to its low elevation, alien vegetation and lack of adequate forest resources. Although not observed on the site, several endangered native birds may overfly, roost, nest, or utilize resources in the general project area of urban Kailua, as they do throughout the island of Hawai‘i. These include the endangered Hawaiian hawk (*Buteo solitarius*) as well as several seabirds: the endangered Hawaiian petrel (*Pterodroma sandwichensis*) and band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*).

Only one native land mammal is present in the Hawaiian Islands, the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*). Found in all environments on the island of Hawaii, this bat roosts in tall shrubs or trees and is vulnerable to disturbance during its roosting season of June 1 to September 15. Aside from the bat, other mammals in the project area are introduced species, including feral cats (*Felis catus*), domestic dogs (*Canis familiaris*), feral pigs (*Sus scrofa*), and small Indian mongooses (*Herpestes a. auropunctatus*), as well as various species of rats (*Rattus* spp.) and mice (*Mus* spp.), and possibly feral goats (*Capra hircus*). Various non-native amphibians and reptiles may also be present. None are of conservation concern and all are deleterious to native flora and fauna.

Impacts and Mitigation Measures

Because of the lack of native ecosystems or threatened or endangered plant species on the project site, the development of a park would have no adverse impacts to native vegetation or rare, threatened or endangered plant species. Mitigation measures will be instituted in order to avoid impacts to Hawaiian hawks, Hawaiian hoary bats, and listed seabirds.

- There will be no clearing of woody vegetation taller than 15 feet during the bat pupping season, which runs from June 1 through September 15 each year.
- There will be no earthmoving or tree cutting during the breeding season for Hawaiian hawks (March through September). If this time period cannot be avoided, the County will arrange for a hawk nest search to be conducted by a qualified biologist, and if hawk nests are present on or within 500 feet of the project site, all land clearing activity will cease until the expiration of the breeding season.
- All lighting installed for either construction or use of the park will be required to be shielded in conformance with the Hawai‘i County Outdoor Lighting Ordinance to reduce the risk that seabirds may be attracted to and then disoriented by the lighting. Additionally, no nighttime construction work will be allowed during the seabird-fledging season, which runs from September 15 through December 15 each year.

3.1.4 Air Quality, Noise, and Scenic Resources

Environmental Setting

Air pollution in West Hawai‘i is mainly derived from volcanic emissions of sulfur dioxide, which convert into particulate sulfate and produce a volcanic haze (vog) that persistently blankets North and South Kona.

Noise on the project site is moderate and derived mainly from motor vehicles on La‘aloa Avenue, with some contribution from adjacent residential activities.

The project site contains no sites considered significant for their scenic character in the Hawai‘i County General Plan and no other scenic resources. The shoreline, located 2,000 feet to the west, is not visible from this location, but horizon views down La‘aloa Avenue include an expanse of ocean.

Impacts and Mitigation Measures

The proposed action would not measurably affect air quality, noise levels or scenic sites recognized in the Hawai‘i County General Plan. Increasing vehicular traffic through the access route to the proposed park will create additional traffic noise, as will park uses, but such increases are expected to be modest and would not require mitigation. Exhaust emissions from park-destined vehicular traffic should not create a noticeable increase of air pollutants to the immediate vicinity. Emissions for the general community may actually be decreased by the reduction of travel distance to a park facility. Although an active sports facility is not designed to be as scenic as a passive park, the park will have landscaping including parking lot trees in conformance with the Hawai‘i County Code, and it will not be visually obtrusive or clash with its surroundings.

3.1.5 Hazardous Substances, Toxic Waste and Hazardous Conditions

A Phase I Environmental Site Assessment (ESA) was conducted for the project site by Myounghee Noh and Associates (MNA). The Phase I ESA is reproduced as Appendix 3. MNA performed the site reconnaissance and conducted record inquiry in June, 2017. The term recognized environmental conditions (REC) means the presence or likely presence of any hazardous substances or petroleum products on the site that indicates an existing release, a past release, or a material threat of a release into structures on the site or into the ground, groundwater, or surface water of the site. A Phase I ESA aims to identify REC that exist on the project site along with REC in the wider project area that have the potential to impact the project site. The Phase I ESA included site reconnaissance, interviews with land owners and managers, and research using a variety of State and federal databases.

No records were identified at the project site of National Priorities List (NPL) sites, federal Resource Conservation and Recovery Act (RCRA) CORRACTS (RCRA Facilities that are undergoing “corrective action”) and Non-CORRACTS Treatment Storage Disposal Facilities, Delisted NPL sites, federal or state Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites, federal CERCLIS No Further Remedial Action Planned (NFRAP) sites, landfill or solid waste

disposal sites, State Leaking Underground Storage Tank (UST) list sites, State Voluntary Cleanup sites, Federal RCRA Generator sites, State registered UST sites, Institutional Controls/ Engineering Controls registries, federal Emergency Response Notification System (ERNS) list sites, or federal or State Brownfields sites. Review of additional records for the project site did not identify any potential RECs.

According to a review of the aerial photographs and interviews, the project site was used as a construction staging area from approximately 2000 to 2015 by Towne Development Hawaii, and also later by contractors building the La‘aloa Avenue Extension, a period when the property was not under the control of the County It was likely used to store construction vehicles and equipment. Although it is possible that hazardous substances or petroleum products were stored here, records reviews, interviews, and the site reconnaissance indicated no evidence of a historical release. As a result, the past use of the project site as a construction staging area is not considered a REC. No REC were identified on the project site based on the historic aerial photograph or topographic map review. During the site reconnaissance, MNA observed no indication of REC.

In conclusion, based on the records review, a review of additional records, research regarding the historical use of the project site, and site reconnaissance, there were no obvious REC.

Impacts and Mitigation Measures

No impacts would be expected as the project site is prepared and the park is constructed and utilized. However, if evidence of suspicious materials or conditions appears during additional survey, design, or construction, the applicant (in the current proposed phase) and/or P&R (in any future development activity) will undertake a systematic assessment of the area and issue(s) and remediate appropriately.

3.2 Socioeconomic and Cultural

3.2.1 Socioeconomic Characteristics

The proposed action would affect and benefit the town of Kailua and most specifically the area centered on La‘aloa Avenue. The project site is near the center of a residential neighborhood of nearly 500 homes created from successive increments of the White Sands Beach Estates, Keauhou View Estates, and Ali‘i Heights subdivisions. These subdivisions lie *mauka* of about 50 primarily single-family residential lots that line Ali‘i Drive south of La‘aloa Beach Park. Although this area has no distinct name and to some degree blends with residential neighborhoods north, south and east, all homes have in common the ability to walk, bicycle or, more realistically, given the steep slopes in the area, take a very short drive to the proposed park location.

Table 2 provides information on the population and socioeconomic characteristics of Kailua and the County of Hawai‘i from the U.S. 2010 Census of Population. As with nearly all locations in the State, both Kailua and the island as a whole display marked socioeconomic diversity, with no census-classified racial group representing the majority anywhere. All areas have some of the highest “Two or More Races” responses of anywhere in the U.S., at more than 20%. However, there are differences

Table 2: Selected Socioeconomic Characteristics

	Kailua	Hawai‘i County
Population, 2010	11,975	185,079
Persons under 5 years, percent, 2013	6.7%	6.3%
Persons under 18 years, percent, 2013	23.4%	22.2%
Persons 65 years and over, percent, 2013	12.4%	16.8%
Female persons, percent, 2013	49.8%	49.9%
White alone, percent, 2013	36.7%	34.4%
Black or African American alone, percent, 2013	0.4%	0.8%
American Indian and Alaska Native alone, percent, 2013	0.6%	0.6%
Asian alone, percent, 2013	18.1%	22.1%
Native Hawaiian and Other Pacific Islander alone, percent, 2013	15.2%	12.7%
Two or More Races, percent, 2013	25.2%	29.5%
Hispanic or Latino, percent, 2013	12.2%	12.2%
White alone, not Hispanic or Latino, percent, 2013	34.5%	30.7%
Living in same house 1 year & over, percent, 2008-2012	80.3%	86.2%
Foreign born persons, percent, 2008-2012	15.9%	11.9%
Language other than English spoken at home, pct. age 5+, 2008-2012	25.2%	19.4%
High school graduate or higher, percent of persons age 25+, 2008-2012	87.8%	90.6%
Bachelor's degree or higher, percent of persons age 25+, 2008-2012	19.1%	25.6%
Mean travel time to work (minutes), workers age 16+, 2008-2012	18.8	25.4
Homeownership rate, 2008-2012	52.4%	65.1%
Housing units in multi-unit structures, percent, 2008-2012	47.9%	20.2%
Median value of owner-occupied housing units, 2008-2012	$373,600	$326,900
Persons per household, 2008-2012	3.09	2.82
Per capita money income in past 12 months (2012 dollars), 2008-2012	$25,985	$24,882
Median household income, 2008-2012	$60,965	$52,098
Persons below poverty level, percent, 2008-2012	12.2%	17.0%

Source U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing. https://www.census.gov/quickfacts/table/PST045216/15; accessed March 2017

distinguishing Kailua and other West Hawai‘i communities from Hawai‘i County as a whole. Kailua has a slightly higher proportion of Whites and a lower proportion of Asians, as well as a higher proportion of Native Hawaiians or Pacific Islanders. Kailua’s socioeconomic characteristics reflect in their ethnic, educational attainment, median income and poverty rates the influx of older mainland residents drawn by the drier climate and attractive coastal waters of West Hawai‘i. Somewhat paradoxically, however, there are more elderly in East Hawai‘i than West Hawai‘i, despite the latter’s reputation for attracting retirees. This is explained by the fact that Kailua has a greater proportion in the 25 to 54-year-old category. East Hawai‘i’s lower population in this demographic has likely resulted from the outflow of young, working age people to West Hawai‘i, Honolulu and the mainland. Another difference is the percent of housing for seasonal/vacation use, which reflects the importance of the visitor industry in West Hawai‘i.

Impacts and Mitigation Measures

The proposed action would benefit recreational users, especially children, by providing a playing field, and eventually, a tennis court, basketball court, children's playground, and walking path. There will be particular benefit for residents of the La‘aloa Avenue area. Given the nearly full build-out of the roughly 550 residential lots in the area, a vacancy rate of about 15 percent, and the average household size of over three persons in Kailua, this area is likely home to about 1,400 residents.

Aside from the beneficial impacts parks have, they may also generate minor amounts noise and traffic, attract unwanted activities, and pose a nuisance for very close neighbors. In this densely populated area of Kona there is no alternative to having a park near neighbors, and this particular site has been identified for decades as a future park site, which most residents who have moved to the area are familiar with and have accepted, and mostly welcome. Consultation with the closest neighbors to date has not revealed any objections. If problems emerge, County P&R has the ability to adjust park hours, require reservations for use of pavilions, and employ other administrative strategies that have proven to successfully reduce nuisance impacts at other parks.

3.2.2 Cultural Resources

A Cultural Impact Assessment was prepared for the project by Lokelani Brandt., M.A., Teresa Gotay, M.A. and Robert Rechtman, Ph.D., of ASM Affiliates. It is contained in whole as Appendix 2 and is summarized below, with some scholarly references removed for readability.

Cultural and Historical Background

The first colonization of Hawai‘i Island is believed to have occurred on the eastern side by no later than 1000 A.D. Early settlers are thought to have first come to the leeward side of the Hawai‘i Island for the procurement of resources during the Early Expansion period up to 1600 A.D. (Cordy 1995). Permanent habitation of Kona began toward the end of that period (Cordy 1995; Schilt 1984).

The Expansion Period was characterized by significant social stratification, socioeconomic changes and land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. The greatest population growth occurred during the Expansion Period, as did efforts to increase upland agriculture. Rosendahl (1972) proposed that settlement at this time was related to seasonal, recurrent occupation in which coastal sites were occupied in the summer to exploit marine resources, and upland sites were occupied during the winter months, with a focus on agriculture. An increasing reliance on agricultural products may have caused a shift in social networks as well, according to Hommon (1976). Hommon argued that kinship links between coastal settlements disintegrated as those links within the *mauka-makai* settlements expanded to accommodate exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupua‘a* system discussed below. The implications of this model include a shift in residential patterns from seasonal, temporary occupation, to permanent dispersed occupation of both coastal and upland areas.

The project site falls within the central region of the traditional *moku* of Kona, in what is today known as North Kona, on the dry leeward side of the island. Kona extends from the shore across the entire volcanic mountain of Hualālai, and continues to the summit of Mauna Loa. Sometime during the A.D. 1400s, the *moku* were further divided into distinct land units known as *ahupuaʻa* (Kirch 1985). *Ahupuaʻa* were prototypically long wedge-shaped slices of land that incorporated all of the eco-zones from the mountains to the sea and several hundred yards beyond, which afforded their inhabitants unlimited access to a diverse subsistence resource base (Cordy 2000). Entire *ahupuaʻa* or portions thereof were managed by appointed *konohiki*, or lesser chiefs, who acted as overseers under the rule of an *aliʻi ʻai ahupuaʻa*. The *moku* of Kona has over 100 *ahupuaʻa*, and approximately 44 of these fall within the fertile central region of Kona. The majority of the *ahupuaʻa* in central Kona are fairly narrow and include a combination of forest lands, upland farms, coastal *kula*, and offshore resources.

The project site is located in the *kula* zone of the Kona Field System, a dryland agricultural complex that extends from the coast to the forested slopes of Kona (Cordy 1995). The system was a nearly continuous series of fields stretching from the Kau Ahupuaʻa in North Kona to Hoʻokena in South Kona. Typically cultivated with sweet potatoes, paper mulberry (*wauke)* and gourds, this zone is often marked by mounds from clearing and planting, modified outcrops and planting terraces and depressions (Hammatt and Clark 1980, Hammatt and Folk 1980, Schilt 1984). Habitation areas are scattered through the *kula* zone but are more typically found along the shoreline (Cordy 1995) along with burial, canoe storage, rituals and marine exploitation activities. The shoreline zone was also the typical location for homes for royalty and their supporting activities including *heiau*, *holua* slides and *puʻuhonua*, or places of refuge.

Most of the project site straddles Pāhoehoe 3 and Pāhoehoe 4 Ahupuaʻa, with its southwest corner within Laʻaloa 1 Ahupuaʻa, also referred to as Laʻaloa Iki (see Figures 3, 4, and 5 and Appendix 2). According to Pukui et al. (1976), Pāhoehoe was named in honor of the chiefess Pāhoehoe-wahine-iki-a-ka-lani. The name also references the *pāhoehoe* type of lava characterized by its unbroken, smooth texture, which is also a defining geological feature of this area. The name Laʻaloa has been literally translated by Pukui et al. as "very sacred" and was home to a *heiau* "called Lele-iwi (bone altar)" where Hāwaʻe, a famous priest, resided (ibid:126). Although the descriptive historical references for Pāhoehoe and Laʻaloa are limited, Handy et al. (1991) and Kamakau (1992) described the upland areas extending from Kailua to Keauhou. Their accounts are presented below:

> In the uplands above Kahaluʻu, Keauhou, and Kailua, was a vast plantation named Kuahewa (huge), belonging to Kamehameha I. To protect these lands, which were cultivated for his people in the section, Kamehameha established the law that anyone who took one taro or one stalk of sugar cane must plant one cutting of the same in its place (Handy et al. 1991:524).
>
> He [Kamehameha I] himself and those who ate with him (*ʻai-alo*) toiled with their own hands to set out a large tract in the uplands of Kailua, known as Kuahewa. When the land had been cleared and taro tops planted the whole field was covered with fern leaves as mulch. As the taro grew large enough to pull the little ones were left to grow, and it was said that the field was productive for years without wild growth. The chief did not allow his men to help themselves to taro and tops for planting, as was the custom for those in power in time of scarcity. He believed in the rights of the common people… (Kamakau 1992:204).

Presumably, what Handy et al. (1991) describe as *Kūāhewa* may be a portion of what has been referred to as the Kona Field System by archaeologists; an agriculturally fertile region that includes multiple *ahupuaʻa* across North and South Kona districts A large portion of the field system is designated in the Hawaiʻi Register of Historic Places as Site 50-10-37-6601 and has been determined eligible for inclusion in the National Register of Historic Places. The Kona Field System is approximately 20 miles long and 3 miles wide, and extends from Kau Ahupuaʻa at the north to Hoʻokena Ahupuaʻa at the south, with an elevation range from sea level to 8,000 feet. A defining feature of the Kona Field System is the network of long field walls that extend in a *mauka-makai* direction. These walls are known by several names, all of which share a similar concept of the skeleton of the land, such as *kuaiwi* or backbone . Handy et al. (1991) provide the following additional description of this concept, stating:

> *Iwi* (bone) or *iwi kuamoʻo* (backbone) was the term applied to the line of rocks and refuse thrown up along the side of *moʻo ʻaina*, or *kihapai* in clearing. These *iwi* or *iwi ʻaina* demarked the boundaries of plantations and arable holdings, and hence were also called *palena*, or bounds. They were not mere rubbish heaps, but for example on Hawaii, served for planting sugar cane round about the field of dry taro in upland Kona, Kaʻu, and Kohala… In upland Kona they may be seen today buried in woods or occasionally bounding taro plantations still utilized (Handy et al. 1991:51)

The ancient horticulturalists observed the elements for signs of rain and invoked certain deities to encourage rainfall and promote abundance. It is therefore not unusual that the Kona region is so associated with the deity Lono, who was considered the "rain maker" and closely associated with fertility (Handy et al. 1991:333). Lono was often identified with the southern coast of Hawaiʻi Island, and according to Kalokuokamaile, a native of Kona, temples dedicated to Lono were established throughout Kona to invoke rain and fertility (ibid.). Lono was also embodied in dark rain clouds brought on by the southerly (*kona*) storms. In traditional myths, it is believed that Lono migrated from the south and landed in Kona where he introduced several food plants, such as *kalo* (taro), *ʻuala* (sweet potato), *uhi* (yams), *kō* (sugar cane), *maiʻa* (banana) and *ʻawa* (kava) (ibid.). Mythology permeated agricultural pursuits as well as other facets of daily life.

Specific legendary and historical references to the Pāhoehoe and Laʻaloa Ahupuaʻa are limited and appear mainly as passing remarks, or are lumped together with references to the neighboring *ahupuaʻa*. Additionally, the literature referring to Pāhoehoe does not distinguish whether the *ahupuaʻa* being referred to is Pāhoehoe 1, 2, 3, or 4. Maly notes that traditionally, Pāhoehoe was one large land unit until the change to a western style land ownership system (the *Māhele* of 1848), when it was divided into four units that are now all identified as separate *ahupuaʻa"*(Maly 1996:A). Three legendary accounts have been identified during this study that made specific reference to Pāhoehoe and Laʻaloa Ahupuaʻa: A Story of Hāwaʻe, *Ke Kaʻao Hoʻoniua Puʻuwai no Ka-miki* (The Heart Stirring Story of Ka-Miki), *He Moʻolelo Kaʻao no Kepakaʻiliʻula* (A Story about Kepakaʻiliʻula), and The Legend of Kaumaʻiliʻula. Summaries of each of these stories are presented in Appendix 2.

Other early events documented in the traditional history of Kona are associated with ʻUmi-a-Liloa, whose father was the first to unify rule there. Kona was a popular dwelling place of chiefs (Kamakau 1992), and

traditional Hawaiian political authority was centered in the area from Kailua to Keauhou from at least the 15th century to the reign of Kamehameha I. Kamehameha embraced foreign trade, including the provisioning of whaling vessels and sandalwood traders (Schilt 1984).

The prophecy of the *kāula* (seer) named Kapihe during the time of Kamehameha I is a significant *moʻolelo* that references the Pāhoehoe-Laʻaloa area (by association with the identified place names). Kapihe's prophecy has been interpreted as foretelling the overturning of the traditional *kapu* system, a system that governed nearly all aspects of the traditional Hawaiian socio-political system, as well as the unification of the Hawaiian Islands under a single ruler. It is important to note that several different versions of this prophecy were printed in Hawaiian language newspapers, as well as in Kamakau (1992) and Malo (1951). According to Kamakau's version:

> Ka-pihe the seer prophesied in the presence of Kamehameha [I] and said, "There shall be a long *malo* reaching from Kuamoʻo to Holualoa. The islands shall come together, the tabus shall fall. The high shall be brought low, and the low shall rise to heaven." (1992:223).

These prophecies were fulfilled within just a few years. Missionaries first arrived in Kailua in 1820 but stayed only a few months. Upon returning three years later they were allotted land for missions and schools. In 1823, to accommodate the growing Hawaiʻi Calvinist mission, British missionary William Ellis along with members of the American Board of Commissioners for Foreign Missions (ABCFM) circuited Hawaiʻi Island in search of suitable locations for future mission stations and churches. Ellis and his party set out on the *ala loa* trail, located near the coast and passed through many places. As they made their way through the Pāhoehoe-Laʻaloa area, Ellis wrote:

> We walked on to Pahoehoe, where we entered a large house, in which many workmen were employed in making canoes. About fifty people soon after assembled around us. We asked them if they would like to hear about the true God, and the way of salvation. They answered, Yes. I then addressed them for about twenty minutes on the first principles of the gospel. As soon as I began to speak, they all sat down, and observed perfect silence.
>
> Shortly after this service we took our leave, and proceeded along the shore to Kahaluu; where a smart shower of rain obliged us to take shelter in a house by the road side. While resting there, the voice of wailing reached out ears. We inquired whence it came and were informed by the people of the house, that a sick person in the neighborhood had just expired (1917:90).

Missionaries like William Ellis sparked a major religious shift that left a lasting impact on the traditional Hawaiian culture including their concepts of land ownership and land use. The *Māhele ʻĀina* of 1848 would forever change the land tenure and the landscape of the Hawaiian Islands, as discussed in the section to follow.

From the 1820s into the 1840s, subsistence farming slowly gave way to a market economy with the introduction of coffee, corn, pumpkins, cotton, pineapple and Irish potatoes. Other crops introduced in the Kailua portion of the *kula* zone of the Kona Field System, which extended from the shoreline to the 500-foot elevation, included melons, cabbage, onions, oranges and tobacco.

Profound religious, socioeconomic and demographic changes also took place in the early 1800s that resulted in the establishment of a Euro-American style of land tenure. The *Māhele ʻĀina* of 1848 was the vehicle used to divide the land between the crown, government, *konohiki* and native tenants. Prior to this land reformation, all the land and natural resources of Hawaiʻi were held in trust by the *aliʻi* who, in concert with *konohiki* land agents, meted out use rights to the native tenants at will. During the *Māhele* all lands were placed in one of three categories: Crown Lands (for the occupant of the throne), Government Lands, and *Konohiki* Lands; all three types of land were subject to the rights of the native tenants therein.

The *aliʻi* and *konohiki* were required to present their claims to the Land Commission to receive a Land Commission Award (LCAw.) for lands provided to them by Kamehameha III. They were also required to provide commutations to the government in order to receive royal patents on their awards. The lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission and subsequent land transfers (Chinen 1961). In 1862, the Commission of Boundaries (Boundary Commission) was established to legally set the boundaries of all the *ahupuaʻa* that had been awarded as a part of the *Māhele*. However, boundary descriptions were not collected for all *ahupuaʻa*.

Native commoners could also register claims for land with the Land Commission, and if substantiated, they would receive awards referred to as *kuleana*. Upon confirmation of a claim, a survey was required before the Land Commission could issue a *kuleana* award. After native tenants were given the right to become private landowners through the *Māhele,* beginning in 1850, foreigners were also given the right to own land upon swearing an oath of loyalty to the Hawaiian Monarchy. According to Kelly (1983) several prominent *konohiki* related in some way to the Kamehameha dynasty received land awards in North Kona District.

As a result of the *Māhele* of 1848, the lands comprising Pāhoehoe 3 and Pāhoehoe 4 were retained as Government land, and subsequently divided and sold off as government issued Land Grants. In contrast, Pāhoehoe 2 was claimed by G. Lahilahi (LCAw. 8520), daughter of John Young Olohana and mistress of Kamehameha III (Kameʻeleihiwa 1992; Kanahele 1999), and all of Laʻaloa 1 was claimed by R. Keʻelikolani (LCAw. 7716), granddaughter of Kamehameha I. Portions of the project sites are within three government issued grants (see discussion below), while the southwest corner is situated within LCAw. 7716 (see Figures 11 and 12 of Appendix 2).

Nine *kuleana* were awarded in Pāhoehoe 2, 3, 4, and Laʻaloa 1; **none of them included land within the current project site**. One *kuleana* land claim was awarded in Pāhoehoe 2 (LCAw. 5769), and three *kuleana* land claims were awarded in both Pāhoehoe 3 (LCAw. 3435B, 3436B, and 4705) and Pāhoehoe 4 (LCAw. 10654, 3433B, and 5788). One *kuleana* was awarded in both Pāhoehoe 2 & 3 (LCAw.10986). Analysis of the Native Testimonies (Table 3 of Appendix 2) indicates that eight *kuleana* contained multiple *ʻāpana* (parcels) hosting several agricultural fields. Five *kuleana* contained several *ʻāpana* located inland and utilized for agricultural purposes and a separate corresponding coastal *ʻāpana* that functioned as a *pā hale* (a house lot or a residential site; see Figure 11 of Appendix 2). Some of these coastal *ʻāpana* were located in neighboring *ahupuaʻa*. As for Laʻaloa 1, only one *kuleana* land claim was awarded (LCAw. 10566). Further research into the Native Testimonies reveals that eight *kuleana*

awardees received or inherited their lands from at least the time of Kamehameha I and II. The Native Testimonies also indicate that three *kuleana* awardees received their lands from chiefs Kahoaliʻi and Kaʻōanāʻeha. The name Kahoaliʻi appeared in *He Moʻolelo Kaʻao no Kepakaʻiliʻula* as a chief of Kona. According to the genealogy of Queen Emma that was printed in *Ka Nūpepa Kūʻokoʻa* on May 5, 1883, the chiefess Kaʻōanāʻeha was married to Keoni Ana, and from their union was born Kekelaokalani and her sister Gini Lahilahi, who claimed Pāhoehoe 2 during the Māhele. In the case of Pāhoehoe 2 and 3, four individuals were unsuccessful at filing their *kuleana* claims with the Land Commission and were therefore not awarded lands.

The Native Testimonies provide insight into the pre-*Māhele* settlement patterns specific to Pāhoehoe and Laʻaloa. The concentration of coastal house lots and the scattered upland agricultural fields is a classic example of the *mauka-makai* relationship that was inherent in the *ahupuaʻa* system. Although not explicit in the Native Testimonies, historic maps and information collected from oral histories (Maly 1998) reveal the importance of pedestrian trails in this system. One such trail is depicted on an early Real Property Tax Office map (see Figure 13 of Appendix 2) extending from the former Ala Loa, through Grant 1927 and Grant 1751 and terminating at the current Kuakini Highway. This trail was either in the extreme northern end of the project site, or more likely just over the wall to the north. The dispersed nature of the agricultural fields coupled with the clustered residential sites provided the area residents with the necessary resources to sustain themselves. This settlement pattern would be severely altered as lands furnishing the essentials of traditional life were reallocated following the *Māhele*.

In conjunction with the *Kuleana* Act, the King authorized the issuance of Land Grants to applicants for tracts of Government land that were allocated during the *Māhele*. These Land Grants were generally larger than those awarded by the Land Commission. The Act resolved that portions of the Government Lands should be set aside and sold as grants ranging in size from one to fifty acres at a cost of fifty cents per acre. The stated goal of this program was to enable native tenants, many of whom were insufficiently awarded or not awarded land through the *Kuleana* Act to purchase lands of their own. Despite the goal, this provided the mechanism that allowed many foreigners to acquire large tracts of the Government Lands. A total four grants were awarded in Pāhoehoe 3, totaling 69 acres, while another four grants were awarded in Pāhoehoe 4, totaling 67.75 acres. The current project site comprises portions of three separate grants, as well as LCAw. 7716, as discussed above. Three of the grants fall within Pāhoehoe 3 (from north to south): Grant No. 1751 to Kahauele, Grant No. 1749 to Kipapa, and Grant 1748 to Kapahu (OHA 2013).

The Native Testimonies provided during the Boundary Commission hearings provide insight into the land use and residency of Laʻaloa 1 and neighboring Pāhoehoe 4 *Ahupuaʻa*. Both testimonies described the presence of *iwi ʻāina* or stone walls often used to mark land boundaries (Pukui and Elbert 1986). As previously mentioned, some of these *iwi ʻāina* have survived into the present day, and have been noted as a major characteristic of the Kona Field System. Additionally, Kipapa described the presence of a *kīhāpai kōʻele*, a "small land unit farmed by a tenant for the chief" (Pukui and Elbert 1986:158). Both testimonies also describe areas known as *oʻioʻina*, which Pukui and Elbert define as a "resting place for travelers, such as a shady tree, [or] rock" (1986:280). Although these *oʻioʻina* could have likely been used by resident farmers, it could also be suggested that such resting places were important for travelers making their way along the steep slopes of Kona.

La‘aloa 1 was retained by R. Ke‘elikōlani until her death in 1883, at which time it was transferred to her niece, Bernice Pauahi Bishop. Upon Pauahi’s death in 1884, her husband and associates took over as executors of her estate. In 1885, La‘aloa 1 was sold to Lahapa Kailipeleuli (also known as Lahapa Halsey), who held the *ahupua‘a* until 1902. Between 1885 and 1902, Lahapa Halsey began leasing portions of the *ahupua‘a* to individuals such as Thomas Silva. Between 1891 and 1897, Thomas Silva assigned portions of La‘aloa 1 to the Hawaiian Coffee & Tea Company, Ltd, and later to the Kailua Coffee Company, Ltd. After 1902, portions of La‘aloa 1 were sold to various companies including the Kona Development Company, Ltd., West Hawaii Railroad Company, Ltd., in addition to a number of individuals. Throughout the 19th and 20th centuries, both La‘aloa and Pāhoehoe were utilized for cattle ranching (Maly 1997).

The 19th century gradually brought increasingly rapid changes to all of Hawai‘i, even the relatively sleepy district of Kona. Cattle ranching as well as commercial coffee production changed traditional agricultural practices and necessitated construction of rock walls to control livestock. One of the better-known examples is the Great Wall of Kuakini, which runs roughly parallel to the coastline in the Kailua to Keauhou area, including a segment that used to exist about 100 feet *makai* of the project site. Construction of the wall began in the early 1800s and was completed in the 1850s under the direction of Governor Kuakini. Although it has been breached in a number of locations, much of it remains intact and is designated as State Inventory of Historic Places Site 6302.

Beginning in the late 1800s, there was a short-lived attempt at commercial sugar cultivation in central Kona. The Kona Sugar Company, which started in 1899, built a sugar mill in Kona and initially obtained most of its raw cane through purchase from independent growers. By 1926, the sugar operation ceased.

In a 1981 interview with Mr. Joe Gomes, a long-time Kona resident, and rancher, Kelly documented the various types of walls commonly used in the local cattle industry.

> Most of the walls have been here since the land was made into *kuleana*. Most walls were built by Hawaiians. Some were built for the ranches. Walls about 3 ft. high can keep donkeys penned. The usual wall is about 4 ½ feet high and keeps cattle in. For goats, you need a wall 6 to 8 ft. high. For wild pigs you need a 6 to 8 ft.-high wall. They climb over lower walls easily. . .
>
> It takes a skilled person to build stone walls. In the early days (1920s-1930s) walls were built and paid for in fathom-long sections (6ft.) for 35¢ or 40¢ a section. They had to be 3 ft. wide at the bottom and 2 ½ ft. wide at the top. You had to lock the rocks and fill the middle with rubble that helped lock the two sides together. Hawaiian built good walls, and later some of the Japanese did, too (1983:112).

Maly opined that cattle and ranching related activities had “the most significant impact on residency, land use, and the cultural and natural landscapes of La‘aloa and Greater Kona, in the late 19th and early 20th centuries” (1997:14). The same holds true for the other subject *ahupua‘a* and the project area vicinity. In particular, the *kula* lands located *mauka* of Ali‘i Drive in Pāhoehoe and La‘aloa, as well as Kāpala‘alaea,

Kahuluʻu, and Hōlualoa, were often utilized as pasture for grazing cattle. Members of the Gouveia family managed such *kula* pasturages beginning in the early to middle 1900s (ibid.).

The next significant change for Kona was the beginning of tourism, marked by the construction in 1928 of Kona's first major hotel, the Kona Inn (Menton 1994). Starting in the 1960s, the area between Kailua-Kona and Keauhou became increasingly dedicated to resort residential land use, as is the case today at the project site, which adjoins several timeshare and vacation rental condos. As cattle ranching continued in the *mauka* area of Laʻaloa and Pāhoehoe well into the mid-20th century, the natural and cultural resources located along the coast were significantly impacted by an expanding tourism based economy and a growing population. Cultural sites located along the coast were destroyed, buried or preserved in situ to make way for new development projects and supporting infrastructure. However, since the 1970s, government mandated archaeological studies allowed for the identification and relocation of many traditional and historical trails, burials, agricultural and habitation sites, thus prompting the involvement of lineal and cultural descendants. This fostered the preservation and restoration of several cultural sites located along the coast.

In the early 1990s, descendants of the Kipapa line began actively participating in the preservation of their family burials on TMK parcel (3) 7-7-008:031, located *makai* of the project area (Kipapa et al. 2013). In 2014, the Kipapa *ʻohana* signed a Friends of the Park agreement with the P&R to assist with management of Laʻaloa Beach Park. In March 2015 the Kipapa *ʻohana* reinstalled and dedicated their family *kūʻula* (fishing shrine) located on the boundary of Pāhoehoe and Laʻaloa (see Figure 15 of Appendix 2).

As part of the Cultural Impact Assessment documented in Appendix 2, an effort was made to assess potential traditional cultural resources and associated practices that might be present or have taken place in this area of Kona. In addition to the documentary research above, which established the values of the general area but did not specifically identify any resources or practices that might be affected on the project site, consultation was undertaken.

Gathering input from community members with genealogical ties and/or long-standing residency relationships to the project area is vital to the process of assessing potential cultural impacts to resources, practices, and beliefs. These individuals ascribe meaning and value to traditional resources and practices. Community members often possess traditional knowledge and beliefs that are unavailable elsewhere in the historical or cultural record of a place. As stated in the OEQC Guidelines for Assessing Cultural Impacts, the goal of the oral interview process is to identify potential cultural resources, practices, and beliefs associated with the affected project area. It is the present authors' further contention that the oral interviews should also be used to augment the process of assessing the significance of any traditional cultural properties that may be identified. Thus, it is the researcher's responsibility to use the gathered information to identify and describe potential cultural impacts and propose appropriate mitigation as necessary.

As part of the current investigation, Lokelani Brandt met with community members with genealogical ties to the Laʻaloa-Pāhoehoe area. Individuals contacted included Curtis Tyler and Malia Kipapa. Additionally, a complete copy of the current study was provided to the Office of Hawaiian Affairs. The full results of the interviews are presented in Appendix 2, and only a brief summary is provided herein.

Curtis Tyler's ancestors lived and resided from *mauka* to *makai* in Pāhoehoe and Laʻaloa, and he has an intimate knowledge of the areas they lived in based on wide experience ad study. His interview emphasized the importance of canoe launching from Keoneohuihui (also known as White Sand Beach, Disappearing Sands, Magic Sands, Magics, and Laʻaloa Beach Park) and traditional trails. He explained that the coastal areas of Pāhoehoe and Laʻaloa historically contained *heiau*, springs, burials, trails, agricultural features, and *kūʻula,* and many of these traditional sites are still found scattered within these areas. He believes that the existence of these cultural sites is a direct result of his ancestors' close relationships with and personal services to the high chiefs who had residences in nearby royal centers, namely, Kahaluʻu-Keauhou, Hōlualoa (Keolonahihi and Keakeaklaniwahine), and the *ahupuaʻa* between Puapuaʻa to Keahuolū. While most of the residential sites were concentrated along the coast, Curtis explained that a network of *kaolo* (trails) connected the coastal area with the *kula* lands, a zone where agriculture and food production took place, and continued further *mauka* to the *wao lāʻau* and sometimes even into the *wao akua*. Curtis referred to one such trail as "Kipapa's trail," which extends from the coastal Ala Loa to a point roughly equivalent with present-day Kuakini Highway. This trail appears to be the same trail discussed above, a portion of which may be on the extreme northern edge of the project site, but is more likely located just north of the project site. He also pointed out that, among other significant cultural and natural resources, the *mauka* areas are intimately connected to the natural fresh water resources that emerge along the coast. He described historical references to the presence of several freshwater *punawai* (springs) that originate in the uplands of Pāhoehoe and emerge along the coast. The comparatively narrow nature of Pāhoehoe 3 and 4 may indicate that significant fresh water sources are contained within these narrow boundaries. He cautioned that ground disturbance occurring *mauka* of these *punawai* could very negatively impact the lava tubes that transport fresh water down to the coast, and, thereby, directly impacting the extent and location of water resources within these springs. At present, due to modern ground disturbances and land uses, he is unsure of the current status and output of each of these water sources.

When asked about his thoughts on the proposed park site, Curtis was pleased to see the project moving forward. Curtis expressed his support and noted the importance of having more public recreational meeting facilities for the *keiki* (children) and other residents living in the nearby communities, especially since more homes have been constructed in this area. Curtis pointed out that there is a lack of parks in Kona, and that having one more centrally located where people live will be very beneficial. Curtis indicated that the project parcel itself has experienced severe ground disturbance and, likely, only a few traditional cultural sites remain, particularly the agricultural sites and perhaps portions of the old *mauka-makai* trail. Curtis hopes the developer considers conserving and protecting any remaining sites of cultural and historical significance, especially since many of the old cultural sites in the area have been destroyed or damaged because of neglect, a lack of knowledge, and modern development of the *ʻāina*. Curtis suggested that interpretive signs be developed and installed at the park that will educate people about traditional Hawaiian land use in the area with an emphasis on *mauka-makai* relationships within these *ahupuaʻa*. Curtis also recommended that if portions of the old trails connect to the parcel, that the developer consider restoring the trails and incorporate them into the long-term park plans. In addition, he recommends the planting of endemic and other native plants, which need little watering and tell a story of their own. Finally, Curtis extended his appreciation for the opportunity to participate in this Cultural Impact Assessment and requested that he and other interested descendants of *nā kūpuna kahiko o*

kēia'āina (the ancestors of this land) be kept informed of any further plans for and development of this project and how he may be of further assistance in the spirit of *e mau ke ea o ka 'āina i ka pono*.

Malia Kipapa grew up and was raised on Hawaiian homestead in Keaukaha but has been living in North Kona since 2009. Her paternal lineage connects her with the lands of Pāhoehoe while her maternal lineage traces to the neighboring *ahupua'a* of Hōlualoa. Malia is Curtis Tyler's niece and thus a direct descendant of Kipapa, Kaupehe, and Kekamakahi, who historically held land grants in the area of Pāhoehoe. Since moving to Kona, Malia and her uncle Curtis have taken leadership roles in the preservation of their *iwi kupuna* (ancestral remains) located on the *makai* portion of Pāhoehoe (TMK: [3]7-7-008:031) to the west of the project site. In addition to caring for their ancestral burial grounds, a Friends of the Park Agreement between Hawai'i County and the Kipapa 'Ohana was established. Malia and Curtis have been working with the County of Hawai'i to assist with the future plans of Kipapa Park and ensuring that this cultural park is established with respect to place and to encourage the restoration and reuse the old *mauka-makai* trails.

Malia shared a lot about her family's history as it relates to Pāhoehoe as well as current preservation efforts occurring in the area. At the onset of the interview she identified the family burial grounds and felt that sharing this information is important given its proximity to the project site. She recounted an old family *mo'olelo* (story) about how her ancestors used to transport the remains of the deceased relatives via canoe from Maui to Pāhoehoe for burial. She also specified that the most recent family burial in Pāhoehoe was for her great-great-great grandmother Kekapahaukea, who was the wife of Kipapa. According to Malia, Kekapahaukea was living on O'ahu with her third husband (Robinson) when she died. Upon her death, her remains were brought from O'ahu to Pāhoehoe for burial. Malia clarified that Land Grant 1927 (awarded to Kipapa) located *makai* of the proposed project area is the location of the reinternments and burials. She reflected on this traditional family practice and commented that Pāhoehoe was and still is an important place for her family.

She shared Curtis's view that the project site may have one of the old *mauka-makai* trails on it. As previously mentioned, one of the outcomes of their current restoration efforts is to get their family and the public to reestablish the tradition of traversing the trails and learning about the history of this place to make connections and develop that sense of appreciation and respect for Pāhoehoe. Malia shared firsthand accounts from several uncles who recalled traveling on these trails during the 20th century between the coast and the old *mauka* family home. She indicated that some of the trails in the area are double-walled, meaning both sides of the trail are delineated by a stone wall. She shared that these double walled trails are still visible in some areas. Malia acknowledged that the *mauka* lands were vital to her family's survival as these areas are where her *kūpuna* (ancestors) produced food to sustain their family. She emphasized the importance of maintaining the *mauka-makai* continuity, which is a traditional concept reflected in the ancient *ahupua'a* system.

When asked about her thoughts on the proposed park plans, Malia proposed an integrated plan that expresses continuity between the project parcel and currently owned County lands located *makai* of the project area, specifically TMKs: (3) 7-7-008:100 and 020. Malia surmised that through integrative planning, the traditional *mauka-makai* concept can be creatively applied in a modern context and can aid in the preservation and promote restoration of the cultural sites in the area. Malia also notes that both Ali'i

Drive and La‘aloa Beach Park have become increasingly crowded with pedestrians and park users. She believes that restoring the *mauka-makai* trails can help to reconnect the project parcel with the *makai* areas and may alleviate some of the foot traffic along Ali‘i Drive.

Malia spoke about the importance of having more public spaces for Kona families to gather. Malia pointed out that currently there are only two areas (Hale Hālāwai and Maka‘eo) in North Kona that can host large family gatherings. To make the park plans culturally appropriate, she believes that having an open concept park with large pavilions would help to fulfill a current community need. With regard to pavilion concept, Malia recommends drawing inspiration from traditional *kauhale*.

She acknowledged that the project site has experienced major ground disturbance, except for a small portion of the parcel. She believes that the undisturbed area containing the agricultural sites should be integrated into the park plans and could be restored and used as community gardens. She noted that there is adequate soil built up in various locations throughout Pāhoehoe and the preservation of these sites would be valuable to the community. She also indicated that there are potential local businesses and individuals that would be interested in reestablishing the old food systems specific to Pāhoehoe.
She recommended that the developer and future park managers continue to engage in dialogue with the Kipapa ‘Ohana to develop a plan to connect both the *makai* parcels and the current project area. Malia feels that through a partnership, the old *mauka-makai* trails can be restored and utilized for modern recreation. In this way, traditional cultural practices can be restored, and the ancient sites maintained.

Summary of Traditional Cultural Resources and Practices on the Project Site

In summary, based on historical research, previous archaeological studies, botanical reconnaissance and inquiries with potentially knowledgeable informants (including the Office of Hawaiian Affairs, Curtis Tyler, and Malia Kipapa), it has been established that the Pāhoehoe and La‘aloa Ahupua‘a have great cultural and historical value, reflecting traditional land uses and relationships to adjacent royal centers among other features. Although fragmented by highways and roads and residential subdivisions, local residents are preserving cultural sites and values and the relationships between them. Critical resources are both physical (e.g., former, existing or potential trail corridors, as well as aquifers) and the social infrastructure required to nourish resources. The coastal area of Pāhoehoe are still being cared for by lineal descendants and accessed for specific cultural practices like maintaining the *kū‘ula* and nearby family burial grounds. Both Curtis Tyler and Malia Kipapa expressed the importance of maintaining a *mauka-makai* continuity as this is how the families from this area utilized and conceptualized the landscape, a concept that is fundamentally linked to the traditional *ahupua‘a* system.

The project site itself has been extensively disturbed by grading, construction staging, and material stockpiling, a small strip of undisturbed land is present on the northern side, where a boundary wall is present. As discussed in the next section, no archaeological sites significant under the State’s historic preservation laws remain, but any remaining archaeological features have at least some degree of cultural value. Although archaeological studies did not identify any trails – including double-walled trails mentioned by both Curtis Tyler and Malia Kipapa, it is possible that a trail was present on the extreme northern part of the property, adjacent to a stone wall, although it is more likely present just north of the property. Furthermore, no caves, springs, *pu‘u*, native forest groves, gathering resources or other natural

features are present on or near the project site. The vegetation is highly disturbed and does not contain the quality and quantity or resources that would be important for native gathering. Although no surface water is present, and the nature of the proposed development is unlikely to affect coastal springs that are associated with the basal aquifer, it is acknowledged that all land disturbance has the potential to affect both the quantity and quality of recharge, which has implications for a culture so bound up with scarce water resources.

Cultural Resources: Impacts and Mitigation Measures

In general, the proposed construction and maintenance of the park does not appear likely to substantially impact any culturally valued resources or cultural practices. However, various mitigation measures have been incorporated to minimize cultural impacts and maximize cultural benefit.

- There is an opportunity to plan the park in an integrated manner with the public lands more *makai* (and, potentially, *mauka*) and shoreline areas in these *ahupuaʻa* to incorporate the network of *kuolo* (trails) that connected the people of old with the agricultural lands located *mauka* and the house lots and fisheries located *makai*. These would include in particular the trail that was most likely located on the northern side of the Site 6352 boundary wall, just outside of the current project site. There is also potential for a future trail within the boundaries of the subject park, at the extreme northern boundary and/or winding through the park facilities themselves. The proposed project provides a good opportunity for public interpretation that can help with highlighting the area's history relative to *mauka-makai* connections and the use of the trail network. The Department of Parks and Recreation will cooperate with the Kipapa descendants and others promoting such education concerning the old *mauka-makai* trails, in an area at the east of the project site that currently does not have any planned uses.
- It bears emphasis that for cultural as well as other reasons, it is critical to maintain the quality of water that either enters the ground and thus the basal aquifer, or is transported overland to sensitive coastal ecosystems. For these reasons, it is important to ensure that the erosion, sedimentation and pollution-prevention BMPs that will be required of grading and related permits detailed in Section 3.1.2 are strictly followed during construction.
- Although the currently proposed park plan lacks covered gathering spaces to host cultural- and community-based events, the covered lanai can serve that function initially. Based on input received during the cultural consultation, the site plan has been modified to accommodate future gathering spaces near the covered lanai, where temporary canopies may be erected in support of area cultural events. In addition, the remaining undeveloped area of the park site may offer an opportunity for pavilions or other facilities for gathering. Likewise, the site immediately *mauka* of the park, which is currently owned by the YMCA, is intended for the development of facilities specifically to support the Kona community's recreational and education needs and may offer a venue that can hold larger public gatherings.

Based on these modifications, it is expected that the proposed development of the park will not adversely affect cultural practices and beliefs or associated cultural resources.

Various parties including the consultees and OHA were supplied a copy of the Draft EA in order to help evaluate and finalize this finding.

3.2.3 Archaeology and Historic Sites

The archaeological resources of the project site, along with those of another 4-acre property to the west (former TMK 7-7-008:096, now part of the right of way for the proposed Kahului to Keauhou Parkway and a property west of that), were investigated in 1997 by Archaeological Consultants of the Pacific. By letter of December 23, 1997 (see Appendix 1a), the State Historic Preservation Division (SHPD) approved the survey as adequate. In the letter, SHPD stated that a preservation plan needed to be completed and implemented for the Kuakini Wall, and a data recovery needed to be completed and implemented for various other sites. The Kuakini Wall and all other sites that required additional work were on parcel 96, rather than the proposed park parcel, which contained two minor sites that were evaluated as requiring no further work. In any case, an integrated mitigation plan for the significant sites was completed by PHRI (2000). The plan was approved by SHPD and the required work was completed.

As such, all archaeological features were properly dealt with. Subsequent to this work, most of the property was graded and cleared for use as a construction staging and stockpiling area. No significant archaeological features remain, and the proposed park can be constructed in full compliance with the laws and regulations related to historic sites.

In the unlikely event that archaeological resources or human remains are encountered during future park development activities, contract specifications will require that work in the immediate area of the discovery shall be halted and -SHPD contacted as outlined in Hawai‘i Administrative Rules 13§13-275-12.

3.3 Infrastructure

3.3.1 Utilities

Existing Facilities and Services and Impacts

Electrical power to the site is supplied by Hawai‘i Electric Light Company, a privately owned utility company regulated by the State Public Utilities Commission, via their island-wide distribution network. Telephone service is available from Hawaiian Telcom. The site is connected to the municipal wastewater system. Sufficient potable water is available at the site via an existing 1-inch Department of Water Supply water line on La‘aloa Avenue to supply the average demand of approximately 1,375 gallons per day needed for the comfort station and the minimal xeric landscaping planned for installation.

The proposed action of park development would not have any substantial impact on existing utilities. Construction would involve use of electrical and water utilities; after construction, the park would also be connected to the municipal wastewater system. Based on consultation with agencies, all of these utilities appear to have sufficient capacity to accommodate the park, and the EA process is being used to help confirm this capacity or identify any shortcomings that require action.

3.3.2 Roadways and Traffic

A Traffic Impact Assessment Report (TIAR) for the proposed action was conducted by SSFM International, Inc. The report is attached as Appendix 4 and summarized below.

Existing Conditions

The relevant roadways in the project area consist of the following:

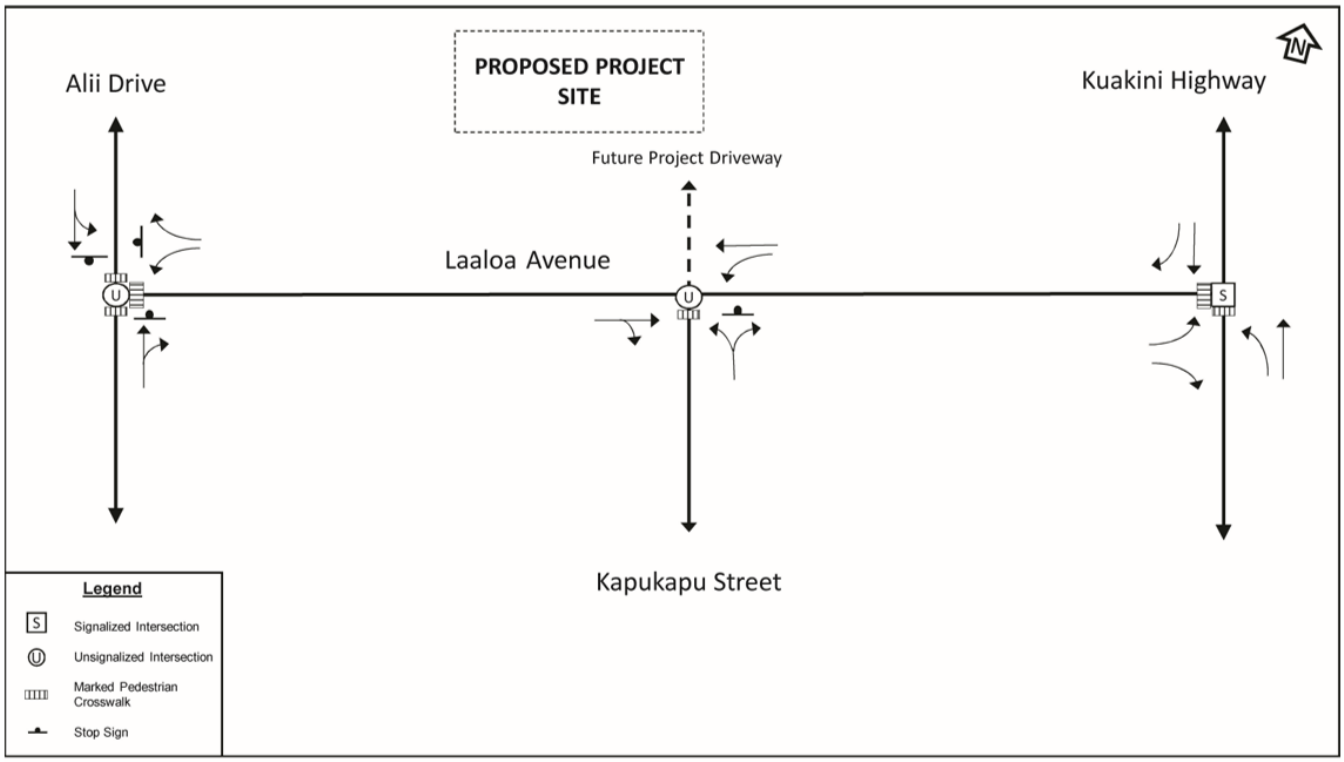
> *La‘aloa Avenue* is a two-lane, undivided roadway, oriented east-west (*mauka-makai*), connecting Kuakini Highway in the east to Ali‘i Drive to the west. The road provides access to residential areas. The posted speed limit is 25 miles per hour (mph). There are paved concrete sidewalks and bike lanes in either direction.
>
> *Ali‘i Drive* is a two-lane, two-way, undivided roadway oriented north-south, paralleling the shoreline between Kailua and Keauhou. It is a County road with the functional classification of urban major collector. The posted speed limit along Ali‘i Drive is 30 mph. The roadway provides access to residential, commercial, parks and hotel areas. No parking is allowed along either side near La‘aloa Avenue. 2015 average daily traffic (ADT) as measured by a Department of Transportation station was 5,500 vehicles per day (vpd).
>
> *Kuakini Highway* (State Route 11) is an undivided, two-lane, two-way highway oriented north-south direction. It is owned by the State of Hawai’i with the functional classification of urban principal arterial. The posted speed limit along the highway varies from 25 mph to 55 mph, but is posted at 45 mph near La‘aloa. There are paved shoulders of various widths from five to ten feet on both sides of Kuakini Highway, and no designated sidewalks or bicycle facilities. ADT in 2015 was 19,800 vpd.

The study intersections include the following:

1. La‘aloa Avenue and Ali‘i Drive
2. La‘aloa Avenue and Kapukapu Street
3. La‘aloa Avenue and Kuakini Highway

Existing (2017) lane configurations, marked pedestrian crosswalks, and traffic controls at the study intersections are shown in Figure 6.

Figure 6. Existing (2017) Lane Configuration



The AM/PM peak hours for Ali‘i Drive are 7:15-8:15 AM/3:30-4:30 PM. Along Ali‘i Drive, between La‘aloa Avenue and Queen Kalama Avenue, during the AM peak hour there are about 195 vehicles per hour (vph) traveling northbound and about 190 vph traveling southbound with a total of 385 vph. During the PM peak hour, there are about 250 vph traveling northbound and 230 traveling southbound with a total of 480 vph.

The AM/PM peak hours for Kuakini Highway are 7:45-8:45 AM/1:45-2:45 PM. Along Kuakini Highway, between Nalani Street and Lako Street, during the AM peak hour there are about 650 vph traveling northbound and 530 vph traveling southbound with a total of 1,180 vph. During the PM peak hour, there are about 650 vph traveling northbound and 740 vph traveling southbound with a total of 1,390 vph. There is another peak in traffic that occurs in the afternoon, but has less vehicles traveling than the 1:45-2:45 PM peak. This occurs around 4:45-5:45 PM in which the total vehicles traveling are around 1,300 vph, with 540 vph traveling northbound and 760 vph traveling southbound. The highest volume traveling in the southbound direction occurred from 5:15-6:15 PM, with 785 vph.

Manual intersection turning movement traffic counts were taken at the three study intersections on Tuesday, May 2, 2017. Counts were conducted during the AM and PM peak periods. Details on turn volumes are included in Appendix 4. Pedestrian and bicycle volumes were also counted at the three intersections during the AM and PM peak periods. Ali‘i Drive has high usage, but pedestrian and bicycle volumes in the other two intersections are minimal due to the suburban nature of the development along Kuakini Highway and La‘aloa Avenue. The County operates a bus system that provides an alternative to

private motor vehicles for accessing the Ali‘i Drive area, but no bus routes are present on La‘aloa Avenue.

Level of service (LOS) is a 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. A Policy on Geometric Design of Highways and Streets (AASHTO 2011) states that an “appropriate” LOS for an urban arterial, which is the classification of Kuakini Highway through the project area, is LOS C or D. An “appropriate” LOS for an urban collector, which is the classification of Ali‘i Drive, is LOS D or better.

Another measure of intersection operation 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. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F per the Highway Capacity Manual (TRB, 2010). 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.

Existing intersection and movement LOS and delay (in seconds per vehicle) was determined for the AM and PM peak hours for all intersections. All movements resulted in appropriate LOS D or better, which suggests acceptable operations at all intersections (see Table 5 of Appendix 4 for details).

Impacts and Mitigation Measures

Most traffic actually generated by the park would occur on weekends, when adjacent street traffic is low and traffic impacts are unlikely. As discussed above, the metric for analysis of traffic impacts was whether traffic from the proposed park would cause the intersection LOS to fall below LOS D during the AM and PM peak hour traffic periods. Intersection LOS and delay were determined for the weekend peak hour using traffic analysis software, as documented in Appendix 4.

To assess future conditions, the analysis used a cumulative perspective, assessing background growth in traffic and all past, current and future foreseeable projects and their potential contribution to traffic. The year 2027 was used as the baseline, which is when both the immediately proposed and future facilities are assumed to be in place. A 1.0% annual growth (resulting in a growth factor of 1.1% from 2017 to 2027) was utilized, consistent with long-term trends in the area. Research using the State of Hawai‘i Office of Environmental Quality Control library, the Statewide Transportation Improvements Program (STIP), County Special Management Area permits, and other sources determined that several projects could induce traffic additional to background growth. These projects and their traffic impacts are discussed in Appendix 4.

In addition to background and additional project traffic growth, the new park will also cause traffic to grow. To estimate by how much, the TIAR examined the level of traffic that is typically generated by new parks of this particular size and type. By a methodology explained in Appendix 4, it was determined that in a worst-case scenario, about 5 trips in and 4 trips out would occur during the AM peak hour for adjacent traffic, and about 19 trips in and 27 trips out would occur during the PM peak hour. The trips were then "distributed" to their expected origins and destinations. This allowed calculations of how these new trips would affect the project area intersections.

As shown in Table 3, all analyzed intersections and movements would continue to operate at an appropriate LOS D or better during the adjacent traffic peak hour, with all v/c under capacity in the year 2027. Furthermore, no impacts to pedestrian or bicycle safety are expected. Additionally, in a letter in response to early consultation of June 30, 2017 (see Appendix 1a for letter), the Hawai‘i County Police Department stated that it did not anticipate any significant impacts to traffic or public safety concerns.

Table 3. Future (2027) With Project Intersection Level of Service

Intersection	Traffic Control		AM Peak Hour			PM Peak Hour		
	Approach	Movement	Delay	v/c	LOS	Delay	v/c	LOS
La‘aloa Avenue and Ali‘i Drive	All-Way Stop Controlled		12.8	-	B	25.4	-	D
	WB	Left	10.6	0.12	B	11.6	0.12	B
		Right	9.6	0.17	A	10.2	0.13	B
	NB	Thru-Right	13.6	0.54	B	21.7	0.75	C
	SB	Left-Thru	13.2	0.53	B	31.7	0.86	D
La‘aloa Avenue and Kapukapu Street	Two-Way Stop Controlled		-	-	-	-	-	-
	EB	Left-Thru-Right	7.4	0.01	A	7.5	0.01	A
	WB	Left	7.4	0.01	A	7.5	0.01	A
	NB	Left-Thru-Right	9.6	0.04	A	10.0	0.03	B
	SB	Left-Thru-Right	9.4	0.01	A	10.1	0.04	B
La‘aloa Avenue and Kuakini Highway	Signalized		30.1	-	C	24.9	-	C
	EB	Left	24.3	0.24	C	26.3	0.20	C
	NB	Left	39.6	0.30	D	40.4	0.23	D
		Thru	13.3	0.74	B	13.0	0.74	B
	SB	Thru	46.2	0.99	D	35.8	0.95	D

Traffic turn movements to the proposed development will come through the intersection of La‘aloa Avenue and Kapukapu Street and the proposed driveway. With the proposed driveway, the intersection will become a four-legged intersection. The TIAR also evaluated the need for turn lanes, considering various factors including travel speed, sight distance, corridor design consistency, vehicle types, vehicular volumes, and technical warrants (determined mathematically). Although a left-turn lane would not be warranted by 2027 based on the current slate of features (in particular, the playing field), if the proposed future plans for a basketball court and tennis court are implemented, the TIAR recommended that the eastbound (uphill) approach include a dedicated left-turn lane. As there is ample room in the median to provide this lane through simple restriping, the County will continue to monitor the situation and construct the lane if and when it is eventually needed. A dedicated right-turn lane into the park was not recommended.

3.4 Secondary and Cumulative Impacts

The project will not involve any secondary or cumulative impacts, such as population changes or effects on public facilities.

Cumulative impacts result when implementation of several projects that individually have limited impacts combine to produce more severe impacts or conflicts in mitigation measures. The proposed action of park development will have limited and temporary construction period impacts that would last over the course of approximately six months for the initial phase, and for as yet undetermined periods associated with future phases. Aside from construction impacts, there are no impacts to natural or cultural resources that have the potential to accumulate.

Review of SMA permits and Chapter 343 documents in the *OEQC Environmental Notice* as well as press coverage indicates that there are a number of planned or ongoing projects in North Kona in the 2017 to 2019 timeframe. Most major projects in the region are centered in the growing Kailua to Keahole area, five to 15 miles north of the proposed La‘aloa Avenue park. These include improvements to Queen Ka‘ahumanu Highway and related roads; Kona International Airport; energy facilities, aquaculture facilities road construction at the Natural Energy Laboratory of Hawai‘i (NELHA); phases of the Kamakana Villages at Keahuolu; various housing and community facility development at the Villages of La‘i‘ōpua; the Waiaha Transmission Waterline on Mamalahoa Highway; the West Hawai‘i Regional Park; and the Kona Judiciary Complex. All of these activities are located sufficiently far from the proposed park that there is little interaction potential for construction impacts.

One project planned for the parcel directly *mauka* on the YMCA property a passive park with walking facilities, and, potentially pavilions or other facilities for gathering. The timing and other details of this project are insufficiently developed to analyze potential cumulative construction or traffic impacts. However, it will complement the facilities at the subject park and the cumulative recreational impacts are expected to be beneficial. Several other projects are distant enough so that construction-related impacts such as dust, noise and runoff will not occur, but close enough so that cumulative traffic impacts on Ali‘i Drive require consideration. About 1.5 miles and 3 miles north of the proposed park, respectively, are two County Department of Public Works projects: the Lako Street Extension, and the Ali‘i Drive Culvert

Replacement. About a quarter mile south, Hawaii One1 Investors, LLC plans a 62-lot, single family residential, planned unit development. About a mile south of the park, there is demolition, renovation and site repurposing at the former Keauhou Beach Resort, a project of Kamehameha Schools known as Kahaluʻu Ma Kai. It should be noted that the largest recently proposed development project in the area, Kahaluʻu Ocean Villas, a 320-unit timeshare project that was slated for the land *mauka* of Kahaluʻu Beach Park about a mile away, has been cancelled.

For each of these four projects, construction traffic from each project may accumulate with traffic from one or more of the others to make Aliʻi Drive function less efficiently. However, only the culvert replacement project will generate substantial traffic slowdowns, as the others will have only minor and temporary effects during periods when equipment is being moved on or off the sites. These infrequent, intermittent traffic impacts can be mitigated by timing such activities to not coincide with peak traffic. There does not appear to be any need for additional mitigation for construction-phase impacts, based on distance, scale and nature. It is expected that local traffic will adjust to any temporary inconveniences.

Operationally, the TIAR discussed in Section 3.3.2 analyzed traffic from a cumulative perspective. The overall impacts were determined to be minor, and the only recommended mitigation was a left-turn lane.

3.5 Required Permits and Approvals

The following permits and approvals would be required:

- National Pollutant Discharge Elimination System Permit (State DOH)
- Grading, Grubbing, Driveway and Work Within County ROW Permits (County DPW)
- Building Permits and Plan Approval (County DPW and Planning)
- Special Management Area Permit (County Planning Commission; previously obtained)

3.6 Consistency with Government Plans and Policies

3.6.1 Hawaiʻi State Plan

Adopted in 1978 and last revised in 1991 (Hawaiʻi Revised Statutes, Chapter 226, as amended), the Plan establishes a set of themes, goals, objectives and policies that are meant to guide the State's long-run growth and development activities. The three themes that express the basic purpose of the *Hawaiʻi State Plan* are individual and family self-sufficiency, social and economic mobility and community or social well-being. The proposed action would promote these goals by providing an appropriate site for additional recreational opportunities for the project area, thereby enhancing quality-of-life and community and social well-being.

3.6.2 Hawaiʻi County General Plan, CDP, Zoning and SMA

The *General Plan* for the County of Hawaiʻi is a policy document expressing the broad goals and policies for the long-range development of the Island of Hawaiʻi. The plan was adopted by ordinance in 1989 and revised in 2005 (Hawaiʻi County Department of Planning). The *General Plan* itself is organized into

thirteen elements, with policies, objectives, standards, and principles for each. There are also discussions of the specific applicability of each element to the nine judicial districts comprising the County of Hawai‘i. Most relevant to the proposed project are the following Goal and Policies, and Courses of Action of particular chapters of the General Plan:

HISTORIC SITES

6.2 GOALS

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai‘i.

(b) Appropriate access to significant historic sites, buildings, and objects of public interest should be made available.

Discussion: The proposed action has involved appropriate inventory survey to determine the presence and significance of historic sites, and no significant sites are present. Therefore, the action satisfies relevant goals, policies, and courses of action for historic sites in Hawai‘i County.

NATURAL BEAUTY

7.2 GOALS

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

(b) Protect scenic vistas and view planes from becoming obstructed.

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

7.3 POLICIES

(a) Increase public pedestrian access opportunities to scenic places and vistas.

(d) Access easement to public or private lands that have natural or scenic value shall be provided or acquired for the public.

(i) Do not allow incompatible construction in areas of natural beauty.

Discussion: The proposed action does not involve scenic areas or vantages and would not be inconsistent with the natural beauty of Kona. Therefore, the action is consistent with relevant goals, policies, and courses of action of the Natural Beauty section of the Hawai‘i County General Plan.

NATURAL RESOURCES

8.2 GOALS

(a) Protect and conserve the natural resources from undue exploitation, encroachment and damage.

(b) Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.

(c) Protect and promote the prudent use of Hawaii’s unique, fragile, and significant environmental and natural resources.

(e) Protect and effectively manage Hawaii’s open space, watersheds, shoreline, and natural areas.

8.3 POLICIES

(b) Encourage a program of collection and dissemination of basic data concerning natural resources.

(h) Encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.
(i) Encourage an overall conservation ethic in the use of Hawaii's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawaii.
(u) Ensure that activities authorized or funded by the County do not damage important natural resources.

Discussion: The project does not involve destruction of natural resources and is consistent with the goals, standards and policies of the Natural Resources chapter of the Hawai‘i County General Plan.

RECREATION

12.2 GOALS

(a) Provide a wide variety of recreational opportunities for the residents and visitors of the County.
(b) Maintain the natural beauty of recreation areas.
(c) Provide a diversity of environments for active and passive pursuits.

12.3 POLICIES

(a) Strive to equitably allocate facility-based parks among the districts relative to population, with public input to determine the locations and types of facilities.
(c) Recreational facilities shall reflect the natural, historic, and cultural character of the area.
(d) The use of land adjoining recreation areas shall be compatible with community values, physical resources, and recreation potential.
(g) Facilities for compatible multiple uses shall be provided.
(h) Provide facilities and a broad recreational program for all age groups, with special considerations for the handicapped, the elderly, and young children.
(i) Coordinate recreational programs and facilities with governmental and private agencies and organizations. Innovative ideas for improving recreational facilities and opportunities shall be considered.
(j) Develop local citizen leadership and participation in recreation planning, maintenance, and programming.
(s) Consider alternative sources of funding for recreational facilities.

12.4 STANDARDS

(d) Neighborhood Parks:

- Provide open space in urbanizing areas for the general aesthetic enjoyment of the outdoors, play areas for young children, and a social gathering place for the neighborhood.
- Up to 4 acres, within the center of the neighborhood and preferably adjacent to a school.
- Minimum facilities include: restrooms; drinking water; walking and jogging paths (bike and skating paths); courts for basketball, volleyball and tennis; ballfields for tetherball, baseball/softball and soccer; play area and equipment for young children; and an adequate parking area.

COURSES OF ACTION for North Kona

(a) Encourage the development of community and district recreational facilities, a gymnasium and community center with easy access for residents.

(o) Increase mauka park lands.

Discussion: The proposed action is an appropriately scaled neighborhood park planned with citizen input gained through change of zone and SMA hearings, focused on a broad range of age groups, and therefore satisfies relevant goals and policies. The project implements a referenced course of action.

The *Hawai‘i County General Plan Land Use Pattern Allocation Guide (LUPAG)*. The LUPAG map component of the *General Plan* is a graphic representation of the Plan's goals, policies, and standards as well as of the physical relationship between land uses. It also establishes the basic urban and non-urban form for areas within the planned public and cultural facilities, public utilities and safety features, and transportation corridors. The project site is classified as Low Density Urban in the LUPAG. Use of the project site as a park is consistent with this designation.

Kona Community Development Plan. The Kona Community Development Plan (CDP) (Hawai‘i County Planning Department 2008) has many elements and wide-ranging implications, but there are several major strategies that embody the guiding principles related to land use, housing, public facilities, infrastructure and services, and transportation. The property is located within the Kona Urban Area (KUA). The proposed park is consistent with Objective PUB-6 (Quality of Life), which seeks to foster a sense of community and health through the public realm, such as gathering places, parks, pedestrian networks and open spaces. Policy PUB-6.2, Active Recreation Opportunities, specifies that a range of recreational opportunities shall be provided to encourage physical activity and interaction among toddlers, youth, teens, adults, and seniors, including neighborhood parks.

Hawai‘i County Zoning. The project site is zoned Single Family Residential (RS-15). Section 25-5-3(a)(11) of the Hawai‘i County Code, Chapter 25, Zoning, lists "neighborhood parks, playgrounds, tennis courts, swimming pools, and similar neighborhood recreational areas and uses" as permitted uses in the RS District. It should be noted that the proposed park has been designed to specifically comply with Condition C of Change of Zone Ordinance No. 09-08 and SMA Use Permit No. 2007-000024 for TMK 7-7-008:021, which required the applicant to provide a minimum of a three-acre, public neighborhood park within an area near the proposed development. Additionally, the project is consistent with Condition F of Change of Zone Ordinance No. 96060 and Condition N of Change of Zone Ordinance No. 97-42, as well as SMA Use Permit No. 385, which required the neighborhood park for the Ali‘i Heights Subdivision.

Special Management Area (SMA). The property is situated within the County's Special Management Area (SMA). Public parks, public uses, and structures are allowed in the Special Management Area. The Planning Department by letter of July 5, 2017, determined after review of the proposed project that a park on the project site had already been approved by SMA Permit No. 385 in 1998, and that further compliance with SMA permitting was not required. The following presents and analysis of the project's effect on key SMA resources:

Recreational Resources. The proposed park would not in any manner adversely affect any recreational resources. The park would expand recreational uses in the area and supply a needed active sports facility. The project would help P&R in its mission to provide adequate, accessible and diverse recreational opportunities.

Historic Resources. The historic resources of the project site have been inventoried and evaluated in coordination with the State Historic Preservation Division. The project would not affect any historic sites.

Scenic and Open Space Resources. The guidelines contained in Rule 9 of the Hawai‘i County Planning Commission Rules (which governs the SMA) express the intent to minimize development that would "substantially interfere with or detract from the line of site toward the sea from the State Highway nearest the coast or from other scenic areas identified in the General Plan." The proposed improvements would not adversely affect any sight lines or scenic resources in any way. Furthermore, the project maintains the quality of scenic and open space resources.

Coastal Ecosystems. The nature, location and design of the proposed park, along with precautions that will be undertaken during construction, would avoid impacts to coastal biological resources. No coastal ecosystems are present on or near the property, and no threatened or endangered animal or plant species would be affected, given proposed mitigation avoidance measures.

Economic Uses. The proposed action use would not impact adversely affect any economic aspects of the coastal zone, and it would positively contribute to the economy by providing safe and accessible facilities for residents and some visitors.

Coastal Hazards. The proposed improvements would be undertaken outside designated floodplains. Maps printed by the Pacific Tsunami Warning Center/Hawai‘i County Civil Defense Agency locate the project site outside the area that should be evacuated during a tsunami warning (http://www5.hawaii.gov/tsunami/maps.asp). In any case, warning sirens are present nearby and the area can readily be evacuated in the event of a tsunami or other coastal hazard emergency. No aspect of the proposed action would adversely affect the public exposure to coastal hazards.

In summary, the proposed action would benefit and/or not adversely impact Special Management Area resources, including beaches, recreation, native species or ecosystems, historic sites, water quality, and susceptibility to hazards. Minor impacts and mitigation measures are discussed individually in the resource sections of Chapter 3, above. The proposed action does not involve any irreversible or irretrievable commitment of resources or any substantial adverse environmental impact that cannot be avoided.

3.6.3 Hawai‘i State Land Use Law

All land in the State of Hawai‘i is classified into one of four land use categories – Urban, Rural, Agricultural, or Conservation – by the State Land Use Commission, pursuant to Chapter 205, HRS. The property is in the State Land Use Urban District. The proposed action of use the project site for a park is consistent with intended uses for this Land Use District.

PART 4: DETERMINATION

Based on the information to this point, the Hawai‘i County Department of Parks and Recreation expects to determine that the proposed project will not significantly alter the environment. It is therefore anticipated that an Environmental Impact Statement is not warranted and that the Department will issue a Finding of No Significant Impact (FONSI). A final determination will be made by the Hawai‘i County Department of Parks and Recreation after consideration of comments on the Draft EA.

PART 5: FINDINGS AND REASONS

Chapter 11-200-12, Hawai‘i Administrative Rules, outlines those factors agencies must consider when determining whether an Action has significant effects:

1. *The proposed project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources.* No valuable natural or cultural resources would be committed or lost by the project, which would not involve significant historic sites or native species or habitat.
2. *The proposed project will not curtail the range of beneficial uses of the environment.* The proposed action expands and in no way curtails beneficial uses of the environment.
3. *The proposed project will not conflict with the State's long-term environmental policies*. The State’s long-term environmental policies are set forth in Chapter 344, HRS. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The proposed action is minor, environmentally beneficial, and fulfills aspects of these policies calling for an improved social environment. It is thus consistent with all elements of the State’s long-term environmental policies.
4. *The proposed project will not substantially affect the economic or social welfare of the community or State.* The proposed action will benefit the social welfare of the community and State by allowing for use of the property for public benefit, as well as improving the amenities of the neighborhood
5. *The proposed project does not substantially affect public health in any detrimental way.* The proposed action will promote public health through provision of recreational opportunities.
6. *The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities*. No secondary effects are expected to result from the proposed action, which would not induce in-migration or affect public facilities.
7. *The proposed project will not involve a substantial degradation of environmental quality*. The proposed action is minor and environmentally benign, and would thus not contribute to environmental degradation with adherence to Best Management Practices.
8. *The proposed project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.* The project site supports overwhelmingly alien vegetation. Impacts to rare, threatened or endangered species of flora or fauna will not occur, with planned mitigation for timing of vegetation removal, and, if necessary, a survey for nesting hawks.
9. *The proposed project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions.* The proposed action is not related to other activities in the region in such a way as to produce adverse cumulative effects or involve a commitment for larger actions.
10. *The proposed project will not detrimentally affect air or water quality or ambient noise levels.* Slight increases in noise and effects to air quality will occur during construction, but below levels

that would require mitigation. All active parks involve increases in noise, but they can be maintained at levels consistent with the urban land use category.

11. *The project does not affect nor would it likely to be damaged as a result of being located in an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal area.* Although the project site is in an area with volcanic and seismic risk, the entire Island of Hawaiʻi shares this risk, and the project is not imprudent to undertake.
12. *The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.* The proposed action would not adversely impact any scenic sites or viewplanes.
13. *The project will not require substantial energy consumption*. The proposed action involves only minor use of energy to construct and maintain the facility. Neighborhood parks offer some energy savings by eliminating or reducing automobile trips for users otherwise obliged to travel farther to meet recreational needs.

For the reasons above, the proposed action would not have any significant effect in the context of Chapter 343, Hawaiʻi Revised Statues and section 11-200-12 of the State Administrative Rules.

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Environmental Assessment

La‘aloa Avenue New Park Development

APPENDIX 1a
Comments in Response to Early Consultation, Flood Hazard Report and SHPD Letter

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DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

EPO 17-146

June 22, 2017

Mr. Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawaii 96721
Email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Early Consultation for Draft Environmental Assessment (EC DEA) for New Park Development at Laaloa Avenue, North Kona District, Hawaii
TMK: (3) 7-7-008:030

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your EC DEA to our office on June 15, 2017.

We understand from the EC DEA that *"the project involves a new soccer field, a comfort station with an attached lanai, a driveway, a parking lot for approximately 35 vehicles, various sidewalks and fencing. It also includes graded and graveled space for a tennis court and basketball court, which may be constructed by P&R at a future date."*

Hawaii's environmental review laws require Environmental Assessments (EAs) and Environmental Impact Statements (EISs) to consider health in the discussion and the mitigation measures to reduce negative impacts. In its definition of 'impacts,' §11-200-2, Hawaii Administrative Rules (HAR) includes health effects, whether primary (direct), secondary (indirect), or cumulative. Further, §11-200-12(b)(5), HAR, lists public health as one of the criteria for determining whether an action may have a significant impact on the environment.

We advocate that you consider health from a broad perspective; one that accounts for the social, economic, and environmental determinants of health and wellbeing. Community well-being can be impacted by access to physical activity, health care, feelings of social connectedness and safety. Design solutions that take these factors into consideration positively contribute to the social determinants of health in a community, improving the well-being of those who live there by influencing health promoting behaviors. Social determinants contribute to preventable chronic diseases such as asthma, diabetes, obesity, and cardiovascular disease.

In the development and implementation of all projects, EPO strongly recommends regular review of State and Federal environmental health land use guidance. State standard comments and available strategies to support sustainable and healthy design are provided at: http://health.hawaii.gov/epo/landuse. Projects are required to adhere to all applicable standard comments. EPO has recently updated the environmental Geographic Information System (GIS) website page. It now compiles various maps and viewers from our environmental health programs. The eGIS website page is continually updated so please visit it regularly at: http://health.hawaii.gov/epo/egis

In 2015, Hawaii passed Act 97 which amended Hawaii's Renewable Portfolio Standards by setting a goal for Hawaii to become one hundred percent renewable by the year 2045. To reach this goal Hawaii should transform its transportation sector from the use of fossil fuels to renewable fuel, electric vehicles (EV)s, and public transit systems including bikeshare programs. To address "range anxiety" and facilitate the adoption of EVs, it is essential that EV charging stations be added to any planned parking areas open to the EV driving public. All future plans should strive to encourage the use of personal bicycles though the development of designated bike lanes and class A bike trails.

All efforts should be made to reduce harmful vehicle emissions, reduce vehicle miles travelled (VMT's), encourage alternative modes of transport and increase physical activity.

EPO also encourages you to examine and utilize the Hawaii Environmental Health Portal at: https://eha-cloud.doh.hawaii.gov. This site provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings.

We suggest you review the requirements of the Clean Water Branch (Hawaii Administrative Rules {HAR}, Chapter 11-54-1.1, -3, 4-8) and/or the National Pollutant Discharge Elimination System (NPDES) permit (HAR, Chapter 11-55) at: http://health.hawaii.gov/cwb. If you have any questions, please contact the Clean Water Branch (CWB), Engineering Section at (808) 586-4309 or cleanwaterbranch@doh.hawaii.gov. If your project involves waters of the U.S., it is highly recommended that you contact the Army Corps of Engineers, Regulatory Branch at: (808) 835-4303.

Please note that all wastewater plans must conform to applicable provisions (HAR, Chapter 11-62, "Wastewater Systems"). We reserve the right to review the detailed wastewater plans for conformance to applicable rules. Should you have any questions, please review online guidance at: http://health.hawaii.gov/wastewater and contact the Planning and Design Section of the Wastewater Branch (WWB) at (808) 586-4294.

Any construction waste generated by the project needs to be disposed of at a solid waste disposal facility that complies with the applicable provisions (HAR, Chapter 11-58.1 "Solid Waste Management Control"). The open burning of any of these wastes, on or off site, is strictly prohibited. You may wish you review the C&D Waste Management Guide at: http://health.hawaii.gov/shwb/files/2016/05/constdem16.pdf Additional information is accessible at: http://health.hawaii.gov/shwb. For specific questions call (808) 586-4226.

You may also wish to review the draft Office of Environmental Quality Control (OEQC) viewer at: http://eha-web.doh.hawaii.gov/oeqc-viewer. This viewer geographically shows where some previous Hawaii Environmental Policy Act (HEPA) {Hawaii Revised Statutes, Chapter 343} documents have been prepared.

To better protect public health and the environment, the U.S. Environmental Protection Agency (EPA) has developed a new environmental justice (EJ) mapping and screening tool called EJSCREEN. It is based on nationally consistent data and combines environmental and demographic indicators in maps and reports. EPO encourages you to explore, launch and utilize this powerful tool in planning your project. The EPA EJSCREEN tool is available at: http://www.epa.gov/ejscreen.

We request that you utilize all this information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design. Thank you for the opportunity to comment.

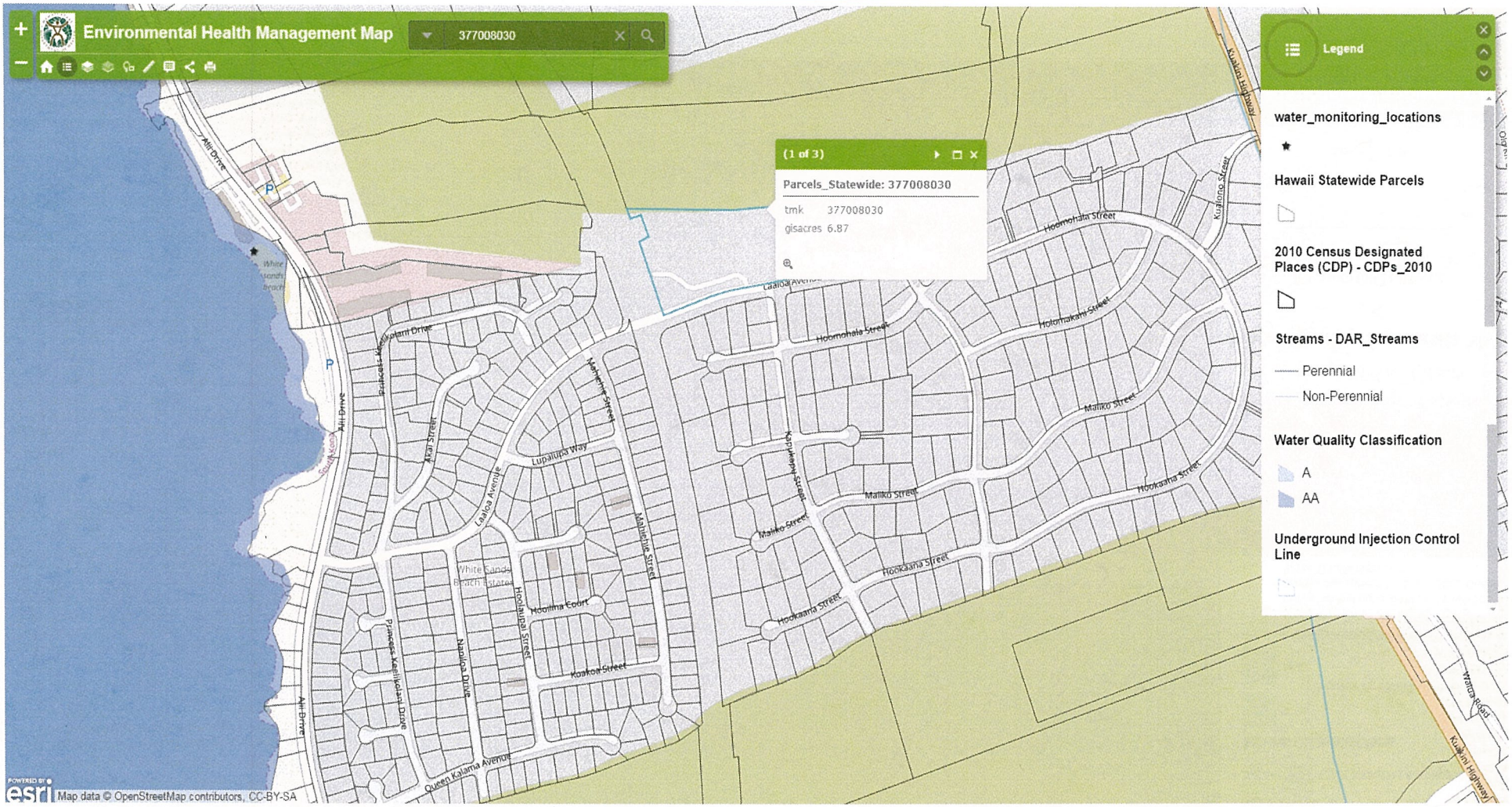
Mahalo nui loa,

Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office
LM:nn

Attachment 1: Environmental Health Management Web App Snipit of Project Area: http://health.hawaii.gov/epo/egis
Attachment 2: Clean Water Branch: Water Quality Standards Map - Hawaii
Attachment 3: OEQC viewer (of some past EA's, EIS's in area)
Attachment 4: U.S. EPA EJSCREEN Report for Project Area

c: DOH: DHO HI, CWB, WWB, PPB (HHS) {via email only}

Attachment 1: Environmental Health Management Web App Snipit of Project Area: http://health.hawaii.gov/epo/egis



Attachment 2: Clean Water Branch: Water Quality Standards Map - Hawaii

Attachment 3: OEQC viewer (of some past EA's, EIS's in area)

Attachment 4: U.S. EPA EJSCREEN Report for Project Area

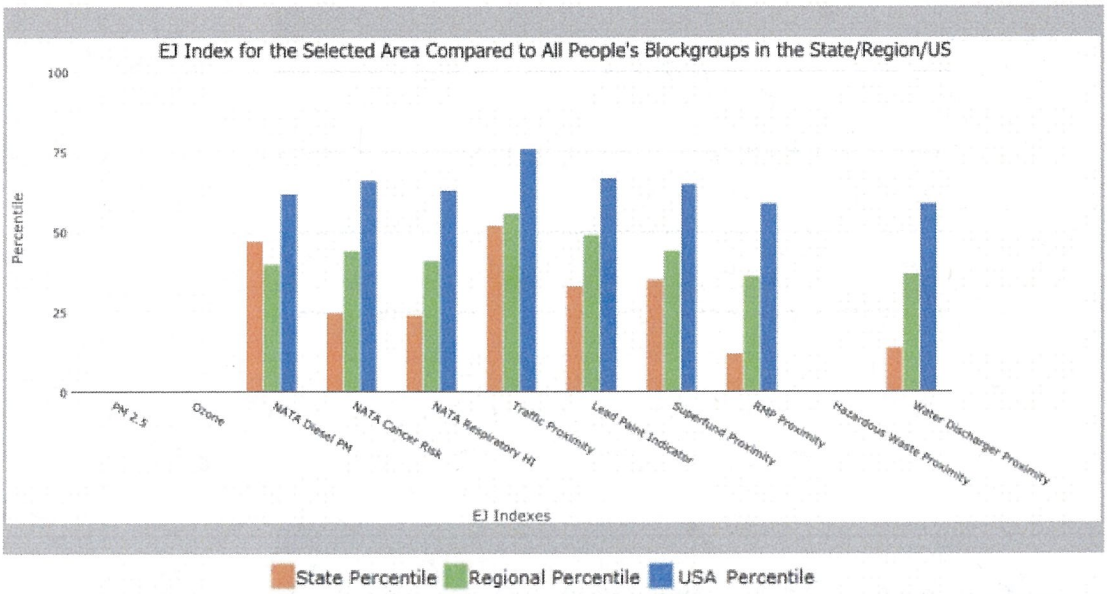
EJSCREEN Report (Version 2016)

1 mile Ring Centered at 19.594034,-155.966815, HAWAII, EPA Region 9

Approximate Population: 4,538

Input Area (sq. miles): 3.14

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	N/A	N/A	N/A
EJ Index for Ozone	N/A	N/A	N/A
EJ Index for NATA* Diesel PM	47	40	62
EJ Index for NATA* Air Toxics Cancer Risk	25	44	66
EJ Index for NATA* Respiratory Hazard Index	24	41	63
EJ Index for Traffic Proximity and Volume	52	56	76
EJ Index for Lead Paint Indicator	33	49	67
EJ Index for Superfund Proximity	35	44	65
EJ Index for RMP Proximity	12	36	59
EJ Index for Hazardous Waste Proximity+	N/A	N/A	N/A
EJ Index for Water Discharger Proximity	14	37	59



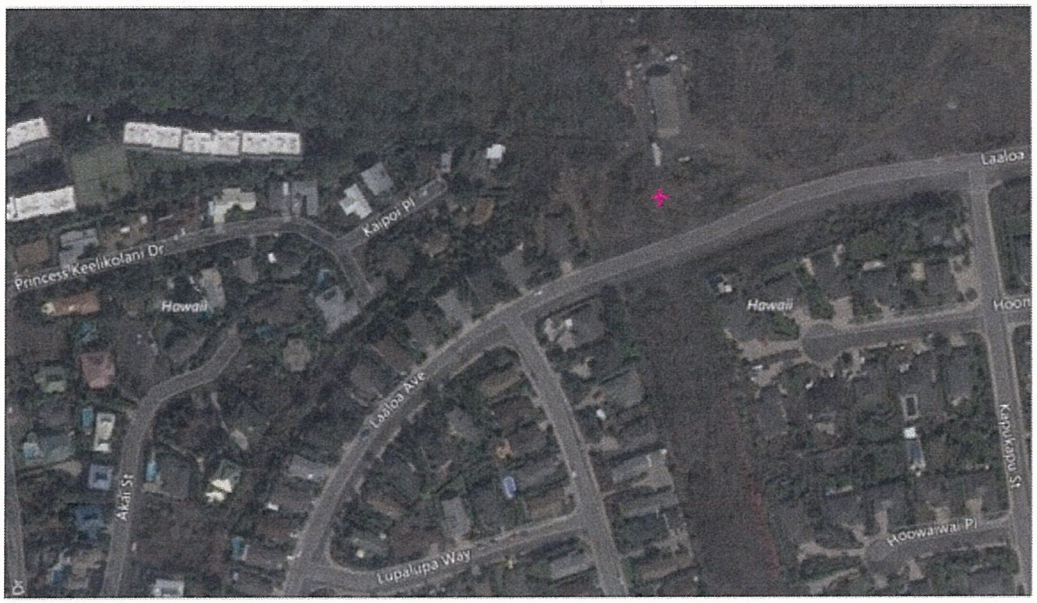
This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report (Version 2016)

1 mile Ring Centered at 19.594034,-155.966815, HAWAII, EPA Region 9

Approximate Population: 4,538

Input Area (sq. miles): 3.14



June 15, 2017

Digitized Point

1:2,257

0 0.0175 0.035 0.07 mi

0 0.03 0.06 0.12 km

© 2017 DigitalGlobe © 2017 Geobye © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0
National Pollutant Discharge Elimination System (NPDES)	0

EJSCREEN Report (Version 2016)

1 mile Ring Centered at 19.594034,-155.966815, HAWAII, EPA Region 9

Approximate Population: 4,538

Input Area (sq. miles): 3.14

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	N/A	N/A	N/A	9.37	N/A	9.32	N/A
Ozone (ppb)	N/A	N/A	N/A	51	N/A	47.4	N/A
NATA* Diesel PM (µg/m³)	0.155	0.149	72	0.978	<50th	0.937	<50th
NATA* Cancer Risk (lifetime risk per million)	28	34	30	43	<50th	40	<50th
NATA* Respiratory Hazard Index	0.72	1	32	2	<50th	1.8	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	240	990	55	1100	47	590	65
Lead Paint Indicator (% Pre-1960 Housing)	0.037	0.16	32	0.24	32	0.3	22
Superfund Proximity (site count/km distance)	0	0.098	29	0.15	13	0.13	16
RMP Proximity (facility count/km distance)	0	0.19	3	0.57	1	0.43	1
Hazardous Waste Proximity+ (facility count/km distance)	N/A	0.14	N/A	0.14	N/A	0.11	N/A
Water Discharger Proximity (facility count/km distance)	0	0.34	6	0.2	3	0.31	1
Demographic Indicators							
Demographic Index	44%	52%	27	47%	48	36%	68
Minority Population	53%	77%	12	58%	43	37%	70
Low Income Population	36%	26%	72	36%	53	35%	56
Linguistically Isolated Population	3%	6%	45	9%	32	5%	60
Population With Less Than High School Education	13%	9%	77	17%	51	14%	60
Population Under 5 years of age	10%	6%	82	7%	79	6%	81
Population over 64 years of age	15%	15%	52	13%	70	14%	62

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

+ The hazardous waste environmental indicator and the corresponding EJ index will appear as N/A if there are no hazardous waste facilities within 50 km of a selected location.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

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

June 30, 2017

Mr. Ron Terry
Principal
Geometrician Associates
P.O. Box 396
Hilo, HI 96721

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR NEW PARK DEVELOPMENT AT LA'ALOA AVENUE, NORTH KONA DISTRICT, ISLAND OF HAWAI'I, TMK (3) 7-7-008:030

Dear Mr. Terry:

This is in response to your letter dated June 13, 2017 regarding comments or concerns on your proposed project.

Thank you for allowing the Hawai'i Police Department to make comments regarding this project; however, at this time, the Hawai'i Police Department has no comments.

Should you have any questions, please contact Captain Gilbert Gaspar Jr., Commander of the Kona District, at 326-4646, extension 299.

Sincerely,

PAUL K. FERREIRA
POLICE CHIEF

M. Kanehailua Jr.

MITCHELL KANEHAILUA JR.
ASSISTANT POLICE CHIEF
AREA II OPERATIONS

GG/jaj
RS170567

Harry Kim
Mayor

West Hawai'i Office
74-5044 Ane Keohokalole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i

PLANNING DEPARTMENT

Michael Yee
Director

Daryn Arai
Deputy Director

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

July 5, 2017

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

SUBJECT: Comments for Early Consultation for Environmental Assessment for New Park Development at La'aloa Avenue
Tax Map Key: (3) 7-7-008:030

This is in response to your letter dated June 13, 2017 requesting early consultation comments for an environmental assessment being prepared for the new park development on the above referenced property, which is owned by the County of Hawai'i. The new park will include a new soccer field, a comfort station with an attached lanai, a driveway, a parking lot for approximately 35 vehicles, various sidewalks and fencing, and an area that will be graded and graveled for a tennis court and basketball court that may be constructed in the future.

1. The subject property is 6.365 acres in size, is zoned Single-Family Residential-15,000 square feet (RS-15) by the County of Hawai'i and designated as Urban by the State Land Use Commission. Section 25-5-3(a)(11) of the Hawai'i County Code, Chapter 25, Zoning, lists "neighborhood parks, playgrounds, tennis courts, swimming pools and similar neighborhood recreational areas and uses" as a permitted use in the RS district.

2. The General Plan Land Use Pattern Allocation Guide (LUPAG) map designations for the property are Urban Expansion (UE) and Medium Density Urban (MDU).

3. The property is located within the Special Management Area (SMA) and the proposed use is permitted under SMA No. 385, which allowed for the development of a 400-lot subdivision and related improvements.

4. The Kona Community Development Plan was adopted by the Hawai'i County Council by Ordinance No. 08-131 on September 25, 2008. The property is located within of the Kona Urban Area (KUA). The proposed park is consistent with Objective PUB-6 (Quality of Life) to foster a sense of community and health through the public realm such as gathering places, parks, pedestrian networks, and open spaces.

   Policy PUB–6.2: Active Recreation Opportunities. A range of recreational opportunities shall be provided to encourage physical activity and interaction among toddlers, youth, teens, adults, and seniors, including, without limitation the following:

   (e) Neighborhood parks (up to 4 acres) –Subdividers shall provide neighborhood parks (including community gardens, community centers, pocket parks, and pet parks) ½ mile apart for area residents and provide for private maintenance or pay a fee pursuant to HCC Chapter 8.

5. The proposed park will comply with Condition C of Change of Zone Ordinance No. 09-08 and SMA Use Permit No. 2007-000024 for TMK 7-7-008:121, which required the applicant to provide a minimum of a three-acre, public neighborhood park within an area near the proposed development. Additionally, the proposed park is consistent with Condition F of Change of Zone Ordinance No. 96-60 and Condition N of Change of Zone Ordinance No. 97-42, as well as SMA Use Permit No. 385 for the neighborhood park for the Ali'i Heights Subdivision.

We have no further comments at this time. Please forward us a copy of the draft EA for review. If you have any questions, please feel free to contact Jeff Darrow at 961-8158.

Sincerely,

MICHAEL YEE
Planning Director

JWD:mad
P:\wpwin60\CH343\2017\LTerry-PreEADraftConsul-LaaloaAvenuePark.doc

cc: REZ 2007-000075
SMA 2007-000024
SMA 385
Kona Planning Department (electronic)
Michael J. Riehm, AIA, NCARB

Harry Kim
Mayor

Wil Okabe
Managing Director

Frank J. De Marco, P.E.
Director

Allan G. Simeon
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

July 6, 2017

Ron Terry, Principal
Geometrician Associates
PO Box 396
Hilo, HI 96721

SUBJECT: Early Consultation for Environmental Assessment for New Park Development at La'aloa Avenue, North Kona District, Island of Hawaii, TMK (3) 7-7-008:030

We reviewed the subject dated June 13, 2017 and have the following general comments:

Floodplain Management

We have determined that the subject property is located within Flood Zone "X" according to the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA).

Drainage

1. All development generated runoff shall be disposed of on-site and shall not be directed toward any adjacent properties.

2. The applicant shall be informed that if they include drywells in the subject development, an Underground Injection Control (UIC) permit may be required from the Department of Health, State of Hawaii.

Earthwork

1. All earthwork and grading shall conform to Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.

2. The applicant shall comply with Chapter 11-55, Water Pollution Control, Hawaii Administrative Rules, Department of Health, which requires an NPDES permit for certain construction activity.

Work within the County Right-of-Way

1. A permit is required for work within the County right-of-way. See Chapter 22, Streets and Sidewalks, of Hawaii County Code.

We would appreciate a notification of EA availability upon completion. Should there be any questions concerning this matter, please contact Natalie Toevs of our Kona office at (808) 323-4853.

for Ben Ishii, Division Chief
Engineering Division

NT
Copy: -- file

Harry Kim
Mayor

Darren J. Rosario
Fire Chief

Renwick J. Victorino
Deputy Fire Chief

County of Hawai'i
HAWAI'I FIRE DEPARTMENT
25 Aupuni Street • Suite 2501 • Hilo, Hawai'i 96720
(808) 932-2900 • Fax (808) 932-2928

July 10, 2017

Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, Hawai'i 96721

Dear Mr Terry:

SUBJECT: Early Consultation for Environmental Assessment for New Park development at La'aloa Avenue, North Kona District, Island of Hawai'i
TMK (3) 7-7-008:030

We are in receipt of your letter dated June 13, 2017 in regards to a draft Environmental Assessment and Anticipated finding of no significant Impact for the above listed subject.

The Hawai'i Fire Department has no issues or comments with regards to the request for a draft Environmental Assessment – New Park Development at La'aloa Avenue and Anticipated finding of no significant Impact as noted above.

If you should have any questions, please feel free to contact my office at (808) 932-2911.

Mahalo,

DARREN J. ROSARIO
Fire Chief

KV/ds

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

July 26, 2017

Mr. Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

Subject: Pre-Environmental Assessment Consultation
New Park Development at La'aloa Avenue
Tax Map Key 7-7-008:030

This is in response to your Pre-Environmental Assessment Consultation letter of June 13, 2017.

Please be informed there is an existing 8-inch waterline along La'aloa Avenue fronting the subject parcel. There is an existing service lateral installed to the parcel capable of accommodating a 5/8-inch meter, which is limited to an average daily usage of 400 gallons.

We recommend that the County of Hawai'i, Department of Parks and Recreation consult with this Department, regarding water availability and any necessary water system improvements to provide water service.

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 – County of Hawai'i, Department of Parks and Recreation

Flood Hazard Assessment Report

www.hawaiinfip.org

Property Information

COUNTY:	HAWAII
TMK NO:	(3) 7-7-008:030
WATERSHED:	WAIAHA
PARCEL ADDRESS:	77-237 LAALOA AVENUE KAILUA KONA, HI 96740

Notes:

Flood Hazard Information

FIRM INDEX DATE:	APRIL 02, 2004
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL - EFFECTIVE DATE:	1551660926E - JUNE 02, 1995 1551660927D - JUNE 02, 1995

THIS PROPERTY IS WITHIN A TSUNAMI EVACUTION ZONE: NO
FOR MORE INFO, VISIT: http://www.scd.hawaii.gov/

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 200 400 ft

Disclaimer: The Hawaii Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use, accuracy, completeness, and timeliness of any information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR, its officers, and employees from any liability which may arise from its use of its data or information.

If this map has been identified as 'PRELIMINARY', please note that it is being provided for informational purposes and is not to be used for flood insurance rating. Contact your county floodplain manager for flood zone determinations to be used for compliance with local floodplain management regulations.

FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND
(*Note: legend does not correspond with NFHL*)

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD - The 1% annual chance flood (100-year), also know as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

	Zone A: No BFE determined.
	Zone AE: BFE determined.
	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

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HONOLULU, HAWAII 96813

December 23, 1997

Mr. Joseph Kennedy
Archaeological Consultants of Hawaii
59-624 Pupukea Road
Haleiwa, Hawaii 96712

LOG NO: 20516 ✓
DOC NO: 9711PM09

Dear Mr. Kennedy:

SUBJECT: **Revised Report:** ***"An Archaeological Inventory Survey Including Subsurface Testing for a Portion of the Ahupua`a of Pahoehoe 3rd Located at TMK: 7-7-08:30 and Adjacent TMK: 7-7-08:96 North Kona District, Island of Hawai`i"*** **(Latinis, Carson and Kennedy 1997)**

Thank you for your letter of May 27, 1997 which submitted this revised report, and our apologies for the long delay in reviewing your report.

The revised report, which was prepared to respond to the comments in our review letter of May 2, 1997 on the second draft now acceptably presents the site inventory portion of these reports. The report is better organized and thus easier to read and understand. We can now agree that the survey of the 14 acre parcel was adequate, finding a total of 18 sites. All of the sites have been acceptably documented.

We agree with your significance evaluations -- three sites are significant solely for their information content and the Kuakini Wall is significant for multiple criteria. And we agree with your mitigation proposals for these significant sites -- data recovery for the three significant solely for their information and preservation of the Kuakini Wall. However, there are still some problems with the presentation of the significance evaluations and mitigation proposals. Pages 87-92 need revision to address these problems and for the report to be acceptable. (See attachment for needed revisions.) However, with the understanding that these revisions will be made and replacement pages submitted to our office, we can accept the report and the significance evaluations and mitigation proposals.

With the implementation of the mitigation commitments, we believe any proposed development will have "no adverse effect" on the four significant sites in the project area. The next step in the historic preservation process is to develop acceptable scopes of work for data recovery and preservation for these sites. We will await receiving these plans (scopes).

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:jen

Attachment

DEC 24 1997

ATTACHMENT

NEEDED REVISIONS
INVENTORY SURVEY REPORT PAHOEHOE 3, TMK 7-7-8: 30, 96
NORTH KONA

ARCHAEOLOGICAL CONSULTANTS OF THE PACIFIC

General Comment on Significance Evaluations and Mitigation Proposals Sections

These sections should be removed from the Conclusions and be presented separately after the conclusions in two sections -- Significance Evaluations and Mitigation Proposals. Thus, please remove those sections (p. 87, last para. through page 89, para. 1; page 91, last two paragraphs and page 92).

Significance Evaluations

1. For the significance section use your page 87-89 text and table.

2. In Table 9, remove the "prior" significance column and change the "present" significance column changed to just read significance.

3. In the text currently at the top of page 89, say what the sites were that are "no longer significant", so the reader can see why reasonable amounts of information were recorded (e.g., if mounds with no deposits, measurement is all one can do).

4. The Kuakini Wall was formally determined to be eligible for inclusion on the National Register of Historic Places in 1977. Its significance was determined then. You should note those points in the text.

5. Also, in Table 9, identify 6302 as the Kuakini Wall.

Mitigation Proposals

1. Discuss only the 4 significant sites.

2. One paragraph on the three important for D and recommended for data recovery is needed. Use text from page 89 (para. 1), but say what the sites were briefly (habitations? temporary or permanent?). Also, clarify whether you are recommending data recovery or passive preservation now. You have to opt for one or the other. If your client wants to alter later, or devise interim protection measures, that is part of the mitigation planning process. It should not be discussed here.

3. A second paragraph should discuss the Kuakini Wall, and you need to say why this wall is recommended for preservation. You could note that it is also the joint policy of the County of Hawaii's Planning Department and our Division to preserve this wall. It is irrelevant what the PHRI report says about the Kuakini Wall.

4. You could place a final column in Table 9, titled Mitigation Proposals and insert entries for the four significant sites. This is not mandatory, but it is a common practice.

Environmental Assessment

La‘aloa Avenue New Park Development

APPENDIX 2
Cultural Impact Assessment

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A Cultural Impact Assessment for TMK: (3) 7-7-008:030

Pāhoehoe 3 and 4, & Laʻaloa 1 *ahupuaʻa*
North Kona District
Island of Hawaiʻi

DRAFT VERSION

Prepared By:

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Prepared For:

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September 2017

ASM Project Number 28380.00

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A Cultural Impact Assessment for TMK: (3) 7-7-008:030

Pāhoehoe 3 and 4 & Laʻaloa 1 *ahupuaʻa*
North Kona District
Island of Hawaiʻi

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1. INTRODUCTION

At the request of Ron Terry of Geometrician Associates, LLC, ASM Affiliates has prepared this Cultural Impact Assessment (CIA) for the proposed construction of a park on a roughly 6.4-acre parcel (TMK: [3] 7-7-008:030) that straddles the Pāhoehoe 3 and Pāhoehoe 4 *ahupuaʻa* boundary, and extends into Laʻaloa 1 Ahupuaʻa, North Kona District, Island of Hawaiʻi (Figures 1 and 2).

The current study was prepared in support of an Environmental Assessment conducted in compliance with HRS Chapter 343; pursuant to Act 50; and in accordance with the Office of Environmental Quality Control (OEQC) *Guidelines for Assessing Cultural Impact*, adopted by the Environmental Council, State of Hawaiʻi, on November 19, 1997. As stated in Act 50, which was proposed and passed as Hawaiʻi State House of Representatives Bill No. 2895 and signed into law by the Governor on April 26, 2000, "environmental assessments . . . should identify and address effects on Hawaii's culture, and traditional and customary rights . . . native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the 'aloha spirit' in Hawaiʻi. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on governmental agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups."

Below is a description of the general project area and proposed development activity, followed by a detailed culture-historical background and a presentation of prior studies; all of which combine to provide a physical and cultural context for the current project area. The results of the consultation process are then presented, along with a discussion of potential impacts to the cultural landscape as well as appropriate actions and strategies to mitigate any such impacts.

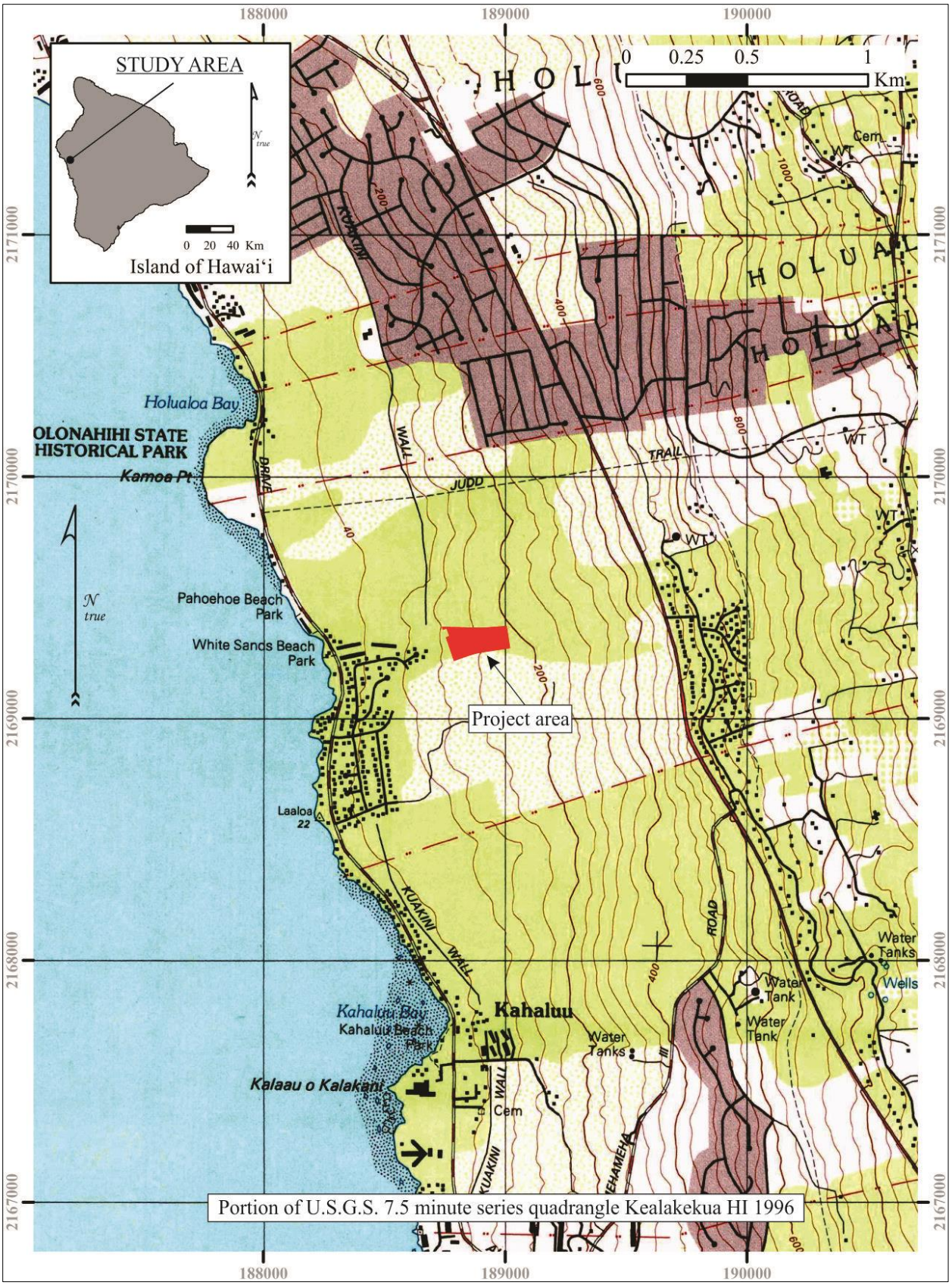


Figure 1. Project area location (portion of U.S.G.S. 7.5 min. series, Kealakekua quadrangle, 1996).

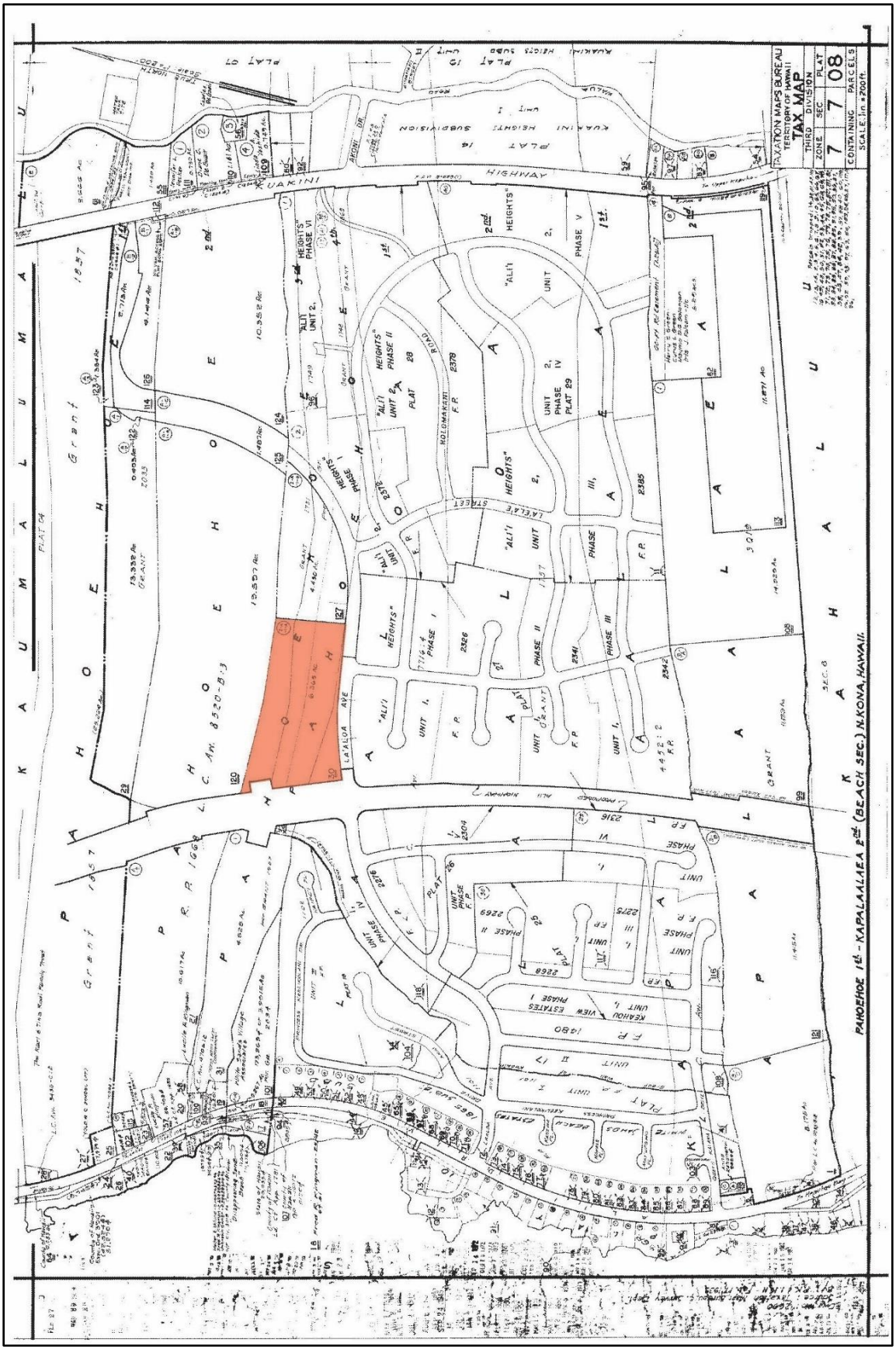


Figure 2. Tax Map Key (TMK) map (3) 7-7-008 showing the current project area (Parcel 030) shaded red.

PROJECT AREA DESCRIPTION

The roughly 6.4-acre project area straddles Pāhoehoe 3 and Pāhoehoe 4 *ahupuaʻa*, while the southwest corner of the parcel is situated in the Laʻaloa 1 Ahupuaʻa, also referred to as Laʻaloa Iki (Figures 3, 4, and 5). Pāhoehoe 3 and Pāhoehoe 4 are two of four *ahupuaʻa* divided out of the greater Pāhoehoe Ahupuaʻa (see Figure 4). The greater Pāhoehoe and Laʻaloa Ahupuaʻa are situated on the southwest slope of Hualālai volcano in the district (*moku*) of North Kona. This portion of Pāhoehoe and Laʻaloa Ahupuaʻa is formed of lava flows originating from Hualālai volcano that dates to approximately ten thousand years before present (Wolfe and Morris 1996).

The subject parcel (TMK: [3] 7-7-008:030) is bordered on the south by Laʻaloa Avenue and the north by a boundary wall (Site 6352), described by Latinis et al. (1996) as the *ahupuaʻa* boundary wall separating the Pāhoehoe 2 and 3. The east end of the property is bordered by TMK (3) 7-7-008:127 and the west end is bordered by the proposed Aliʻi Highway corridor (see Figures 2 and 3). Elevation within the project area ranges from 38 meters (125 feet) at the western boundary to approximately 60 meters (200 feet) at the eastern boundary. The project area is located within the *kula* vegetation zone of a large traditional agricultural field system, known as the Kona Field System. A comprehensive explanation of the Kona Field System is provided in the background section of this report.

Although the majority of the parcel has undergone major ground disturbance, there are pockets of natural, undisturbed land characterized by exposed *pāhoehoe* bedrock with some soil build up. The mean annual rainfall within the project area is approximately 837.2 millimeters (33 inches), with most of the rainfall occurring during the summer months (Giambelluca et al. 2013). The climate is relatively warm and dry, with a mean annual temperature ranging from 70 to 77 degrees Fahrenheit (Giambelluca et al. 2014). A large portion of the parcel has been previously grubbed and graded and currently contains no physical structures (see Figure 3).

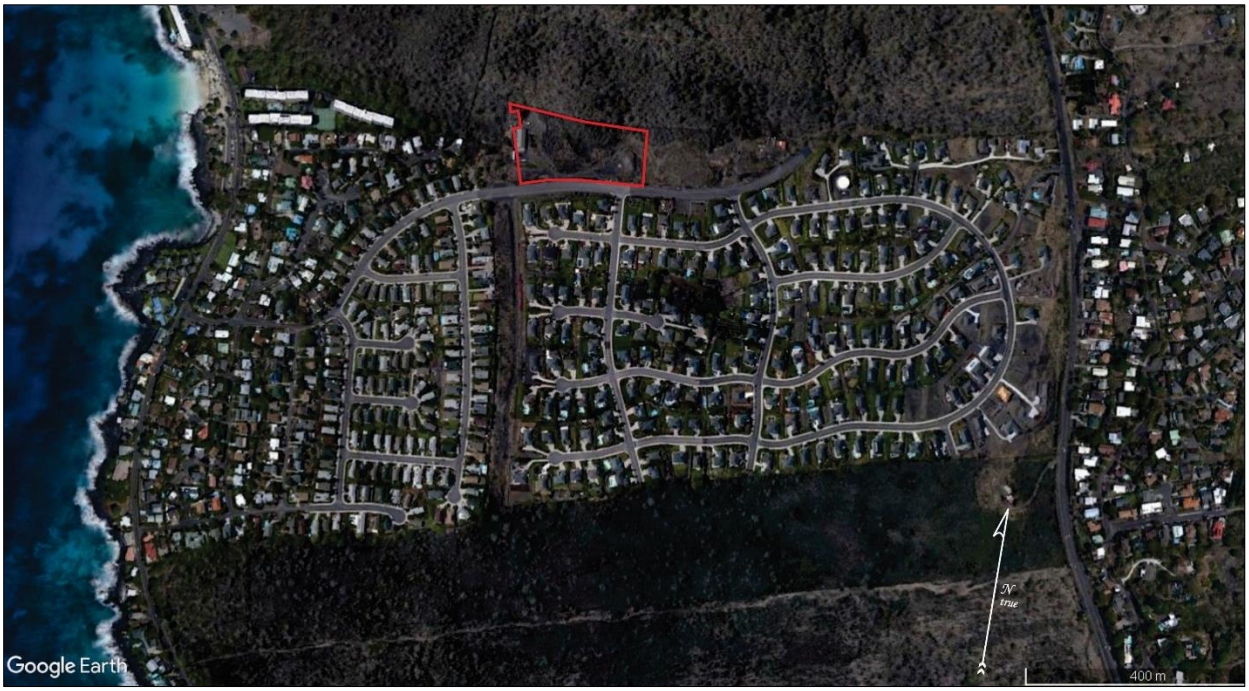


Figure 3. Google Earth™ satellite image showing location of current project area (outlined in red).

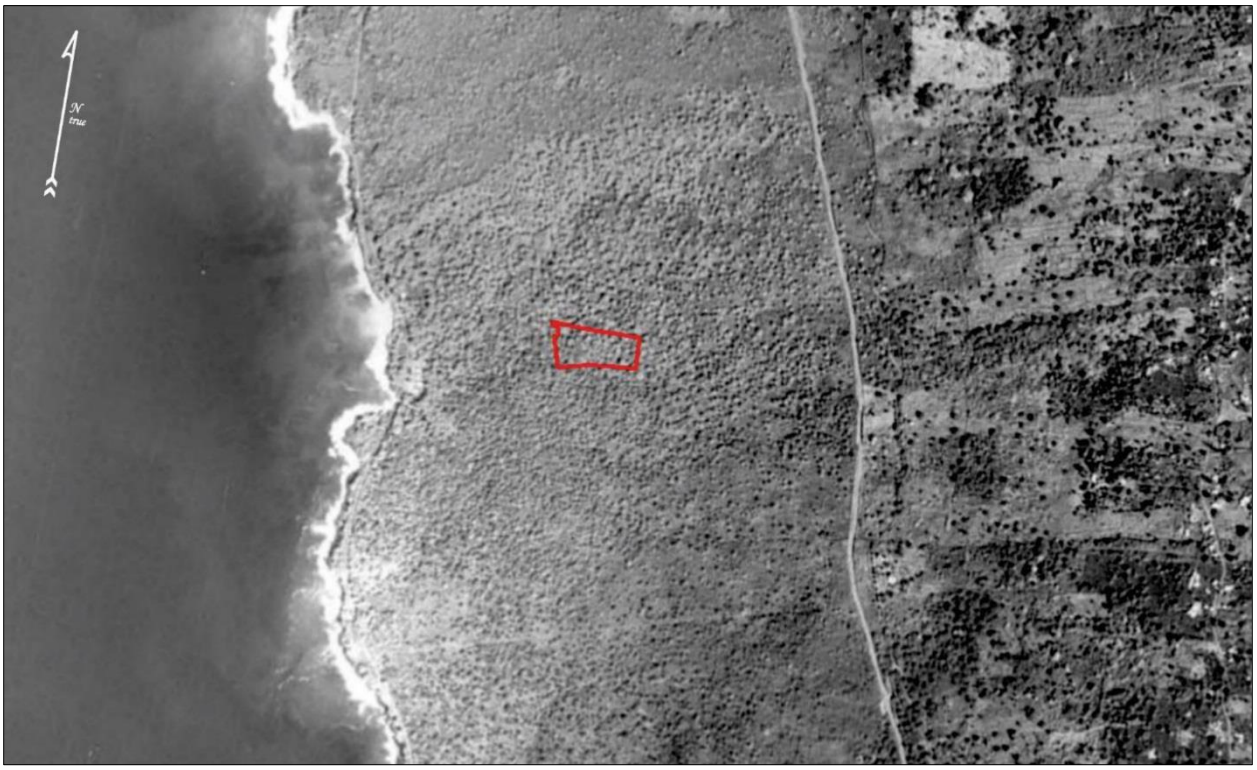


Figure 4. 1954 USGS aerial photograph showing the current project area outlined in red.

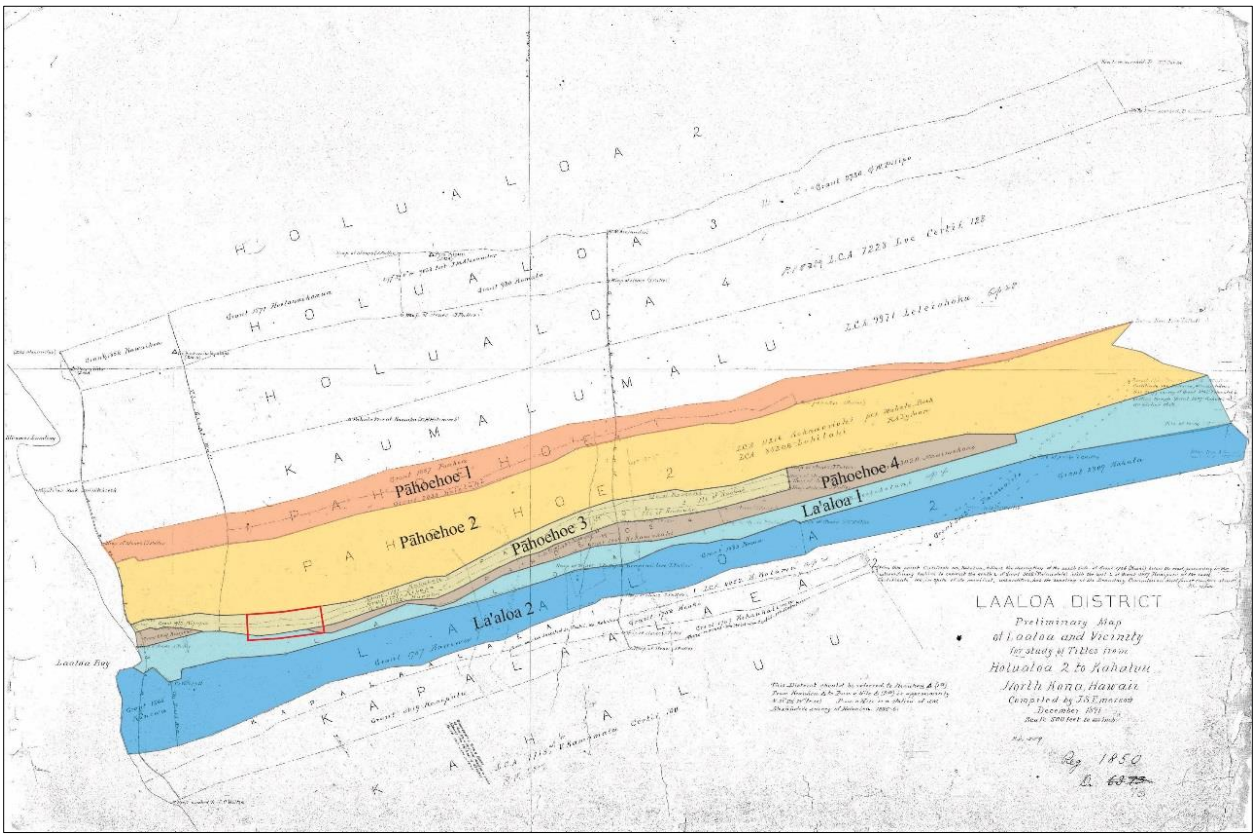


Figure 5. Registered Map 1850 by Emerson showing project area location and adjacent *ahupua'a*, ca. 1891.

On July 18, 2017, Lokelani Brandt, M.A. and Matthew Clark, M.A. of ASM Affiliates conducted an inspection of the subject parcel. The purpose of the visit was to assess the current condition of the property and identify any remaining sites that were previously documented by Latinis et al. (1996) (Figure 6) and Henry et al. (1998). During the inspection, a Historic Period wall (SIHP Site 6352) was observed separating Pāhoehoe 2 and 3 (Figure 6); as was southern portion of SIHP Site 20841 a modified rock outcrop associated with a possible agricultural plot that extends between Pāhoehoe 2 and 3 (Latinis 1996) (Figure 7). The wall (SIHP Site 6352) bisects the modified outcrop (SIHP Site 20841). Both sites are situated within the north central portion of the parcel, located on the higher, relatively undisturbed, rockier *pāhoehoe* outcroppings. Additionally, we observed extensive modification (grading and grubbing) to the majority of the project area, while there is a small undisturbed area located within the northern central portion of the parcel.

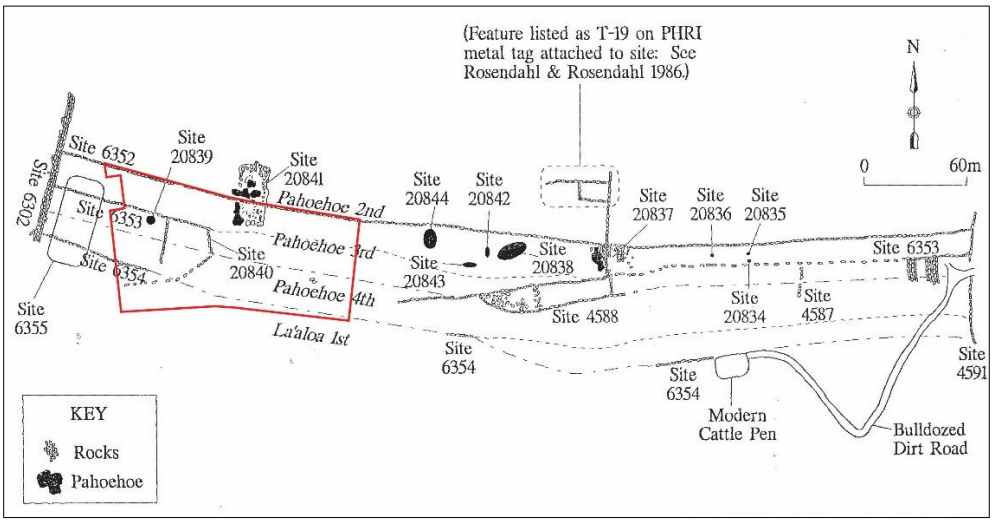


Figure 6. Archaeological sites recorded by Latinis et al. (1996: 6) for TMK [3] 7-7-08:030 & 096, with subject parcel outlined in red.

Figure 7. Portion of SIHP Site 6352 boundary wall separating Pāhoehoe 2 and Pāhoehoe 3 *ahupua'a*.

Two distinct vegetation patterns were noted during the site visit. One a result of the recent grading and grubbing activity, which contains a mix of guinea grass (*Megathyrsus maximus*), *haole koa* (*Leucaena leucocephala*), *ʻuhaloa* (*Waltheria indica*), *ʻopiuma* (*Pithecellobium dulce*), *ʻilima* (*Sida fallax*), and other species of grasses and vines (Figure 8). The vegetation in the undisturbed areas is a mix of guinea grass (*Megathyrsus maximus*), *haole koa* (*Leucaena leucocephala*), *ʻihi* (*Portulaca lutea*), and old *kiawe* trees (*Prosopis pallida*), many of which have fallen over and are in a state of decomposition (Figure 9).

Figure 8. Vegetation in previously disturbed areas.

Figure 9. Vegetation in undisturbed areas.

PROPOSED DEVELOPMENT ACTIVITY

The County of Hawai‘i seeks to develop a new park on TMK: (3) 7-7-008:030 through a partnership with Hawaii One1 Investors, LLC. The proposed park plans include the construction of a new soccer field, a comfort station with an attached *lanai*, a driveway, a parking lot for approximately thirty-five vehicles, sidewalks, and fencing (Figure 10). The plans also include a graded and graveled space for a tennis and basketball court, which may be constructed by the County of Hawai‘i Parks and Recreation at a future date. The County of Hawai‘i has determined that the park-related requirements associated with Hawai‘i County Change of Zone Ordinance No. 09-08 (REZ 07-000075) and Special Management Area (SMA) Use Permit No. 07-000024 (SMA 07-000024) undertaken for development of the La‘ipala Makai Planned Unit Development (located at TMK (3) 7-7-008:012, approximately a half mile south of La‘aloa Avenue) by Hawaii One1 Investors, LLC will be satisfied with the development of the current proposed park.

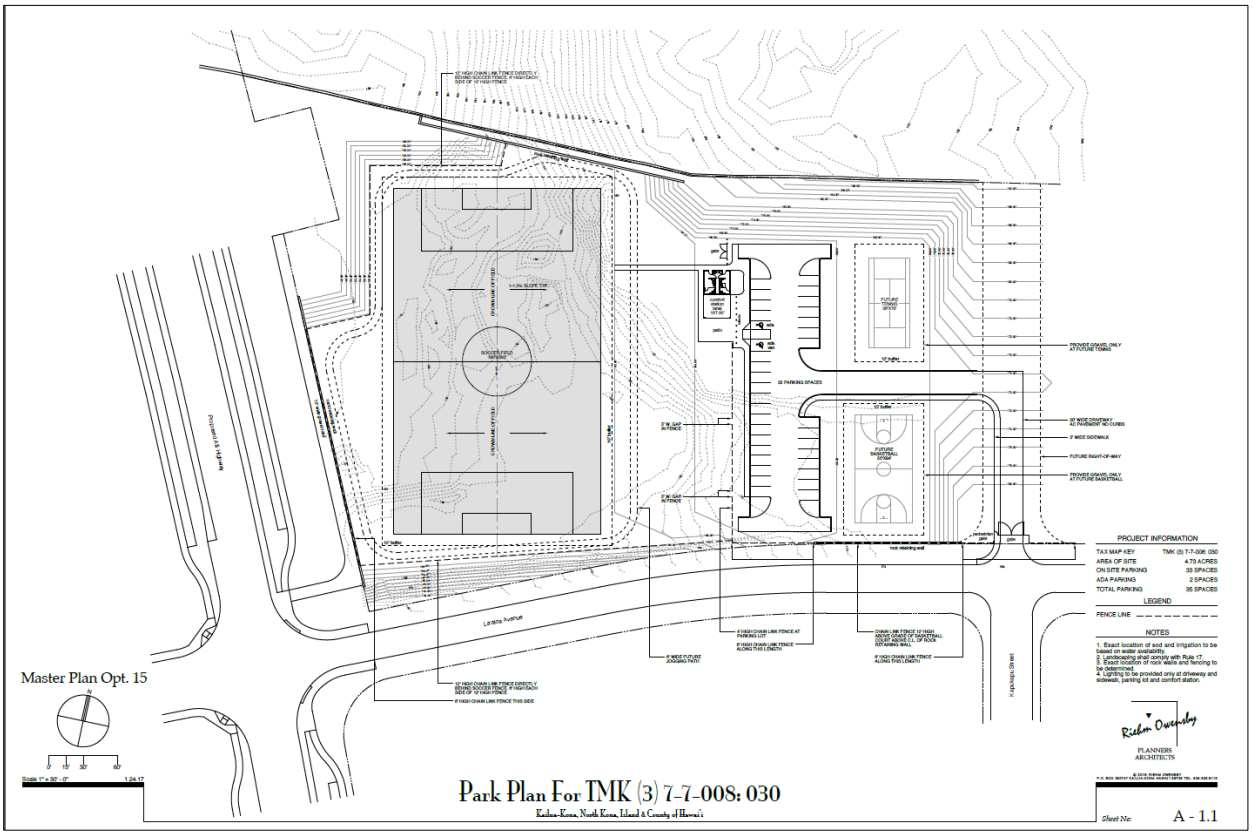


Figure 10. Proposed park plan for TMK (3) 7-7-008:030.

2. BACKGROUND

This section of the report includes a discussion of the cultural-historical background for the project area and a synthesis of relevant prior research. This information is presented to provide a comprehensive understanding of the cultural significance of the area and to establish an analytical basis for the assessment of any potential cultural impacts.

CULTURE-HISTORICAL CONTEXT

The chronological summary presented below begins with the peopling of the Hawaiian Islands and a generalized model of Hawaiian Prehistory followed by a collection of legendary and historical references to the *ahupuaʻa* of Pāhoehoe and Laʻaloa, and the greater North Kona District. The discussion continues with a summary of Historic events in the Hawaiian Islands after the arrival of foreigners. This summary includes oral traditions and first-hand historical accounts of the project area and beyond recorded by visitors and missionaries.

A Generalized Model of Hawaiian Prehistory

While the question of the timing of the first settlement of Hawaiʻi by Polynesians remains unanswered, several theories have been offered that derive from various sources of information (i.e., genealogical, oral-historical, mythological, radiometric). However, none of these theories is today universally accepted (c.f., Kirch 2011). The three most popular theories place the first settlement at around A.D. 300, A.D. 600, and A.D. 1000, respectively. What is more widely accepted is the answer to the question of where Hawaiian populations came from and the transformations they went through on their way to establish a uniquely Hawaiian culture. The initial settlement in Hawaiʻi is believed to have originated from the southern Marquesas Islands (Emory in Tatar 1982). During these early times, Hawaiʻi's inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy et al. 1991). This was a period of great exploitation and environmental modification when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order; which was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1880), the Hawaiians brought from their homeland certain universal Polynesian customs and belief: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *ʻaumakua* concept; and the concept of *mana*. The initial permanent settlements were established at sheltered bays with access to fresh water and marine resources. These communities shared extended familial relations and there was an occupational focus on the collection of marine resources. Over a period of a few centuries, the areas with the richest natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the common people. As populations increased so did societal conflict, which resulted in hostility and war between neighboring groups (Kirch 1985). Soon, large areas of Hawaiʻi were controlled by a few powerful chiefs.

As time passed, a uniquely Hawaiian culture developed. The portable artifacts found in archaeological sites of this next period reflect an evolution of the traditional tools and distinctly Hawaiian inventions. The adze (*koʻi*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. A few areas in Hawaiʻi produced quality basalt for adze production. Mauna Kea possessed a well-known adze quarry. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are *ʻulu maika* stones and *lei niho palaoa*. The latter was a status item worn by those of high rank, indicating a trend toward greater status differentiation (Kirch 1985). As the population continued to expand so did social stratification, which was accompanied by major socioeconomic changes and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. During this expansion period, additional migrations to Hawaiʻi occurred from Tahiti in the Society Islands. Rosendahl (1972) has proposed that settlement at this time was related to seasonal, recurrent occupation in which coastal sites were occupied in the summer to exploit marine resources, and upland sites were occupied during the winter months, with a focus on agriculture. An increasing reliance on agricultural products may have caused a shift in social networks as well; as Hommon (1976) argues, kinship links between coastal settlements disintegrated as those links within the *mauka-makai* settlements expanded to accommodate the exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupuaʻa* system sometime during the A.D. 1400s (Kirch 1985), which added another component to an already well-stratified society. The implications of this model include a shift in residential patterns from seasonal, temporary occupation, to permanent dispersed occupation of both coastal and upland areas.

The *ahupuaʻa* became the equivalent of a local community, with its own social, economic, and political significance, which added another component to a then well-stratified society. *Ahupuaʻa* were ruled by *aliʻi ʻai ahupuaʻa* or chiefs who controlled the *ahupuaʻa* resources; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land. *Ahupuaʻa* lands were in turn, managed by an appointed *konohiki* or lesser chief-landlord. The *aliʻi-ʻai-ahupuaʻa*, in turn, answered to an *aliʻi ʻai moku* (chief who claimed the abundance of the entire district). Thus, *ahupuaʻa* resources supported not only the *makaʻāinana* (commoners) and *ʻohana* (families) who lived on the land but also contributed to the support of the royal community of regional and/or island kingdoms. *Ahupuaʻa* are land divisions that typically incorporated all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base (Hommon 1986). Although the *ahupuaʻa* land division typically incorporated all of the eco-zones, their size and shape varied greatly. This form of district subdividing was integral to Hawaiian life and was the product of resource management planning that was strictly adhered to. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources (Rechtman and Maly 2003). In communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in the procurement of marine resources) were also strictly enforced.

By the seventeenth century, large areas of Hawaiʻi Island were controlled by a few powerful *aliʻi ʻai moku*. There is island-wide evidence to suggest that growing conflicts between independent chiefdoms were resolved through warfare, culminating in a unified political structure at the district level. It has been suggested that the unification of the island resulted in a partial abandonment of portions of leeward Hawaiʻi, with people moving to more favorable agricultural areas (Barrera 1971; Schilt and Sinoto 1980). ʻUmi a Līloa, a renowned *aliʻi* of the Pili line, is often credited with uniting the Island of Hawaiʻi under one rule and spent time in Hilo during the Precontact Period (Cordy 1994).

A Brief History of Hawaiʻi After Western Contact

The arrival of Western explorers in Hawaiʻi ca. 1778 signified the end of the Precontact Period and the beginning of the Historic Period. With the arrival of foreigners such as British explorer Captain James Cook, in command of the ships *H.M.S. Resolution* and *H.M.S. Discovery*, Hawaiʻi's culture and economy underwent drastic changes. Demographic trends during the late early Historic Period indicate population reduction in some areas due to war and disease, with an increase in others and relatively little change in material culture. At first, there was a continued trend toward craft and status specialization, intensification of agriculture, *aliʻi* controlled aquaculture, the establishment of upland residential sites, and the enhancement of traditional oral history (Kirch 1985; Kent 1983). The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although western influence was already altering the cultural fabric of the Islands (ibid.). Foreigners very quickly introduced the concept of trade for profit, and by the time Kamehameha I had conquered Oʻahu, Maui, and Molokaʻi, in 1795, Hawaiʻi had seen the beginnings of a market system economy (Kent 1983). Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early visitors. Introduced foods often grown for trade with Westerners included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845). As the Historic Period progressed, Kamehameha I died in 1819, and the long standing *kapu* system was abolished soon after, in 1820. Christianity established a firm foothold in the islands, and introduced diseases and global economic forces began to have a devastating impact on traditional lifeways in the Hawaiian Islands. This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture.

PĀHOEHOE, LAʻALOA AND THE GREATER NORTH KONA DISTRICT

The current project area is situated in the central region of the *moku* (district) of Kona, which is one of six *moku* on Hawaiʻi Island. Kona extends from the shore across the entire volcanic mountain of Hualālai and continues to the summit of Mauna Loa. Due to its sheer size, Kona is often geographically divided into two regions, North Kona or Kona *ʻĀkau*, and South Kona or Kona *Hema* (Figure 11). The project area is situated within the North Kona region, which is traditionally delineated by Keahualono at the north to Puʻuohau at the south (Pukui 1983). Within the greater Kona region, royal centers were established at several locations including Kailua, located north of the project area, and Kahaluʻu-Keauhou, Kaʻawaloa-Kealakekua, and Hōnaunau, located to the south of the project area. The *moku* of Kona contains over 100 *ahupuaʻa* and approximately forty-four of these fall within the agriculturally fertile central Kona region. The majority of the *ahupuaʻa* located in the central Kona region are fairly narrow and include a combination of forest lands, upland farms, coastal *kula*, and offshore resources.

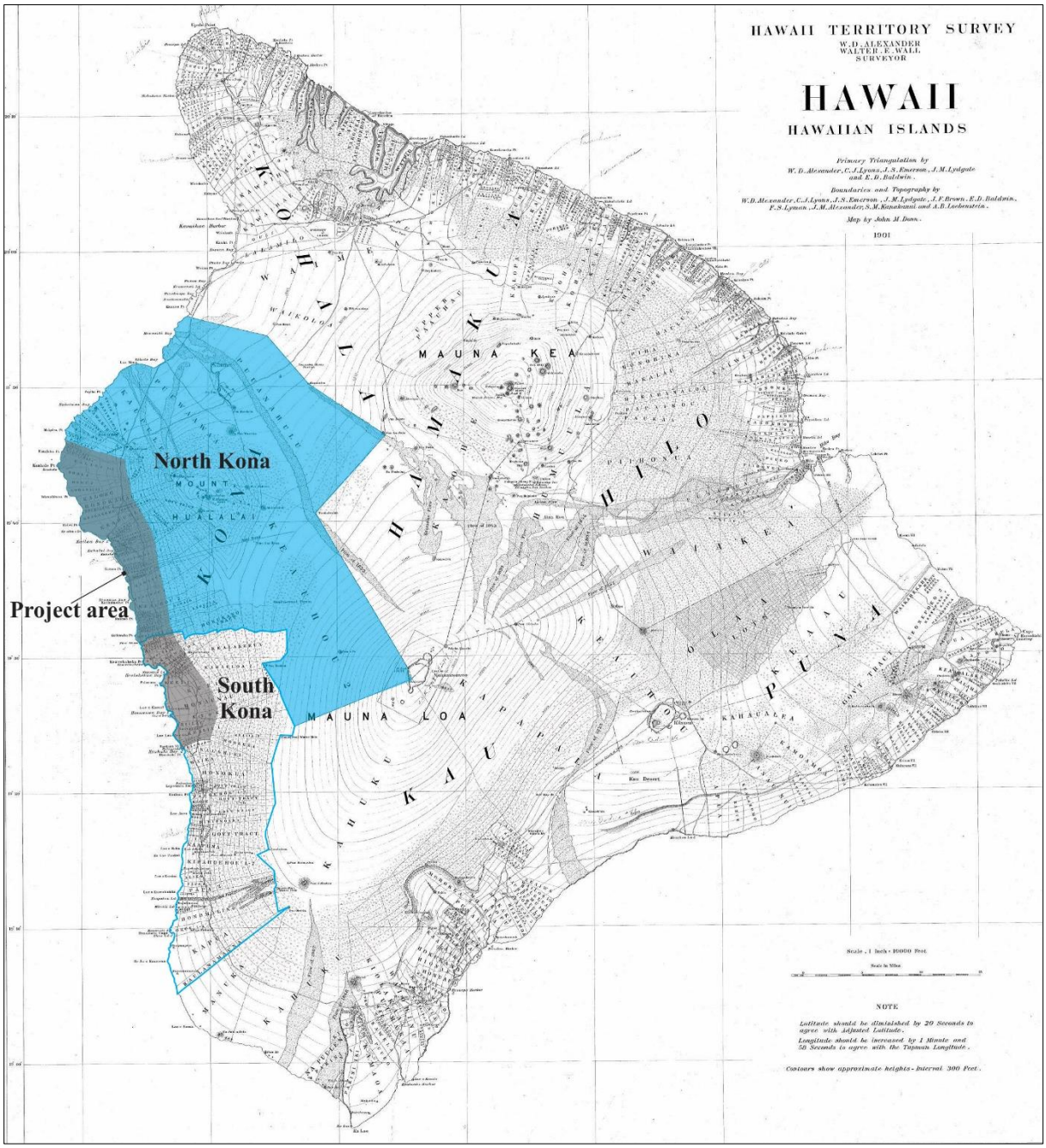


Figure 11. Portion of Hawai‘i Registered Map 2060 by J.M. Donn showing project area location in relation to Kona district (blue) and Kona Field System (shaded gray) ca. 1901.

According to Pukui et al. (1974), Pāhoehoe was named in honor of the chiefess Pāhoehoe-wahine-iki-a-ka-lani. The name also references the *pāhoehoe* type of lava characterized by its unbroken, smooth texture (ibid.), which is also a defining geological feature of this area. The name Laʻaloa has been literally translated by Pukui et al. as "very sacred" and was home to a *heiau* "called Lele-iwi (bone altar)" where Hāwaʻe, a famous priest, resided (ibid:126). Although the descriptive historical references for Pāhoehoe and Laʻaloa are limited, Handy et al. (1991) and Kamakau (1992) provide general descriptions of the upland areas extending from Kailua to Keauhou. Their accounts are presented below:

> In the uplands above Kahaluʻu, Keauhou, and Kailua, was a vast plantation named Kuahewa (huge), belonging to Kamehameha I. To protect these lands, which were cultivated for his people in the section, Kamehameha established the law that anyone who took one taro or one stalk of sugar cane must plant one cutting of the same in its place. (Handy et al. 1991:524)

> He [Kamehameha I] himself and those who ate with him (*ʻai-alo*) toiled with their own hands to set out a large tract in the uplands of Kailua, known as Kuahewa. When the land had been cleared and taro tops planted the whole field was covered with fern leaves as mulch. As the taro grew large enough to pull the little ones were left to grow, and it was said that the field was productive for years without wild growth. The chief did not allow his men to help themselves to taro and tops for planting, as was the custom for those in power in time of scarcity. He believed in the rights of the common people… (Kamakau 1992:204)

Presumably, what Handy et al. describe as *Kūāhewa* may be a portion of what has been referred to as the Kona Field System (see Figure 11) by archaeologists; an agriculturally fertile region that includes multiple *ahupuaʻa* across North and South Kona districts. (Cordy 1995; Newman 1970; Schilt 1984). A large portion of the field system is designated in the Hawaiʻi Register of Historic Places as Site 50-10-37-6601 and has been determined eligible for inclusion in the National Register of Historic Places. The Kona Field System is approximately 30 x 5 kilometers, and extends from Kaū Ahupuaʻa at the north to Hoʻokena Ahupuaʻa at the south, with an altitudinal range of 0-2,500 meters (Horrocks & Rechtman 2009). A defining feature of the Kona Field System is the network of long field walls that extend in a *mauka-makai* direction. These walls are known by several names, all of which share a similar concept of the skeleton of the land, such as *kuaiwi* or back bone (Allen 2004). Handy et al. provide the following additional description of this concept, stating:

> *Iwi* (bone) or *iwi kuamoʻo* (backbone) was the term applied to the line of rocks and refuse thrown up along the side of *moʻo ʻaina*, or *kihapai* in clearing. These *iwi* or *iwi ʻaina* demarked the boundaries of plantations and arable holdings, and hence were also called *palena*, or bounds. They were not mere rubbish heaps, but for example on Hawaii, served for planting sugar cane round about the field of dry taro in upland Kona, Kaʻu, and Kohala… In upland Kona they may be seen today buried in woods or occasionally bounding taro plantations still utilized. (Handy et al 1991:51)

Other key features of the field system are terraces, mounds, and enclosures (Allen 2004). Historically, the various fields that make up the Kona Field System were thought to be a cohesive unit (Newman 1974). However, recent research and interpretation suggest the field system was more dynamic with distinct agro-ecological zones (Lincoln & Ladefoged 2014). Additionally, the field system is believed to have expanded as the regional population increased and the Hawaiian socio-political system became more centralized (Horrocks & Rechtman 2009; Rechtman et al. 2001). This dryland field system was a major source of food for the Island of Hawaiʻi as evidenced by early European explorers and played a central part in the Hawaiʻi's Precontact economy. Given the lack of major surface streams in this geologically young district, the Kona Field System relied primarily on rainfall, supplemented with innovative regional horticultural techniques (Lincoln & Ladefoged 2014).

The basic characteristics of this agricultural/residential system as presented in Newman (1970) have been confirmed and elaborated on by archaeological (Kelly 1983; Cordy 1995; Johnson and Wolforth 2006) and ethnohistorical investigations (Kelly 1983). The construct is based on the Hawaiian terms for the major vegetation zones, which are used to define and segregate space horizontally across the region's *ahupuaʻa* (Table 1). These vegetational bands are organized roughly parallel to the coast and mark changes in elevation, rainfall, and flora. The current project area is located within the *kula* zone, described by Horrocks & Rechtman (2009) as extending from sea level-150-meter elevation. Kelly briefly describes the general characteristics of the *kula* zone thusly:

> The term *kula* is defined as a "plain, field, open country, pasture" (Pukui and Elbert 1957:164). A legislative act passed in 1884 "distinguishes dry or *kula* land from wet or taro land" (ibid.). At Kailua, Kona, the *kula* zone, or coastal plain, stretches inland from the beach. (1983:47)

Table 1. Traditional Hawaiian agricultural zones

Zone	*Annual Rainfall (cm.)*	*Elevation (m.)*	*Primary Crops*
Kula	75-125	Sea level-150	*ʻUala*, *wauke*, and *ipu*
Kaluʻulu	100-140	150-300	*ʻUlu*, *ʻuala*, and *wauke*
ʻĀpaʻa	140-200	300-750	Dry land *kalo*, *ʻuala*, *kī* and *kō*
ʻAmaʻu	> 200	750-1,200	*Maiʻa* (both plantain and banana)

Because of the geographical location coupled with the lack of perennial streams, the field system depended primarily on rainfall. Pukui documents several *ʻōlelo noʻeau* (Hawaiian proverbs) for Kona that capture the importance of observing nature for signs of rain.

> *Aia ka wai i ka maka o ka ʻōpua*
>
> Water is in the face of the ʻōpua clouds.
>
> In Kona, when the *ʻōpua* clouds appear in the morning, it's a sign that rain is to be expected. (1983:9)
>
> *Ao ʻōpiopio*
>
> Young cloud.
>
> A cloud that rises from sea level or close to the cloud banks and is as white as steam. When seen in Kona, Hawaiʻi, this is a sign of rain. (ibid.: 27)
>
> *Māmā Kona i ka wai kau mai i ka maka o ka ʻōpua*.
>
> Kona is lightened in having water in the face of the clouds.
>
> Kona is relieved, knowing that there will be no drought, when the clouds promise rain. (ibid.:232)

In addition to observing the elements for signs of rain, the ancient horticulturalists also invoked certain deities to encourage rainfall and promote abundance. It is therefore not unusual that the Kona region is synonymous with the deity Lono, who was considered the "rain maker" and closely associated with fertility (Handy et al. 1991:333). Lono was often identified with the southern coast of Hawaiʻi Island, and according to Kalokuokamaile, a native of Kona, temples dedicated to Lono were established throughout Kona to invoke rain and fertility (ibid.). Lono was also embodied in dark rain clouds brought on by the southerly (*kona*) storms. In traditional myths, it is believed that Lono migrated from the south and landed in Kona where he introduced several food plants, such as *kalo* (taro), *ʻuala* (sweet potato), *uhi* (yams), *kō* (sugar cane), *maiʻa* (banana) and *ʻawa* (kava) (ibid.). Mythology permeated agricultural pursuits as well as other facets of daily life. The following section focuses on such legendary accounts of the project area vicinity.

Legendary Accounts for the Ahupuaʻa of Pāhoehoe and Laʻaloa

Specific legendary and historical references to the Pāhoehoe and Laʻaloa *ahupuaʻa* are limited and appear mainly as passing remarks, or are lumped together with references to the neighboring *ahupuaʻa*. Additionally, the literature referring to Pāhoehoe does not distinguish whether the *ahupuaʻa* being referred to is Pāhoehoe 1, 2, 3, or 4. Maly notes that traditionally, Pāhoehoe was one large land unit until the change to a western style land ownership system (the *Māhele* of 1848), when it was divided into four units that are now all identified as separate *ahupuaʻa"*(Maly 1996:A). Three legendary accounts have been identified during this study that made specific reference to Pāhoehoe and Laʻaloa *ahupuaʻa*: A Story of Hāwaʻe, *"Ke Kaʻao Hoʻoniua Puʻuwai no Ka-miki"* (The Heart Stirring Story of Ka-Miki), "*He Moʻolelo Kaʻao no Kepakaʻiliʻula*" (A Story about Kepakaʻiliʻula), and The Legend of Kaumaʻiliʻula. Summaries of each of these stories are presented below.

A Story of Hāwaʻe

In 1997, Kepā Maly located a legendary account in the Charles R. Bishop collection at the Bernice Pauahi Bishop Museum about an ancient and powerful priest named Hāwaʻe. According to legend, Hāwaʻe was born in a supernatural form and lived at the *heiau* of Leleiwi located in the uplands of Laʻaloa. Hāwaʻe became such a powerful and renowned priest that he was later worshipped by the ancient people. Maly writes (emphasis added):

> Hāwaʻe is the name of one of the gods, worshipped by the ancient people of these islands. This god was famous for his *mana* (power), and ability to help those who cared for him. In this story of the priestly order, Hāwaʻe was of the seventeenth order of priests descended from Haumea… Because

> Hāwaʻe was expert in various practices of the priest, he became the foremost priest of Ehu Kaipo, the chief who controlled the island of Hawaiʻi, who dwelt above the trail known as Ehu Kaipo (*ke ala Ehu*) in North Kona. The chief would continually call upon the name of his priest and seer, Hāwaʻe, because there was no one more powerful than he…
>
> There were eight images which were all called by the name Hāwaʻe. The first image was hidden near the *heiau* Ka-houpo-o-Kāne at Kapuʻa. The second image was hidden in an ocean cave in front of Hale-o-Keawe. The third image was hidden in a cave near the *heiau* called Hai-lu-lani in Hōlualoa 4. The fourth image was in the uplands of Laʻaloa. North Kona, near the *heiau* called Lele-iwi. It was at this *heiau* that the priest Hāwaʻe also dwelt. The fifth image was hidden near the *heiau* called Ku-hoʻopio-ka-lā, above Kailua. The sixth image was on the north side of the hill of Huʻehuʻe in Kekaha. It was broken apart when the road was made. The seventh image was in the uplands of Waiʻaha, [a] place in the spring of Waikiʻi, near the *heiau* of Papa-kōlea. The eighth image was found there in the *heiau* of Kuahua, at Kukui-o-lauka.
>
> The order of priest of Keaweʻaikō were the last to care for these images… It was because so many of these images were kept at the various *heiau*, that the saying came about "*Hoʻokāhi wale no o Hāwaʻe, lauhue Kona*" (There is only one Hāwaʻe, all Kona is covered with the vines of the poison gourd)… (Maly 1997:4-5).

Based on Hāwaʻe's association with the ruling chief ʻEhu, who ruled during the 1500s, this legendary account is one of the earliest for the Pāhoehoe-Laʻaloa area.

"Ke Kaʻao Hoʻoniua Puʻuwai no Ka-miki"- The Heart Stirring Story of Ka-Miki

The *moʻolelo* titled, "*Kaʻao Hoʻoniua Puʻuwai no Ka-Miki"* (The Heart Stirring Story of Ka-Miki), originally appeared in the Hawaiian language newspaper *Ka Hōkū o Hawaiʻi* between 1914 and 1917. This *moʻolelo* was likely authored during the late 1800s through early 1900s by noted Hawaiian scholars John Wise and J.W.H.I. Kihe. Maly notes that although this *moʻolelo*,

> . . . is not an ancient account, the authors used a mixture of local legends, tales, and family traditions in association with place names to tie together fragments of site specific stories that had been handed down over the generations. Thus, while in many cases, the personification of individuals and their associated place names may not be "ancient," the site documentation within the "story of Ka-miki" is of both cultural and historical value. (1997:5)

The story tells of two supernatural brothers, Ka-Miki and Maka-ʻiole, who were skilled *ʻōlohe* (competitors/fighters), and their travels around Hawaiʻi Island by way of the ancient trails and paths (*ala loa* and *ala hele*), seeking competition with other *ʻōlohe.* The two brothers were born to Pōhaku-o-Kāne (male) and Kapaʻihilani (female), who were the *aliʻi* of the lands of Kohana-iki and Kaloko, North Kona. Upon the mysterious and premature birth of Ka-miki, he was placed in the cave of Pōnahanaha and given up for dead. He was eventually saved and raised by his ancestress, Ka-uluhe-nui-hihi-kolo-i-uka, a manifestation of the goddess Haumea, at Kalamaʻula, an area located on Hualālai. Ka-miki was later joined by his elder brother Makaʻiole where their ancestress Ka-uluhe-nui trained her grandsons into *ʻōlohe*, or experts skilled in fighting, wrestling, debating, riddle solving, and running, and how to use their supernatural power.

A portion of the legend was set in the Pāhoehoe-Laʻaloa area and was published in *Ka Hōkū o Hawaiʻi* on April 9, 1914. Upon partaking in some *ʻawa*, a drink made by mixing the root of the *ʻawa* plant (*Piper methysticum*) with fresh water, with their ancestress, Ka-uluhe-nui falls asleep and the two brothers venture down to the area of Kealakekua to explore the land and the people. Upon their return, Ka-uluhe-nui inquires about their visit. From this portion of the *moʻolelo*, we learn about the lands of Pāhoehoe and Laʻaloa. Based on the described route, Ka-miki and his brother Maka-ʻiole would have passed through the Pāhoehoe-Laʻaloa area. Translated by Maly, this portion of the *moʻolelo* describes the people and places within the area as follows:

> … Kaumalumalu was named for the chief Kaumalumalu, he was the - *aliʻi ʻai ahupuaʻa, me nā paukū ʻāina a me nā ʻokana ʻāina o Pāhoehoe, Laʻaloa, a me Kāpalaʻalaea*—chief to whom the sub-districts and land parcels of Pāhoehoe, Laʻaloa and Kāpalaʻalaea answered. The saying, "Kaumalumalu i ka hēkuawa" (Kaumalumalu is like a sheltered, or shaded valley) is said in praise of the calm and beauty of this area… (Maly 1997:6)

"He Moʻolelo Kaʻao no Kepakaʻiliʻula"—A Story about Kepakaʻiliʻula

The areas of Pāhoehoe and Laʻaloa are briefly mentioned in the *moʻolelo* of Kepakaʻiliʻula. This story has been recorded in two Hawaiian language newspapers, *Ka Nūpepa Kūʻokoʻa* (between October 22, 1864, and June 8, 1865) by S.W.P. Kaulainamoku, and later in *Ka Hōkū O Hawaiʻi* (between March 20, 1919, and December 9, 1920). Abraham Fornander (1917) also recorded this story, however, his version differs substantially from those printed in the newspapers and is not included in this study. As such, from versions recorded in the newspapers, we learn of a large *māla maiʻa* (banana patch) that belonged to the *aliʻi* Kahoʻoaliʻi of Kona, which extended *mauka* of Kaumalumalu (north of project area) to Kāpalaʻalaea (south of project area).

Maly (1997) provides a brief background for this lengthy story. Through analyzing and associating other figures identified in this story, Maly believes the story is set sometime during the 16th century. As such, a summary of Maly's description is provided. Kepakaʻiluʻula was born in an *ʻeʻepa* (mysterious, premature) form to his mother Hinaʻaikamālama and his father Makaokū at Mokuola (also known as Coconut Island) in Hilo. Being left for dead by his parents, Kepakaʻiliʻula was taken and reared by his mother's brothers, Kiʻihele and Kiʻinoho, who trained him in fighting techniques, and instructed him on how to use his supernatural powers. When Kepakaʻiliʻula came of age, his uncles set out in search of a suitable chiefess whom he could marry. The uncles searched all over Hawaiʻi Island but found no one suitable until they met Mākoleʻā, the daughter of chief Keolonāhihi and his wife Kahaluʻu. Keolonāhihi, Kahaluʻu and the two uncles agreed that Mākoleʻā was the most suitable partner for Kapakaʻiliʻula. After securing the arrangement, *the chief* Kaikipaʻananea of Maui approached Keolonāhihi and asked to marry his daughter. Thus, Keolonāhihi broke the betrothal between Kepakaʻiliʻula and Mākoleʻā. The breaking of this betrothal set in motion a series of events which is the focus of this narrative.

After leaving Kahaluʻu, Kepakaʻiliʻula and his men travel in the uplands and reach the *ahupuaʻa* of Kaumalumalu at a place known as Kiʻei. Here they arrive at a large patch of bananas that belonged to chief Kahoaliʻi of Kona. Kepakaʻiliʻula and his men remain at this patch for four *anahulu* (roughly forty nights as one *anahulu* equals ten days) and destroyed the banana patch (*Ka Nūpepa Kūʻokoʻa* November 5, 1864). This section of the story differs slightly in the version printed in *Ka Hōkū O Hawaiʻi* (July 24, 1919). This version of the story adds that Kepakaʻiliʻula sought to wage war on Kahoaliʻi by eating from his sacred patch and later destroying the patch altogether. The act of destroying large groves of trees was sacrilegious and was grounds for war (Kamakau 1992).

The Legend of Kaumaʻiliʻula

In her book titled *Hawaiian Mythology*, Martha Beckwith published a shortened version of the story of Kaumaʻiliʻula. From this account we learn that Hōlualoa and Laʻaloa, the namesake of one of the subject *ahupuaʻa*, were husband and wife who together bore ten children (Beckwith 1970). Their five sons were named Kalino, Lulukaina, Ahewahewa, Wawa, and Mumu. Beckwith lists their five daughters as "the four Maile sisters and Kaulana" (ibid.:517). Additional research into the Hawaiian language newspapers reveals that the names of the four *maile* sisters were: Mailelauliʻi, Maileha'iwale, Mailepākaha and Mailehihikaluhea (*Ka Nūpepa ʻElele*, January 9, 1892). According to Pukui & Elbert, four varieties of *maile* (*Alyxia* sp.) are named in honor of the four demigoddess sisters, who each possessed the fragrance of the *maile* plant (1986:478). Beckwith's version is presented below:

> …Mailelauliʻi, the eldest girl, becomes the wife of Hikapoloa, chief of Kohala district, and lives upward of Puʻuwepa. Ka-ili-a(a)la (*Fragrant skin*) is their child. He marries Waikua-aala and the two have four children, Luʻukia, Kaumailiula, Ka-lehua-lihilihi-loloa, and Kukui-kupuohiohi-hoʻowiliwili. Luʻukia sails to Kahiki and weds Olopana, ruling chief of Kahiki. Olopana's daughter Kaupea hears so much from Luʻukia of the beauty of Kaumailiula that she sails from Kuaihelani, finds him at Kailua, and takes him for her husband. She becomes pregnant and returns to Kahiki for the child's birth. Kaumailiula follows but lands in Kuaihelani on a tapu day when Kaupea is in labor and Luʻukia and the chief are gathered in the tapu house prepared for the birth of the child. The whole party is seized and imprisoned. Old woman Kaikapu proceeds to have them burnt to death, but through the prayers of Kaulana [youngest child of Hōlualoa and Laʻaloa] they escape. The child is called Ka-maka-o-ke-ahi (Eye of fire), and from him is descended Kahihi-o-ka-lani (The branching of the heavenly one). (1970:517)

Early Historic Accounts- The Reign of ʻEhunuikaimalino through Kamehameha I

Sometime during the sixteenth century, chief ʻEhuinuikaimalino (also referred to as ʻEhu) was appointed by his father Kūāiwa to rule over Kona, while a junior son, Hukulani ruled over Kohala. During ʻEhu's reign, four of the six *moku*

on Hawai‘i Island was ruled by an independent chief: Kulukulu‘ā in Hilo, Hua‘ā in Puna, ‘Īmaikalani in Ka‘ū, and it is believed that Līloa ruled over Hāmākua (Cordy 2000). In addition to ‘Ehu, Kūāiwa had three sons from a previous wife, Kahoukapu, Hukulani, and Manauea, all of whom became the heads of Hawai‘i’s aristocratic families (Fornander 1880). Although the ‘Ehu line of chiefs grew to be somewhat powerful, ‘Ehu was ranked second to Līloa (Kelly 1983). According to Kamakau, ‘Ehu placed his son, Laea-nui-kau-manamana in Līloa’a royal court and for some time they both resided in Waipi‘o where Laea-nui assisted with the construction of the sacred stone slab known as *Ka paepae kapu o Līloa*. Upon the death of Līloa, his kingdom was usurped by his second son, ‘Umi-a-līloa. However, the chiefs of Hilo, Puna, Ka‘ū, and Kona withheld their allegiance to ‘Umi. According to Kamakau (1992), by the time ‘Umi sought to gain control over Kona, ‘Ehu was of old age, and therefore Kona and Kohala were easily seized by ‘Umi. With regard to the death of ‘Ehunuikaimalino, Malo (1951) notes that he was assassinated by some fishermen out in Keahuolū, Kona.

Upon ‘Umi’s unification of Hawai‘i Island, he moved his royal court to Kailua, Kona and eventually took the daughter of ‘Ehu, Moku-a-hua-lei-akea as his wife. She bore ‘Umi a daughter named ‘Akahi-‘ili-kapu. ‘Umi’s reign is one that is often celebrated as it marked a time of peace and increased productivity and a move towards craft specialization. According to Kamakau,

> There was no kingdom like his. He took care of the old men, the old women, the fatherless, and the common people. Murder and thievery were prohibited. He was a religious chief, just in his rule…
>
> During ‘Umi-a-Liloa’s reign, selected workers and set them in various positions in the kingdom. He separated those of the chiefly class (*papa ali‘i*), of the priestly class, of the readers of omens (*papa kilo*), those skilled in the affairs of the land (*po‘e akamai o ka ‘aina*), farmers, fishermen, canoe builders, warriors, and other skilled artisan (*po‘e pale ‘ike*) in the work they were best suited for; and each one applied himself to his own task. . .
>
> ‘Umi-a-Liloa did two things with his own hands, farming and fishing. He built large wet taro patches in Waipi‘o, and farming was done on all the lands. Much of this was done in Kona. . . (1992:19)

References to Pāhoehoe and La‘aloa appear in the *mo‘olelo ka‘ao no Kūhaupi‘o, ke koa kaulana o ke au o Kamehameha ka Nui* (Kamehameha and his warrior Kekūhaupi‘o), published by Reverend Stephen Desha (2000). According to his account, after the death of the high chief Kalani‘ōpu‘u, his body was transported to Kona on a large canoe accompanied by Kīwala‘ō, his son and heir to his kingdom, and chief Keawemauhili of Hilo. Upon their arrival in Kona, Keawemauhili greeted the chiefs of Kona, who thereby took insult to his speech. The Kona chiefs suspected that Keawemauhili was seeking grounds to wage war against them. Aware of the impending situation, Kekūhaupi‘o fetched Kamehameha from Kohala and brought him to Ka‘ūpūlehu, Kona. After preparing Kamehameha, the account goes on to note that Kekūhaupi‘o departed Ka‘ūpūlehu and stayed with some of his uncles in La‘aloa (ibid.).

The Prophesy of Kapihe

The prophecy of the *kāula* (seer) named Kapihe during the time of Kamehameha I is another significant *mo‘olelo* that references the Pāhoehoe-La‘aloa area (by association with the identified place names). Kapihe’s prophesy has been interpreted as foretelling the overturning of the traditional *kapu* system, a system that governed nearly all aspects of the traditional Hawaiian socio-political system, as well as the unification of the Hawaiian Islands under a single ruler. It is important to note that there are several different versions of this prophecy that have been printed in Hawaiian language newspapers as well as in Kamakau (1992) and Malo (1951). According to Kamakau’s version:

> Ka-pihe the seer prophesied in the presence of Kamehameha [I] and said, “There shall be a long *malo* reaching from Kuamo‘o to Holualoa. The islands shall come together, the tabus shall fall. The high shall be brought low, and the low shall rise to heaven.” (1992:223).

In the book *Hawaiian Antiquities*, Malo expounds on characteristics of traditional *kāula* and describes them as “a very eccentric class of people” who often “lived apart in desert places, and did not associate with people or fraternize with any one” (1951:114). Regarding the details of the prophecy, Malo writes:

> Kapihe was a noted *kaula* of the last century, living in Kona, Hawaii, at the time when Kamehameha was a general under Kalaniopuu. To Kapihe was ascribed the following oracular utterance (*wanana*) which is of the nature of a prophesy:
>
> *E iho ana o luna*; That which is above shall be brought down;
>
> *E pii ana o lalo*; That which is below shall be lifted up;
>
> *E hui ana na moku*; The islands shall be united;

E ku ana ka paia. The wall shall stand upright (1951:115).

Another version of this prophecy was published in *Ka Hae Hawai'i* on May 23, 1860, under the title "He Wanana" (A Prophesy). Maly provides a translation of the article, and it is presented in its entirety below:

> Perhaps you have heard about the prophesy made by Kapihe, before Kamehameha first. If perhaps you have not, here is the prophesy—Kamehameha returned to Hawaii with the Niaukani (fleet of canoes and ships in c. 1812), he dwelt at Holualoa in North Kona. Kapihe was a person who dwelt at Kuamoʻo, and he was at times considered to be somewhat crazy (a result of his gift of prophesy). He traveled from Kuamoo to Holualoa with a long *malo* (loincloth), prophesizing before the King. This is what he said.

E hui ana na aina,	The lands shall be united,
E iho mai ana ko ka lani,	That which is above shall come down,
E pii aku ana ko lalo nei,	That which is below shall rise above,
E iho mai ana ke Akua ilalo nei,	The God shall come down,
E kamailio pu ana me kanaka,	Speaking with mankind,
E pii mai ana o Wakea iluna,	Wakea shall rise up,
E iho aku ana o Milo ilalo,	Milo shall descend,
E noho pu ana ke akua me kanaka	The gods shall dwell like man. (Maly 1997:9)

The outcome of Kapihe's prophesy was fulfilled by 1795 when Kamehameha I conquered and unified the islands, with the exception of Kauaʻi and Niʻihau under his rule. By 1810, Kamehameha managed through negotiation with chief Kaumualiʻi of Kauaʻi to cede the remaining two islands to Kamehameha (Kamakau 1992). Following the death of Kamehameha in 1819, his son and heir to the Kingdom, Liholiho failed to reinstate the laws of *ʻaikapu*, which resulted in a war fought at Kuamoʻo (ibid.), and the ultimate abandonment of the ancient religion.

Around the same time that the prophecy of Kapihe was uttered (ca. 1812), Hawaiian historian John Papa ʻĪʻī describes a brief family gathering in Pāhoehoe. Born in 1800, John Papa ʻĪʻī was descended from the Luluka line, and following in the customs of his family, he served as *kahu* (caretaker) to several chiefs (ʻĪʻī 1959). Thus, ʻĪʻī's accounts offer an intimate look into the daily lives of the chiefs during the 19th century. ʻĪʻī's family had ties to the lands of Pāhoehoe, Kaumalumalu, and Kahaluʻu. At the time of his account, ʻĪʻī's grandfather had become ill and requested to leave Kailua and head to Hoʻokena in South Kona. During their trip ʻĪʻī recalls:

> Papa's health had become much worse after the king and chiefs had left for Kahaluu. His friends and the boy's father had gathered at Pahoehoe in Kaumalumalu, near Kailua, to be with him. The boy and his companions arrived there at dusk, to find that Papa could no longer speak clearly. (1959:115)

The Journal of William Ellis (1823)

In 1823, to accommodate the growing Hawaiʻi Calvinist mission, British missionary William Ellis along with members of the American Board of Commissioners for Foreign Missions (ABCFM) circuited Hawaiʻi Island in search of suitable locations for future mission stations and churches. Ellis and his party set out on the *ala loa* trail, located near the coast and passed through many places. As they made their way through the Pāhoehoe-Laʻaloa area, Ellis writes,

> We walked on to Pahoehoe, where we entered a large house, in which many workmen were employed in making canoes. About fifty people soon after assembled around us. We asked them if they would like to hear about the true God, and the way of salvation. They answered, Yes. I then addressed them for about twenty minutes on the first principles of the gospel. As soon as I began to speak, they all sat down, and observed perfect silence.
>
> Shortly after this service we took our leave, and proceeded along the shore to Kahaluu; where a smart shower of rain obliged us to take shelter in a house by the road side. While resting there, the voice of wailing reached out ears. We inquired whence it came and were informed by the people of the house, that a sick person in the neighborhood had just expired. (1917:90)

Missionaries like William Ellis sparked a major religious shift that left a lasting impact on the traditional Hawaiian culture including their concepts of land ownership and land use. The *Māhele ʻĀina* of 1848 would forever change the land tenure and the landscape of the Hawaiian Islands, as discussed in the section to follow.

The Legacy of the *Māhele ʻĀina* of 1848

By the middle of the nineteenth century the ever-growing population of Westerners in Hawaiʻi forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership. In 1848, the *Māhele ʻĀina* became the vehicle for determining ownership of Hawaiian lands. This change in land tenure was promoted primarily by the missionaries and Western businessmen in the island kingdom, who were hesitant to enter business deals on leasehold lands (Chinen 1958). The *Māhele* (division) defined the land interests of Kamehameha III (the *Mōʻī* or King), the high-ranking chiefs (*aliʻi*), and the *konohiki*. During the *Māhele*, all lands in the Kingdom of Hawaiʻi were placed in one of three categories: (1) Crown Lands for the occupant of the throne; (2) Government Lands; and (3) *Konohiki* Lands (ibid.). As such, these lands were claimed mainly as entire *ahupuaʻa* or *ʻili kūpono* (a subdivision of an *ahupuaʻa* that operated nearly independently of the *ahupuaʻa* in which it was located) and recorded in the *Buke Māhele*. The chiefs and *konohiki* were required to present their claims to the Board of Commissioners to Quiet Land Titles (commonly referred to as the Land Commission) to receive a Land Commission Award (LCAw.) for lands provided to them by Kamehameha III (ibid.). They were also required to provide commutations to the government in order to receive Royal Patents on their land claim awards (ibid.). The lands claimed during the *Māhele* were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. Awarding lands by name is one way the Land Commission expedited their work until formal government surveys could be completed (Chinen 1961).

As a result of the *Māhele* of 1848, the lands comprising Pāhoehoe 3 and Pāhoehoe 4 were retained as Government land, and subsequently divided and sold off as government issued Land Grants. In contrast, Pāhoehoe 2 was claimed by G. Lahilahi (LCAw. 8520), daughter of John Young Olohana and mistress of Kamehameha III (Kameʻeleihiwa 1992; Kanahele 1999), and Laʻaloa 1 was claimed by R. Keʻelikolani (LCAw. 7716), granddaughter of Kamehameha I. The project area is situated within three government issued grants, while the southwest corner is situated within LCAw. 7716 (Figures 12 and 13).

As the King and chiefs made claims to large tracts of land via the *Māhele*, questions arose with regard to the protection of rights for the native tenants. To address this matter, on August 6, 1850, the *Kuleana* Act or Enabling Act was passed that allowed native tenants to acquire an allodial title to *kuleana* parcels that they actively lived on or farmed. As such, all lands identified and claimed during the *Māhele* were subject to the rights of the native tenants therein. The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (Chinen 1958). Native tenants wishing to make a claim to their lands were required to submit a Native Register with the Land Commission, followed by Native Testimony given by at least two individuals to confirm their claim to the land. Testimony was typically given by neighbors. Upon successful submittal of the required documents, the Land Commission rendered their decision, and if successful, the tenant was awarded a LCAw. Unlike the *Māhele* between the chiefs, tenants claiming land through the *Kuleana* Act were required to pay for a Government surveyor to survey and map the boundaries of their awarded parcels.

To develop a sense of how the residents of Pāhoehoe and Laʻaloa utilized and organized themselves on the land prior to and after the *Māhele ʻĀina*, the authors of this study examined both the Native Testimony as well as the various LCA's awarded. Table 2 contains a list of all nine *kuleana* awarded in Pāhoehoe 2, 3, 4, and Laʻaloa 1. One *kuleana* land claim was awarded in Pāhoehoe 2 (LCAw. 5769), and three *kuleana* land claims were awarded in both Pāhoehoe 3 (LCAw. 3435B, 3436B, and 4705) and Pāhoehoe 4 (LCAw. 10654, 3433B, and 5788). One *kuleana* was awarded in both Pāhoehoe 2 & 3 (LCAw.10986). Analysis of the Native Testimonies (Table 3) indicates that eight *kuleana* contained multiple *ʻāpana* (parcels) hosting several agricultural fields. Five *kuleana* contained several *ʻāpana* located inland and utilized for agricultural purposes and a separate corresponding coastal ʻ*āpana* that functioned as a *pā hale* (a house lot or a residential site; see Figure 11). Some of these coastal *ʻāpana* were located in neighboring *ahupuaʻa*. As for Laʻaloa 1, only one *kuleana* land claim was awarded (LCAw. 10566). Further research into the Native Testimonies reveals that eight *kuleana* awardees received or inherited their lands from at least the time of Kamehameha I and II. The Native Testimonies also indicate that three *kuleana* awardees received their lands from chiefs Kahoaliʻi and Kaʻōanāʻeha. The name Kahoaliʻi appeared in *He Moʻolelo Kaʻao no Kepakaʻiliʻula* as a chief of Kona. According to the genealogy of Queen Emma that was printed in *Ka Nūpepa Kūʻokoʻa* on May 5, 1883, the chiefess Kaʻōanāʻeha was married to Keoni Ana, and from their union was born Kekelaokalani and her sister Gini Lahilahi, who claimed Pāhoehoe 2 during the Māhele. In the case of Pāhoehoe 2 and 3, four individuals were unsuccessful at filing their *kuleana* claims with the Land Commission and were therefore not awarded lands.

Figure 12. Portion of current TMK map showing locations of Land Commission Awards in the project area vicinity.

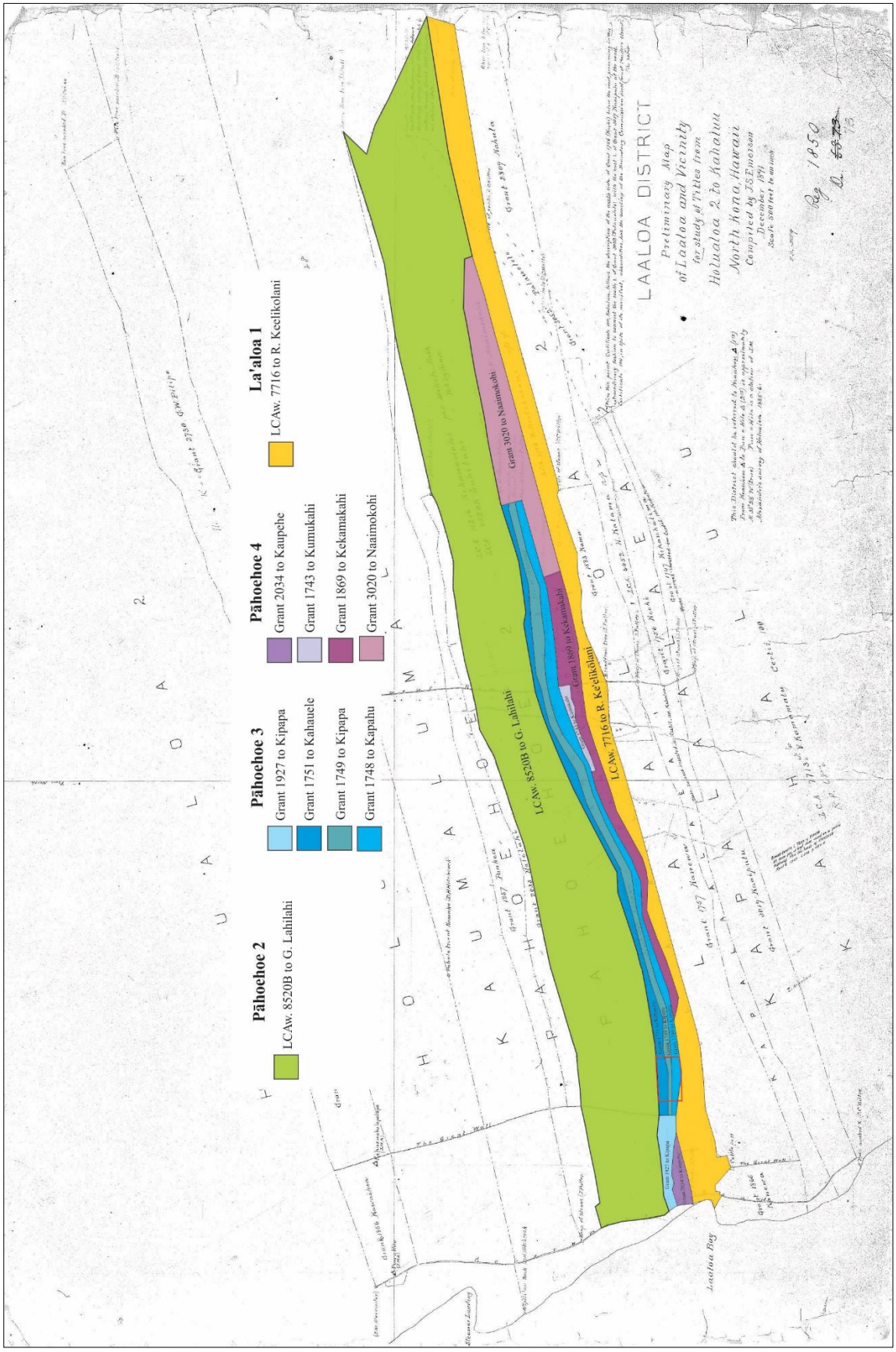


Figure 13. Registered Map 1850 by Emerson showing Land Claim Awards and Government Land Grants for Pāhoehoe 2, 3, and 4, and La'aloa 1, ca. 1891.

Table 2. Land Commission Awards in Pāhoehoe 2, 3, 4, and Laʻaloa 1.

LCAw.	*Royal Patent*	*Claimant*	*# ʻĀpana*	*Area (Acres)*	*Ahupuaʻa*	*Associated ʻili*
5769	4216	Kapule	2	2.03	Pāhoehoe 2	Haleolono
8520B	1668	G. Lahilani*	n/a		Pāhoehoe 2	
10986	4220	(Na)welu	2	2.49	Pāhoehoe 2 & 3	Kaukau
3435B	4218	Kapahu	1	2.0	Pāhoehoe 3	Keamuku
3436B	4217	Koeke	1	2.10	Pāhoehoe 3	Kahai
4705	4221	Moopuu	2	3.38	Pāhoehoe 3	Kamani
10654	4219	Pueo	1	1.8	Pāhoehoe 4	Ililoa and Kamuku
3433B	7018	Kahookele	1	1.8	Pāhoehoe 4	Kapio
5788	4222	Kauaawa	2	1.6	Pāhoehoe 4	Kapio and Ililoa
7716	n/a	R. Keelikōlani*	n/a		Laʻaloa 1	
10566	4214	Opunui	2	1.53	Laʻaloa 1 &2	Ohiki and Ulaole

** Aliʻi awards during the Māhele of 1848*

Table 3. Summary of Native Testimonies for *kuleana* awards (*ʻāpana* = Ap.).

Claimant/LCAw.	*Associated Notes*	*Agricultural Features*	*Residential Features*
Kapule/ 5769	From Kaoanaeha during reign of Kamehameha I. Nawelu resided under Kapule, who died in 1847, whereby the estate was transferred to his five children.	Ap. 1- 3 *kīhāpai* Ap. 2- 5 *kīhāpai* Ap. 3- 5 *kīhāpai* Ap. 4- 6 *kīhāpai* Ap. 5- 7 *kīhāpai* Ap. 6- 6 *kīhāpai* Ap. 7- 3 *kīhāpai*	Ap. 8- *Pāhale*, fenced with 3 homes, 2 for Kapule and 1 for Nawelu. Ap. 9- *Pāhale* located *makai* of the Govt. Road. Fenced.
Nawelu/10986:1	From his in-laws who received the land during the time of Kamehameha I	Ap. 1- 5 *kīhāpai* Ap. 2- 6 *kīhāpai* Ap. 3- 5 *kīhāpai* Ap. 4- 7 *kīhāpai*	Ap. 5- *Pāhale* located *mauka* of the Govt. Road. Lot is fenced with 2 houses for Nawelu
Kapahu/3435B	Received during the time of Kamehameha II	Ap. 1- 6 *kīhāpai* Ap. 2- 9 *kīhāpai* Ap. 3- 8 *kīhāpai*	n/a
Koeke/3436B	n/a	Ap. 1- 8 *kīhāpai* Ap. 2- 7 *kīhāpai* Ap. 3- 5 *kīhāpai*	n/a
Moopuu/4705	From Kahoaalii during the time of Kamehameha II	Ap. 1- 5 *kīhāpai* Ap. 2- 1 *paukū* Ap. 3- 1 *paukū* & 3 *kīhāpai*	Ap. 4- *Pāhale* located *mauka* of Govt. Road. Lot is fenced with 4 houses, 1 for Moopuu, 1 for Kapahu, 1 for Koeke
Pueo/10654:3	Received land during time of Kamehameha I	Ap. 1- 16 *kīhāpai* Ap. 2- 1 *paukū* Ap. 3- 1 *paukū* Ap. 4- 1 *paukū*	n/a
Kahookele/3433B	From Kaoanaea in 1844	Ap. 1- 7 *kīhāpai* Ap. 2- 4 *kīhāpai* Ap. 3- 3 *kīhāpai* Ap. 4- n/a	n/a
Kauaawa/5788	Kauaawa died in Dec. 1848 and his estate transferred to Pueo	n/a	Ap/ 1 *Pāhale mauka* of Govt. Road. Lot is fenced with 3 houses.
Opunui/10566	Received from his parents during the time of Kamehameha I	Ap. 1- 4 *kīhāpai* Ap. 2- *Kaluʻulu* with 16 *kīhāpai* Ap. 3- *Paheʻe* with 8 *kīhāpai* Ap. 4- Kula with 8 *kīhāpai* Ap. 5- 4 *kīhāpai*	Ap. 6- Pāhale mauka of Govt. Road. Lot is fenced with 2 houses.

The Native Testimonies, provide insight into the pre-*Māhele* settlement patterns specific to Pāhoehoe and La‘aloa. The concentration of coastal house lots and the scattered upland agricultural fields provides a classic example of the *mauka-makai* relationship that was inherent in the *ahupua‘a* system. Although not explicit in the Native Testimonies, historic maps and information collected from oral histories (Maly 1998) reveal the importance of pedestrian trails in this system. One such trail is depicted on an early Real Property Tax Office map (Figure 14) extending from the former Ala loa, through Grant 1927 and Grant 1751 and terminating at the current Kuakini Highway. The dispersed nature of the agricultural fields coupled with the clustered residential sites provided the area residents with the necessary resources to sustain themselves. This settlement pattern would be severely altered as lands furnishing the essentials of traditional life were reallocated following the *Māhele*.

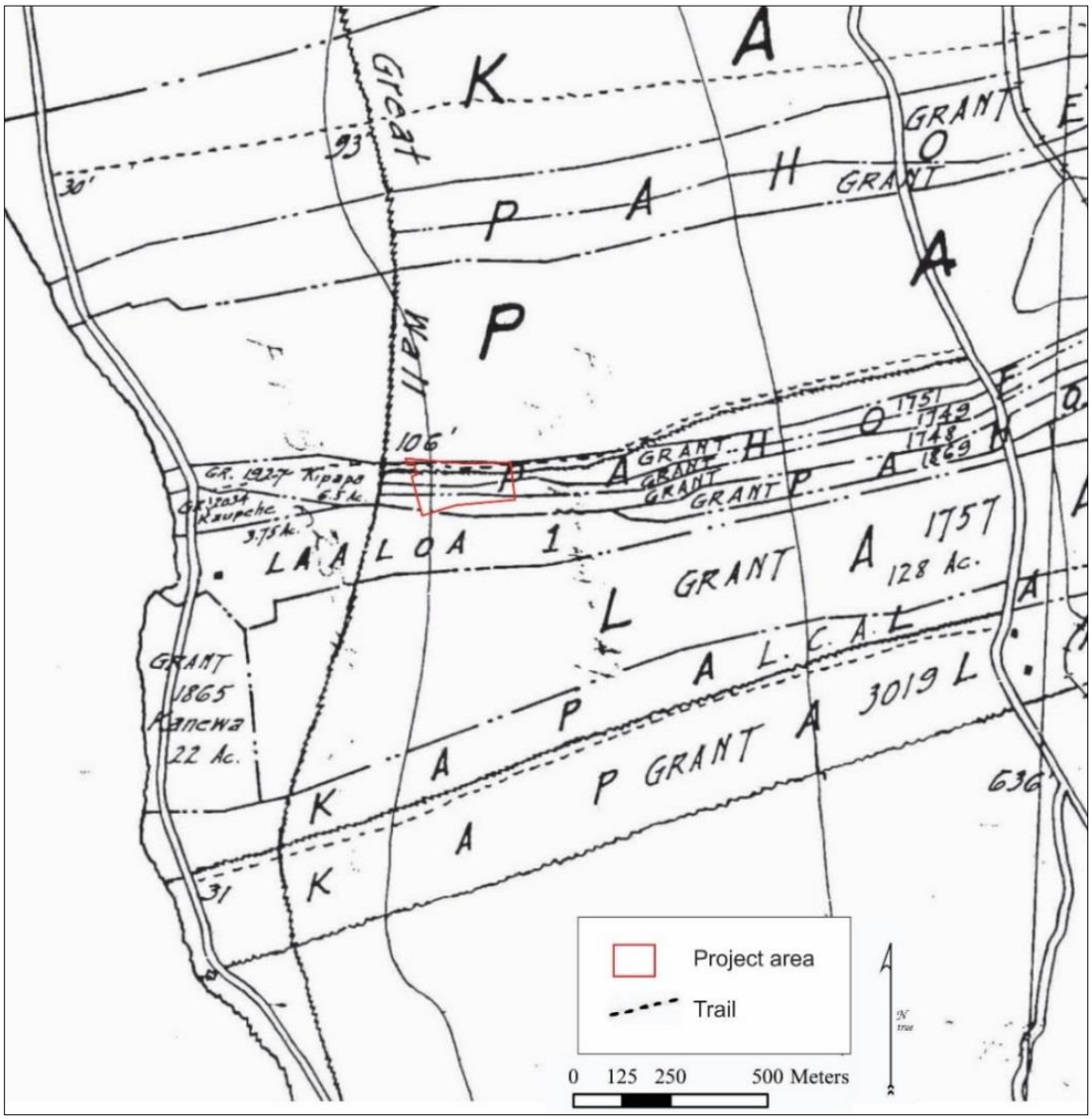


Figure 14. “Kainaliu” pre-tax map circa 1928 (Real Property Tax Office) showing a trail extending through the project area and nearby vicinity.

In conjunction with the *Kuleana* Act, the King authorized the issuance of Land Grants to applicants for tracts of Government land that were allocated during the *Māhele*. These Land Grants were generally larger than those awarded by the Land Commission. The Act resolved that portions of the Government Lands should be set aside and sold as grants ranging in size from one to fifty acres at a cost of fifty cents per acre. The stated goal of this program was to enable native tenants, many of whom were insufficiently awarded or not awarded land through the *Kuleana* Act to

purchase lands of their own. Despite the stated goal of the land grant program, this provided the mechanism that allowed many foreigners to acquire large tracts of the Government Lands. Table 4 is a listing of all Land Grants for Pāhoehoe 3 and Pāhoehoe 4. A total four grants were awarded in Pāhoehoe 3, totaling 69 acres, while another four grants were awarded in Pāhoehoe 4, totaling 67.75 acres. The current project area is comprised of portions of three separate grants and LCAw. 7716. Three of the grants fall within Pāhoehoe 3 (from north to south): Grant No. 1751 to Kahauele, Grant No. 1749 to Kipapa, and Grant 1748 to Kapahu. While the southwest portion of the parcel lies within LCAw. 7716 awarded to R. Keʻelikōlani as depicted in Figures 13 and 15. All Land Grant documents were obtained from the Office of Hawaii Affairs (OHA) Kipuka Online GIS Database (OHA 2013).

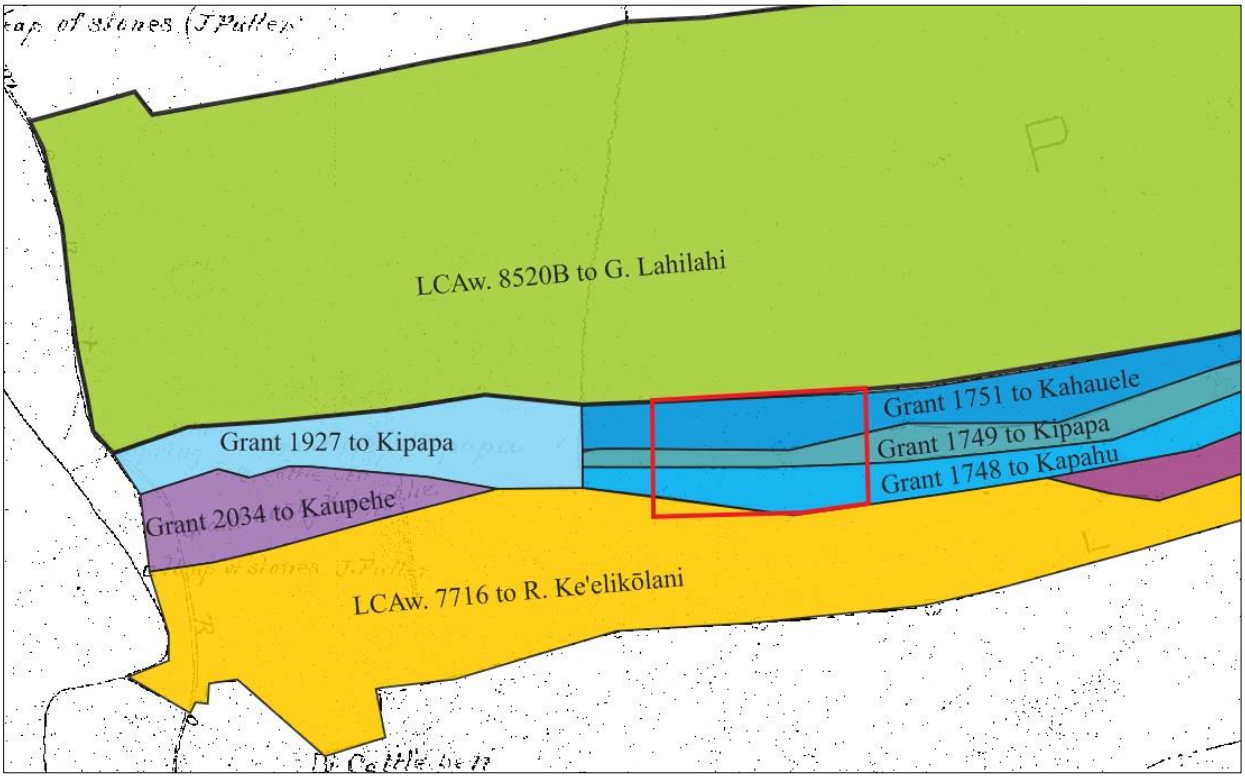


Figure 15. Detail of Registered Map No. 1850 by Emerson showing Land Claim Awards and Government Land Grants within the subject parcel (outlined in red), ca. 1891.

Table 4. List of Land Grants awarded in Pāhoehoe 3 and Pāhoehoe 4.

Land Grant No.	*Claimant*	*Acres*	*Year Awarded*	*Ahupuaʻa*
1927	Kipapa	6.5	1855	Pāhoehoe 3
1751	Kahauele	19.0	1855	Pāhoehoe 3
1749	Kipapa	22.5	1855	Pāhoehoe 3
1748	Kapahu	21.0	1855	Pāhoehoe 3
2034	Kaupehe	3.75	1856	Pāhoehoe 4
1743	Kumukahi	5.0	1855	Pāhoehoe 4
1869	Kekamakahi	26.5	1855	Pāhoehoe 4
3020	Naaimokohi	32.5	1866	Pāhoehoe 4

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawaiʻi to legally set the boundaries of all the *ahupuaʻa* that had been awarded as a part of the *Māhele*. Subsequently, in 1874, the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were old native residents of the lands, many of which had also been claimants for *kuleana* during the *Māhele*. This information was collected primarily between 1873 and 1885 and was usually given in Hawaiian and transcribed in English. Although hearings for most *ahupuaʻa* boundaries were brought before the Boundary Commission and later surveyed by Government employed surveyors, in some instances, the boundaries were

established through a combination of other methods. In some cases, *ahupuaʻa* boundaries were established by conducting surveys on adjacent *ahupuaʻa*. Or in cases where the entire *ahupuaʻa* was divided and awarded as Land Claim Awards and or Government issued Land Grants (both which required formal surveys), the Boundary Commission relied on those surveys to establish the boundaries for that *ahupuaʻa*. Although these small-scale surveys aided in establishing the boundaries, they lack the detailed knowledge of the land that is found in the Boundary Commission hearings. This was the case for Pāhoehoe 3 and Pāhoehoe 4 as the entirety of these *ahupuaʻa* were subdivided into Land Claim Awards and Government issued Land Grants. Therefore, the Boundary Commission did not solicit testimony from area residents. However, the boundaries for neighboring Laʻaloa 1 were brought before the Boundary Commission in 1873, as presented below.

Boundary Commission Hearings for Laʻaloa 1 Ahupuaʻa (1873)

On August 11, 1873, hearings were held regarding the boundaries of Laʻaloa 1 Ahupuaʻa. The testimony of two residents, Nahina and Kipapa states:

> Laaloa 1st (August 11, 1873)
>
> Nahina, Sworn: I was born at Pahoehoe… at the time of *Okuu*, know the land of Laaloa 1st and its boundaries adjoining Pahoehoe. Know the corner of Kipapa's land at the big stone wall, it is on Pahoehoe and is called Haukalua [now the name given to the *heiau*]. Thence *mauka* along old *iwi aina* between Laaloa 1st and Pahoehoe to Puuheu, an *oioina* [a trail side resting place] with *puuhala* trees. Thence *mauka* to *oioina* o Puukukui, with *kukui* trees, thence to a pile of stones at the *mauka* Government road called Lehukapu. Thence to Kaukahoku by a spring of water, thence to Kaaikukai, a *kahua hale* [house site]. Thence to Hehenapuweo, thence to Waialiipoa, the *mauka* corner of Laaloa 1st and Pahoehoe, where Kaumalumalu and Kahaluu cut them off. Ancient fishing rights extending out to sea. (Boundary Commission Testimony Volume I-A:330)
>
> Kipapa, Sworn: I was born in Puna Hawaii. Have lived in Pahoehoe North Kona for over twenty years, and know a part of the boundaries between Laaloa and Pahoehoe. They were pointed out to me by Nakuina. The corner of my land on Pahoehoe, adjoining Laaloa is at a place called Puka auwai, a pile of stones by the gate in the big wall; thence *mauka* along the *iwi aina* by the old road. Thence along the road to Puuheu an *oioina*, with *puuhala*. Thence mauka to Kohelepo an *ahu pohaku* at the corner of Kekamakahi's land on Pahoehoe. Thence along his land to Puukukui, where there is a… kukui tree, and puuhala, to Kamalako, an *oioina*. Thence to Kahawaihele, where the road leaves the *iwi aina* and runs on to Pahoehoe, said place is a *pulu lepo*. Thence the boundary follows the *iwi aina* to the Government road. Thence *mauka* to Pulehukapu, a water hole. Kaukahoku a *kihapai koele* [a garden plot worked for the chief] is the boundary and is on the north side of the spring…My land ends at a stone in the corner…. . . (ibid. :331)

The native testimonies provided during the Boundary Commission hearings provide insight into the land use and residency of Laʻaloa 1 and neighboring Pāhoehoe 4 *Ahupuaʻa*. Both testimonies describe the presence of *iwi ʻāina* or stone walls often used to mark land boundaries (Pukui and Elbert 1986). As previously mentioned, some of these *iwi ʻāina* have survived into the present day, and have been noted as a major characteristic of the Kona Field System. Additionally, Kipapa described the presence of a *kīhāpai kōʻele*, a "small land unit farmed by a tenant for the chief" (Pukui and Elbert 1986:158). Both testimonies also describe areas known as *oʻioʻina*, which Pukui and Elbert define as a "resting place for travelers, such as a shady tree, [or] rock" (1986:280). Although these *oʻioʻina* could have likely been used by resident farmers, it could also be suggested that such resting places were important for travelers making their way along the steep slopes of Kona.

The following details of land holdings for Pāhoehoe 3, 4, and Laʻaloa 1 after the *Māhele* and *Kuleana* Act were presented in a documentary and oral history study of Laʻaloa prepared by Maly (1997). Laʻaloa 1 was retained by R. Keʻelikōlani until her death in 1883, at which time Laʻaloa was transferred to her niece, Bernice Pauahi Bishop. Upon Pauahi's death in 1884, her husband and associates took over as executors of her estate. In 1885, Laʻaloa 1 was sold to Lahapa Kailipeleuli (also known as Lahapa Halsey), who held the *ahupuaʻa* until 1902. Between 1885-1902, Lahapa Halsey leased portions of the *ahupuaʻa* to Thomas Silva. Between 1891-1897, Thomas Silva assigned portions of Laʻaloa 1 to the Hawaiian Coffee & Tea Company, Ltd, and later to the Kailua Coffee Company, Ltd (Supreme Court of the Territory of Hawaiʻi 1903). After 1902, portions of Laʻaloa 1 were sold to various companies including the Kona Development Company, Ltd., West Hawaii Railroad Company, Ltd., in addition to a number of individuals. Throughout the 19th and 20th centuries, both Laʻaloa and Pāhoehoe were utilized for cattle ranching (Maly 1997).

Cattle Ranching and More Recent History in the Project Area Vicinity

Hawaiʻi's ranching industry can be traced back to the introduction of the first cattle in 1793 when Captain George Vancouver gifted Kamehameha I with several horned cattle and other ungulates. To ensure growth for the newly introduced cattle, Vancouver encouraged Kamehameha I to instate a ten-year *kapu* that prevented people from hunting the animals. The cattle were taken to Waimea and allowed to roam freely and reproduce (Kuykendall 1938). The *kapu* placed on the cattle proved to be an environmental disaster and greatly affected the crops, homes and the livelihood of the native residents. According to Maly, by 1812, unrestricted herds of cattle had made their way down towards the coast and roamed freely between Kailua and Keauhou (1997). To combat the effects of cattle on the local food crops and houses, native residents began constructing stone walls as a deterrent (Handy et al. 1991; ʻĪʻī 1959). In a 1981 interview with Mr. Joe Gomes, a long-time Kona resident and rancher, Kelly documented the various types of walls commonly used in the local cattle industry.

> Most of the walls have been here since the land was made into *kuleana*. Most walls were built by Hawaiians. Some were built for the ranches. Walls about 3 ft. high can keep donkeys penned. The usual wall is about 4 ½ feet high and keeps cattle in. For goats, you need a wall 6 to 8 ft. high. For wild pigs you need a 6 to 8 ft.-high wall. They climb over lower walls easily. . .
>
> It takes a skilled person to build stone walls. In the early days (1920s-1930s) walls were built and paid for in fathom-long sections (6ft.) for 35¢ or 40¢ a section. They had to be 3 ft. wife at the bottom and 2 ½ ft. wide at the top. You had to lock the rocks and fill the middle with rubble that helped lock the two sides together. Hawaiian built good walls, and later some of the Japanese did, too. (1983:112)

Maly opines that cattle and ranching related activities had "the most significant impact on residency, land use, and the cultural and natural landscapes of Laʻaloa and Greater Kona, in the late 19th and early 20th centuries" (1997:14.). The same holds true for the other subject *ahupuaʻa* and the project area vicinity. In particular, the *kula* lands located *mauka* of Aliʻi Drive in Pāhoehoe and Laʻaloa, as well as Kāpalaʻalaea, Kahuluʻu, and Hōlualoa were often utilized as pasture for grazing cattle. Members of the Gouveia family managed such *kula* pasturages beginning in the early to middle 1900s (ibid.). As cattle ranching continued in the *mauka* area of Laʻaloa and Pāhoehoe well into the mid-20th century, the natural and cultural resources located along the coast were significantly impacted by an expanding tourism based economy and a growing population. Cultural sites located along the coast were destroyed, buried or preserved in situ to make way for new development projects and supporting infrastructure. However, since the 1970s, government mandated archaeological studies allowed for the identification and relocation of many traditional and historical trails, burials, agricultural and habitation sites, thus prompting the involvement of lineal and cultural descendants. The involvement of the descendants lent to the preservation and restoration of several cultural sites located along the coast. In the early 1990s, descendants of the Kipapa line began actively participating in the preservation of their family burials on TMK parcel (3) 7-7-008:031, located *makai* of the project area (Kipapa et al 2013). In 2014, the Kipapa *ʻohana* signed a Friends of the Park agreement with the County of Hawaiʻi Parks and Recreation to assist with management of Laʻaloa Beach Park. In March 2015 the Kipapa *ʻohana* reinstalled and dedicated their family *kūʻula* (fishing shrine) located on the boundary of Pāhoehoe and Laʻaloa (Figure 16).

Figure 16. Kipapa family kūʻula located on the boundary of Pāhoehoe and Laʻaloa.

PREVIOUS STUDIES

Since the early 1900s, Hawaiians and non-Hawaiians alike expressed a growing concern for the loss of traditional knowledge and the destruction of traditional cultural sites throughout the islands. This growing concern prompted them to map sites and talk with Hawaiian *kupuna* (elders) to gather knowledge about the sites. John F. Stokes and Thomas G. Thrum were the first to inventory and record such traditional cultural sites, although they focused primarily on *heiau* and ceremonial sites. In 1906-1907, Stokes conducted a survey of *heiau* on Hawaiʻi Island (Stokes and Dye 1991). While in Laʻaloa, Stokes recorded Haukālua Heiau and provided the following description:

> *Heiau* of Haukalua, land of Laʻaloa, North Kona. Located on the north side of the bay, between the sea and the road. This is a low platform or terrace that rises to a height of four feet as its southwest corner. The northern and eastern sides are level with the ground. The location of the northeast corner is somewhat uncertain. (ibid.:63-64)

In 1908, Thomas G. Thrum compiled a list of *heiau* around the Hawaiian Islands (Thrum 1908). Among these, Thrum documented three sites, one located in Pāhoehoe and two situated in Laʻaloa. Although the name of the *heiau* in Pāhoehoe was not recorded, Thrum noted, "a reported large heiau, not found" (ibid.:44). In describing the other two *heiau*, Thrum wrote, "Haukalua… [located in] Laaloa, a heiau of 100x75 ft., little of which now remains," and "Kalaemano… [located in] Laaloa, located as a present house lot" (ibid.).

Between 1929 and 1930, John Reinecke from the Bishop Museum attempted to record all the sites he encountered along the Kona-Kohala coast (Reinecke 1930). Although Reinecke's work was focused on the more populous coastal areas, he did at times describe the upland areas. As such, he spent some time surveying a stretch of land between Kapalaʻalaea Ahupuaʻa, located to the south of Laʻaloa, and Lanihau, located to the north, near Kailua. Reinecke provided the following description of the uplands above Laʻaloa Bay:

> A very large portion of the dwelling sites and other structured along this coast must have been erected mauka of the government beach road; but it is practically impossible to penetrate the undergrowth to investigate even as far mauka as the Pa Kuakini [Great Wall of Kuakini]; where I did so, the results were disappointing, as grazing of cattle and the demands of kuleana walls have resulted in the destruction of many sites. Furthermore, this coast was rather densely populated until recently, so that most dwelling sites will be recent and of little interest. (Reineke 1930:39)

In the 1940s and 1950s, Hawaiian historian Theodore Kelsey collaborated with Native historian Henry Kekahuna to document the knowledge of Hawaiian *kupuna* (elderly). Kelsey and Kekahuna interviewed elders and collected their stories. They also produced annotated maps of culturally and historically significant sites in Kona that depicted their accounts. Maly (1997) included transcripts of excerpts from Kekahuna and Kelsey's audio recordings (c. 1959) as part of his limited oral history study for Laʻaloa Ahupuaʻa, which are presented below. According to Maly,

> . . . One of the most significant aspects of Kelsey and Kekahuna's work in North Kona, was that they took the time to record the histories as remembered by several aged natives, among whom was Mr. Nāluahine Kaʻōpua ("Nāluahine"), a native resident of the Kahaluʻu area, descended from the line of La-naʻi, who was reportedly, the last formal priest of Ka-pua-noni Heiau. . .
>
> The following narratives collected by Kelsey and Kekahuna from Nāluahine, include descriptions for sites and resources of coastal Laʻaloa. Because of the impacts of development over the last 40 years, their record of such sites is all that remains. It should be noted that the excerpts below, are but a small portion of the rich texts recorded by Kelsey and Kekahuna. Anyone interested in the history of Kona should review their varied collections. (1997:20)

The following excerpts are duplicated as they appeared in Maly (1997):

> **Selected Excerpts from Interviews**
>
> **with Nāluahine Kaʻōpua**
>
> [T. Kelsey: written by hand]
>
> Lehu-kapu, a spring, from which Pahoehoe and Laaloa obtained water. (*Komo ka wai o Pahoehoe me Laa-loa.*)
>
> Laa-loa I. The *ʻawa* bowl of Kāne. (Kāne and Kana-loa were twin demi-gods, bearing the names of major deities.) Kānoa ʻAwa a Kāne, on the right. It is a large stone by the road. (Some iron rails are laid over a slight depression in the road near here). There is a house on the upland side.
>
> [hand written notes; nd.] Pahoehoe I—Spring name Moku-loulu. Lae o ka huihui [noted not "*huʻihuʻi*"], at the south of the sand beach. *Lehu-kapu komo pahi iloko o ke one o Pahoehoe* [Lehu-kapu spring perhaps enters in the sands of Pāhoehoe].
>
> Laʻa-loa, the cove is known as Hopoe. Huihui is on the boundary of Pahoehoe and Laʻa-loa. Ka wai-a-Kane spring at the seashore on the northwest of the present house now standing there. Ka lae o Ke-peʻa [the point of Ke-peʻa] at the west of Ka-wai-a-Kane. . .
>
> <u>Huihui</u> (not Huʻihuʻi), a patch of sand (Kīpuka one). The name is also given to the cove here.
>
> Laʻa-loa, a large land. There is a spring at the shore here named Wai a Kāne. Demi-god Kāne's bowl for drinking *ʻawa* portions is in upland Laʻa-loa on the upper side of the road, near one or more residences, where some iron rails are laid, (I think; Kel.). The water of Kāne's spring was used to clear his *ʻawa* (*hoka i ka ʻawa*). When a menstruating woman went to bathe in Kāne's water upland it dried up and reappeared at the shore. The place upland, where Ke Kānoa ʻAwa o Kāne (Kāne's ʻAwa Bowl) is was very *tabu*. There was water there for preparing the *ʻawa* drink. There is a *pahoehoe* flat (*papa pahoehoe*) and a high mound there, hollowed for the drinking of Kāne's ʻawa. (*Ua hana poho ʻia i wahi e inu ai ka ʻawa o Kāne.*)
>
> <u>Ke-peʻa</u>, a tiny rocky cove. …20. Wai-a-Kāne. Puka keia wai i kai o Laa-loa; he punawai. Aia Ka ʻApu ʻAwa o Kāne iuka o Laa-loa. Oia ka wai e hoka ai ka ʻawa o Kāne. Hele kekahi wahine hana wai malaiala [sic], a holoi i kona maʻi, a maloo ka wai o uka, a puka i kahakai. Kapu loa kela wahi o uka. Aia malaila he Kānoa ʻAwa o Kāne. He wai hana i ka ʻawa. He papa pahoehoe a he ohua kiʻekiʻe malaila. Ua hana poho ia i wahi e inu ai ka ʻawa o Kāne. Kanana ia ka ʻawa, a inu. (ibid.)

Maly goes on to quote the following words of advice provided by Kekahuna and Kelsey in a "pre-final draft of an article that was later published in the Hawaii Tribune-Herald" (ibid.:21):

> . . . We hope that the people will cherish the things that should be preserved for themselves and for posterity—things which they now deliberately destroy or allow to perish, but for which in a very few years from now we shall be clamoring.
>
> Perhaps people will be inspired to roam the country and preserve for posterity our treasures of antiquity. They may become in [the] future a greatest source of revenue for our government. Let us

> awaken now, and not later, lest our precious remnants of the past be lost forever [Kelsey and Kekahuna, Ms., c. 1950:41]. (ibid.)

Since the 1970s, mandated archaeological studies prompted by the passing of federal and state legislature concerning the preservation of historic and cultural sites have been conducted in the project area vicinity (Table 5). A summary of each study is presented below and the locations of prior studies are depicted in Figure 17.

In 1973, the Archaeological Research Center Hawaii (ARCH) conducted the initial archaeological surface survey (Ching et al.) for the proposed Aliʻi Drive realignment project. Their study area crossed through seven *ahupuaʻa* (from north to south)- Kahului, Puapuaʻa, Hōlualoa, Pāhoehoe, Laʻaloa, Kapalaʻalaea, and Kahaluʻu; and extended 150 feet on either side of the proposed road centerline for approximately 3.4 miles starting at Kuakini Highway in Kailua and terminating near Kahaluʻu Beach Park. This proposed road corridor serves as the western boundary for the current project area. A total of 285 archaeological features were recorded within the limits of the proposed road and assigned SIHP numbers. Twenty-six features were recorded in both Laʻaloa 1-2, and Pāhoehoe 1-4, of which five sites were recorded within the immediate project area. For Pāhoehoe, SHIP Site 6355 is described as an agricultural mound complex, SIHP Sites 6352, 6353, and 6354 are described as walls. For Laʻaloa, SIHP Site 6382 is described as a monument platform.

Twenty-five years later, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey (AIS) of the proposed Aliʻi Highway corridor (Henry et al. 1998; Haun et al. 1998; see Figure 17). The fieldwork for this project involved several highway alignment alternatives and was conducted in five phases over the span of twenty-five years, which began in 1973 with the aforementioned ARCH study (Ching et al. 1973). The total length of the corridor was 4.49 miles and originated in Kahului 1 Ahupuaʻa (located north of the project area), and extended along the southwest side of the Queen Kaʻahumanu Highway and terminated at Keauhou 1 Ahupuaʻa (located south of the project area). As previously mentioned, a portion of this corridor serves as the western boundary of the current project area. The *ahupuaʻa* of Pāhoehoe and Laʻaloa made up approximately 13% of the entire corridor area. A total of 177 sites were identified in their study corridor, with 1,548 component features, in addition to the Kona Field System (SIHP Site 6601), and the Kahaluʻu Historic District (SIHP Site 4150).

Table 5. Previous archaeological and historical studies conducted within the project area vicinity.

Year	*Author*	*Ahupuaʻa*	*Type of Study*
1973	Ching et al.	Various	Inventory Survey
1978	Soehren	Laʻaloa	Reconnaissance Survey
1979	Hammatt	Pāhoehoe 4 Laʻaloa, Kapalaʻalaea	Reconnaissance Survey
1980	Hammatt & Clark	Pāhoehoe 4, Laʻaloa, Kapalaʻalaea	Testing & Salvage Excavations
1980	Barrera	Kaumalumalu & Pāhoehoe	Inventory Survey
1986	Rosendahl & Rosendahl	Pāhoehoe 2	Reconnaissance Survey
1996	Head & Rosendahl	Pāhoehoe 2	Inventory Survey
1997	Borthwick et al.	Pāhoehoe 2 & 3	Inventory Survey
1996	Latinis et al.	Pāhoehoe 3	Inventory Survey
1997	Maly	Laʻaloa	Historical, Oral History, Site Preservation Plan
1998	Henry et al.	Various	Inventory Survey
1998	Henry and Wolforth	Laʻaloa 1 & 2	
2000	Hammatt et al.	Pāhoehoe 2	Data Recovery
2004	Ketner et al.	Pāhoehoe 1	Inventory Survey
2005	Clark et al.	Pāhoehoe 1 & 2	Inventory Survey

Within the current project area, Henry et al. recorded SIHP Sites 6352, 6353, 6354, and 6356 all of which were previously recorded by Ching et al (1973). SIHP Site 6352, described as an *ahupuaʻa* boundary wall, begins on the east side of SIHP Site 6302 (Kuakini wall) and extends in *mauka* between Pāhoehoe 2 and Pāhoehoe 3. This wall is still intact and was observed in good condition during the recent site visit. Likewise SIHP Site 6353 is described as a wall that extends from the east side of SIHP Site 6302 (Kuakini wall) and continues *mauka* for an undetermined distance.

SIHP Site 6353 was destroyed a result of past bulldozing activities. SIHP Site 6354, described as an *ahupuaʻa* boundary wall, extends from the east side of the Kuakini wall between Pāhoehoe 4 and Laʻaloa 1. Although portions of this wall are still visible outside of the current project area, portions of the wall formerly located within the project area have been destroyed by bulldozing activities. Located to the south of SIHP Site 6354, is SIHP Site 6356, described as a complex with thirty-six component features, of which only the northwest portion of this complex was located within the current project area. However, no features of the complex remain within the project area today, as a result of the construction of the nearby Keauhou View Estates subdivision and supporting infrastructure. In addition to the inventory survey, Maly conducted oral history interviews with twenty-one individuals, the results of which were incorporated in the summary volume of the same study (Haun et al. 1998). Topics that were covered in the interviews included: major families associated with the project areas; traditions, legends, and tales; roads; residential patterns; marine resources; canoe, boat and steamer landings; agriculture; ranching; trails; fresh water; major events; amusements and pastimes; burial and religious practices; and place names.

In 1978, Lloyd Soehren conducted a preliminary archaeological reconnaissance survey of a 5.81 acre parcel (TMK: (3)-7-7-08:104) in Laʻaloa, located to the southwest of the current project area and east of Aliʻi Drive (see Figure 17). Soehren recorded eleven sites, some of which he identified as walls and cairns, which he associated with agricultural activities. He also recorded habitation sites, house foundations, one possible *heiau*, and platforms of various shapes and sizes. Soehren did confirm that one exposed platform (site eight) was indeed a burial site. Although Soehren interpreted many of the platforms to be burials, he did not carry out further testing to confirm his interpretation.

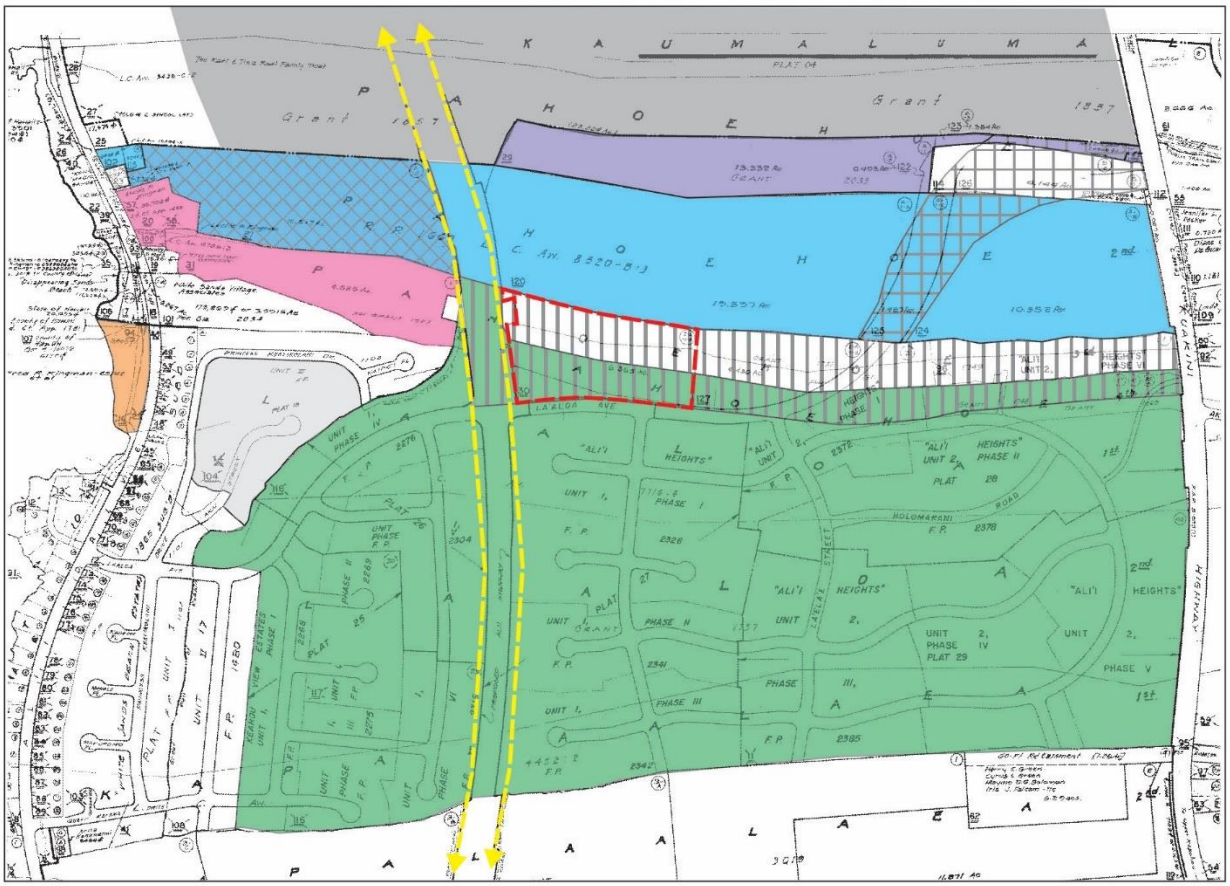
In 1979, ARCH conducted a reconnaissance survey (Hammatt 1979) of the 155-acre Ginter property located adjacent and to the south of the current project area (see Figure 17). The following year, ARCH conducted testing and salvage excavations (Hammatt and Clark 1980) of the sixty-six sites recorded by Hammatt (1979). ARCH reported that artifact assemblages recovered from testing platforms indicated use associated with volcanic glass reduction; while the assemblage from cave sites indicated fishhook manufacture and woodworking. Nearly twenty years later, PHRI conducted an Archaeological Inventory Survey (AIS) of the same property and recorded five previously unidentified sites and recommended data recovery for eight sites (Henry and Wolforth 1998). In addition, Henry and Wolforth reported that thirty-one of the previously recorded sites had been destroyed as a result of mechanical clearing activities.

In 1985, PHRI conducted an archaeological reconnaissance survey (Rosendahl and Rosendahl 1986) of a 44-acre property (TMK: [3] 7-7-008:021) located in Pāhoehoe 2 Ahupuaʻa, between Aliʻi Drive and Kuakini Highway, adjacent and to the north of the current project area (see Figure 17). Portions of their study area had been surveyed as part of the Aliʻi Drive realignment project (Ching et al. 1973; Hommon and Rosendahl 1983) and for residential development (Barrera 1980). As a result of these three earlier studies, twenty-one sites comprised of nearly one hundred features were recorded and assigned SIHP site numbers within the Pāhoehoe 2 project area prior to the initiation of the 1985 fieldwork. PHRI relocated the previously identified sites and recorded an additional twenty-three sites with over 350 component features. The newly identified sites were assigned only temporary site numbers. The forty-four sites were distributed throughout the project area and included a *heiau*, agricultural components, boundary walls, possible burials, habitation complexes, terraces, platforms, shelters, ranching features, and trails (Figure 18). Rosendahl and Rosendahl (1986) found evidence of both Historic and Precontact occupation. Historic land use was limited to ranching features such as walls. The large Precontact habitation complexes and a single *heiau* were located near the coast, whereas smaller habitation complexes and associated agricultural features were located throughout the project area. The majority of the agricultural field components were located in the higher elevations of the project area.

In 1991, Cultural Surveys Hawaii conducted an archaeological inventory survey (Borthwick et al. 1997) of a 7-acre parcel (TMKs: [3] 7-7-008:020, 031 and 100) within Pāhoehoe 2 and Pāhoehoe 3 *ahupuaʻa* (see Figure 17). The majority of their study area was adjacent to the southwest corner of the current project area. As a result of their survey, twenty sites and site complexes were recorded. Site types encountered were agricultural, boundary, burial, and habitation. Feature types included platforms, walls/wall complexes, enclosures, modified outcrops, and terraces. Excavation units were placed in six of the sites to determine function and age. Age was determined by observable characteristics of the site and the cultural remains found within the excavation units. Of the six sites tested, two were reported to be Precontact, three were Historic, and one represented use from Precontact through to Historic times. Borthwick et al. (1997) concluded that their study revealed the typical Kona settlement pattern in which Precontact habitation features are located near the coast with a few located more inland near agricultural features. They identified that areas of higher elevation contained agricultural features representative of the Kona Field System; and that soon after European contact and settlement, habitation moved more inland to make room for residential expansion along

the coast. They surmised that the early to mid-1900s saw the introduction of cattle into the area leaving traces of ranching features on the landscape, and that following the 1940s, the coast was once again used for residential purposes, leaving the inland areas for pasturage.

In 1996, PHRI conducted an AIS (Head and Rosendahl 1996) of the then proposed sewage pump station site (TMKs: (3) 7-7-008:021 and 023) in Pāhoehoe 2 Ahupuaʻa, located to the northwest of the current project area (see Figure 17). As a result of their fieldwork, PHRI recorded two sites (SIHP Sites 6381 and 6996) previously identified by Barrera (1980) and Rosendahl and Rosendahl (1986), and three previously unidentified sites (SIHP Sites 19857-19859). No further work was the recommended treatment for the three stone wall sites (SIHP Sites 6381, 19858, and 19859) based on the lack of cultural deposits. While a midden scatter (SIHP Site 6996) and a buried cultural deposit (SIHP Site 19857), both interpreted as associated with short-term Precontact habitation were recommended for further data collection. Head and Rosendahl reported "other than a thin scatter of surface ecofacts that may have been culturally modified, there are no indications of the expected late prehistoric-early historic period structures" (1996:37). They posited that the lack of such features was likely due to either earlier repurposing of materials from Precontact or Historic features, or the effects of mechanical land clearing. About fifteen years later, Cultural Surveys Hawaii, Inc. conducted data recovery for sites SIHP Sites 6996 and 19857 (Hammatt et al. 2000).



Project area boundary
Ching et al 1973; Henry et al. 1998
Soehren 1978
Borthwick et al. 1996
Hammatt 1979; Hammatt & Clark 1980; Henry and Wolforth 1998
Latinis & Kennedy 1996
Barrera 1980; Rosendahl & Rosendahl 1986
PHRI 1999 (portion)
Head & Rosendahl 1996; Hammatt et al. 2000
Ketner et al. 2004
Maly 1997; Kawachi et al. 2000; Rechtman 2006a/b
Clark et al. 2005

Figure 17. Previous archaeological and cultural studies conducted in project area vicinity.

In 1996, Archaeological Consultants of the Pacific (ACP) conducted a 14-acre AIS (Latinis et al. 1996) of two parcels in Pāhoehoe 3, which included the current project area (TMK: [3] 7-7-008:030) and extended *mauka* to include the neighboring parcel (TMK: [3] 7-7-008:096; see Figure 17). As a result of their fieldwork, ACP recorded eight previously identified sites, seven of which were stacked stone walls (SIHP Sites 4587, 4588, 4591, 6302, 6352-6354). The remaining previously recorded site was an agricultural complex containing fifteen features (SIHP Site 6355). Latinis et al. also recorded eleven previously unidentified sites: (SIHP Sites 20834-20844), comprised of fifteen features that included two stone clearing mounds (SIHP Sites 20835, 20836, 20838C), a C-shaped enclosure (SIHP Site 20839), a walled enclosure (SIHP Site 20840), three modified outcrops (SIHP Site 20837 and 20841, 20842), four crude platforms (SIHP Sites 20838A, B, D, and E) and three blister caves/shelters (SIHP 2034, 20843 and 20844). Subsurface testing revealed cultural remains only from the lava blister features, located to the east of the current project area, which consisted of Precontact artifacts including charcoal, *kukui* nut fragments, dog tooth bracelet links, bone picks, and faunal remains. The absence of Historic artifacts throughout their study area was also noted. Latinis et al. concluded that their study area, "may have been marginally utilized for limited agricultural production (primarily sweet potato, dryland taro, wauke, sugar cane, and possibly yam)" and said production "likely did not contribute substantially to subsistence demands in comparison to more productive zones located further inland" (ibid.:85).

Seven of the sites (SIHP Sites 6352-6355 and 20839-20841) were recorded within the current project area. ACP noted the effects of bulldozing activity associated with land clearing for cattle grazing and as a means of brush fire prevention and containment. As previously mentioned, a field visit conducted for the preparation of the current document revealed that only two of the seven sites formerly present within the current project area remains: the stacked stone *ahupuaʻa* boundary wall between Pāhohoehoe2 and 3 (SIHP Site 6352) and remnants of the modified outcrop (SIHP Site 20841). In addition, the portion of the Kuakini Wall (SIHP Site 6302) recorded by ACP (Latinis et al. 1996) remains, beyond and to the west of the current project area.

In 1997, Kēpā Maly prepared a preservation plan and cultural study (Maly 1997) that included a limited oral history, consultations, and historical documentary research for the then-proposed improvements to Laʻaloa Beach Park (TMK: [3] 7-7-010:036) in coastal Laʻaloa 1 Ahupuaʻa, to the southeast of the current project area. As a result of the interviews he conducted between 1996 and 1997, Maly was able to gather information regarding the traditional land use and the former condition of historic properties within the coastal parcel, in addition to recommendations for the preservation of cultural remains. Informants recalled that the aforementioned Hakālua Heiau was constructed of water worn stones and that any coral present was only recently added to the remnants of the sacred site. Interviewees also recalled how fishing improved whenever the *kūʻula* (stone or stone structure used to attract fish) was upright and standing in its intended location and that the name Hōpoe may have referred to the *kūʻula* itself. Also of interest, is mention of the Laʻaloa-iki-Pāhoehoe *mauka-makai* trail, which lies beneath the driveway of the Kona White Sands condominium development. The same former resident of coastal Laʻaloa spoke of his father's walled garden within which they grew *palaʻai* (pumpkin) and *ʻuala* (sweet potato). His family ate the *palaʻai* and also used it as bait for *ʻōpelu*. In addition, the bay between Laʻaloa Park and Pāhoehoe was named Maʻalaea rather than Pāhoehoe, which was reserved for referring to the land.

Eight years later, in 2005, Rechtman Consulting (RC) prepared a Burial Treatment Plan (Rechtman 2006a) for Haukālua Heiau (SIHP Site 2009) and a Preservation Plan (Rechtman 2006b) for additional Historic Properties located within the Maly (1997) study area in conjunction with the improvements to Laʻaloa Beach Park. The burial treatment plan addressed a single burial site (SIHP Site 2009), which is also an ancient *heiau* (Haukālua), and the location of modern Hawaiian cultural practices (Rechtman 2006a). As previously mentioned, Haukālua Heiau was first recorded by Stokes in 1906 (Stokes and Dye 1991) and later by Reinecke in 1929 (Reinecke 1930.). This site was later evaluated during the 1972 Statewide Inventory of Historic Places and formally recorded during fieldwork conducted in 1995 by a team of archaeologists from Federal, state, and county agencies whose report (Kawachi et al. 2000) was not finalized until 2000.

In February of 1995, DLNR-SHPD recovered fragmentary human remains that were washing out of a looters' pit on the *makai* side of the *heiau*. These remains were collected and reinterred in the *heiau* with the approval of the DLNR-Burials Program in February of 1996. The following narrative describes the circumstances:

> Burial and Reinterment Sites: On February 16, 1996, E. Halealoha Ayau went to Hoʻonā to leave a *pūʻolo iwi* (bundle or package of remains) that had come from Laʻaloa with Uncle Alena [Alena Kaiokekoa]. Halealoha had been asked to take the *pūʻolo iwi* to Uncle, because the Laʻaloa boys "did not know the protocol for their return to Laʻaloa." Uncle explains that a series of events took place over that night, that made it clear to him that the *iwi* (funerary remains) needed to be returned to Laʻaloa. Uncle explains that on the next day (Feb. 17th), he discerned that the *iwi* had come from a particular location on the *makai* facing side of the *heiau*. That day, Uncle, Kawelu, and Fred Himalaya took the *iwi* home to Laʻaloa. Upon going to the *heiau*, Uncle saw an area mid-way in the *heiau*, on the *makai* side, where there was a small *ahu* (cairn-like feature) and an opening down into a crypt-like feature. It was in this crypt opening that the *iwi* were reinterred. It was also observed that other *iwi* were already in place in this *ʻilina* (a formal burial site). At that time, in February 1996, there was a small *ahu* with four stacked stones, marking the grave and reinterment site. (Maly 1997:42).

RC conducted fieldwork as part of the preparation of their preservation plan and made the following observations:

> Today, the *heiau* exhibits extensive modification, which has apparently occurred since 1996. New surface platforms have been built; pavements, upright stones, and coral have been added; and a wooden *lele* has been constructed on the platform surface. These features were apparently added to the site as part of its modern rededication by members of the Laʻaloa ʻOhana, an organization that assumed a "caretaker" role for the area. (Rechtman 2006a:5)

In addition, RC conducted consultations with descendants as well as with members of Laʻaloa ʻOhana. Preservation in place is the treatment proposed for the burials present in Haukālua Heiau. At the direction of Melanie Chinen (Administrator of the State Historic Preservation Division) the recent (post-1996) modifications to the Haukālua Heiau, including the placement of the wooden *lele* on top of this burial site, are to remain in place.

The Preservation Plan (Rechtman 2006b) addressed the following sites recorded by Kawachi et al. (2000): SIHP 2009 (Haukālua Heiau/burial site), SIHP 20764 (stone platform), SIHP 21218 (wall remnant), SIHP 21219 (*furo*/spring), SIHP 21222 (*papamū*), and SIHP 21223 (bait mortars). All of the sites were evaluated to be significant under Criterion d and three of the sites SIHP 2009 (Haukālua Heiau), SIHP 21222 (*papamū*), and SIHP 21223 (bait mortars) were also considered significant under Criterion e. According to Rechtman (2000b), Kawachi et al. recognized that two additional sites (SIHP 21220 location of a former *kūʻula*, and SIHP 21221 location of a canoe landing) were identified through oral information in the Maly (1997) study, but they incorrectly concluded that these sites were not within their study area. Rechtman (2006b) concluded that while this may have been true for the *kūʻula*, the canoe landing was identified at the southern end of the park expansion parcel.

In 1999, PHRI conducted an AIS (PHRI 1999) of 173 acres (TMKs: [3] 7-7-004:002 and [3] 7-7-008:027) in Kaumalumalu and Pāhoehoe 1, located adjacent to the north and west boundaries of the current project area (see Figure 17). The report encompassed two phases of survey. The first survey occurred on a portion of the property in 1997 (Henry and Wolforth 1998b) and was submitted to DLNR-SHPD for review, but was never finalized because the developer wanted the rest of the property surveyed. After addressing the review comments by DLNR-SHPD and surveying the remainder of the property, a second report (PHRI 1999) was completed. PHRI recorded sixty-six sites and site complexes comprised of 715 features, which included mounds, terraces, modified outcrops, walls, platforms, enclosures, and planting areas. Fifty-one of the sites were recorded as single features. Functions for the recorded Precontact sites and features included temporary and permanent habitation, agriculture, trail, storage, and possible *heiau*. Permanent habitation sites and features were located near the shore with only a few recorded in the upland agricultural areas where more temporary habitation features were located. Historic Period sites included mainly walls that functioned as either animal control features or land division boundaries, but a Historic trail (the Judd Trail) and four cattle enclosures were also recorded. PHRI dug a total of thirty-two excavation units and thirteen charcoal samples taken. The charcoal samples yielded dates ranging from A.D. 1265 to modern times. PHRI (1999) stated that their findings fit the expectations derived from the Kona Field System model in which more Precontact permanent habitation took place near the coast and Precontact temporary habitation and agricultural practices were conducted in the upland portions of the *kula* zone. Historical features related to ranching were expected due to the introduction of cattle into the project area in the 1920s.

In 2004, Rechtman Consulting, LLC (RC) conducted an archaeological inventory survey (Ketner et al. 2004) of a roughly 15-acre parcel (TMK: [3] 7-7-008:029) located between the proposed Ali‘i Highway and the current Kuakini Highway in Pāhoehoe 1, to the north and west of the current project area (see Figure 17). As a result of their fieldwork, eight previously unrecorded archaeological sites and three previously recorded sites were located and recorded. The sites included the Kuakini Wall (SIHP Site 6302) and three historic ranching/boundary walls (SIHP Sites 6381, 21384, and 24271), a bedrock outcrop modified historically for ranching purposes (SIHP Site 24273), a core-filled wall segment (SIHP Site 24276), four Precontact habitation complexes (SIHP Sites 24270, 24274, 24275, and 24277), one of which included a burial (SIHP Site 24270), and a grouping of 321 agricultural features that spanned nearly their entire survey area (SIHP Site 24272). All identified sites were assessed and determined to be significant under Criterion d, except for SIHP Sites 6302 and 24270. SIHP Site 6302 was also determined to be significant under Criteria a and c, and SIHP Site 24270 which was determined to be significant under Criterion e. Recommended for preservation was SIHP Sites 6302, 24270, 24274, 24275 and 24277. No further work was recommended for the remaining sites.

In 2005, RC conducted an archaeological inventory survey (Clark et al. 2005) for the La‘aloa Avenue Extension Project of a roughly 14-acre parcel that straddled Pāhoehoe 1 and 2 (see Figure 17). The study area included portions of TMKs: (3) 7-7-008:029, 114, and 120, thus creating a *mauka-makai* access connecting Ali‘i Drive to La‘aloa Avenue, and Kuakini Highway. As a result of their survey, six previously unrecorded archaeological sites and eight previously recorded sites were located and recorded. The sites include seven historic ranching/boundary walls (SIHP Sites 4591, 6352, 6381, 21384, 24271, 24376, and 24380), an alignment of possible Historic origin (SIHP Site 24379), a trail (SIHP Site 6350), four Precontact habitation sites including three complexes (SIHP Sites 6984, 24375, and 24378) and a terrace remnant (SIHP Site 24377), and a grouping of 213 agricultural features that spans the entire project area (a portion of SIHP Site 24272). Fifteen test units were excavated at six of these sites. All identified sites were assessed and determined to be significant under Criterion d. As such, data recovery were recommended for four Precontact sites (SIHP Sites 6984, 24375, 24377, and 24378), while no additional work was recommended for the remaining sites.

3. CONSULTATION

Gathering input from community members with genealogical ties and/or long-standing residency relationships to the project area is vital to the process of assessing potential cultural impacts to resources, practices, and beliefs. These individuals ascribe meaning and value to traditional resources and practices. Community members often possess traditional knowledge and beliefs that are unavailable elsewhere in the historical or cultural record of a place. As stated in the OEQC Guidelines for Assessing Cultural Impacts, the goal of the oral interview process is to identify potential cultural resources, practices, and beliefs associated with the affected project area. It is the present authors’ further contention that the oral interviews should also be used to augment the process of assessing the significance of any traditional cultural properties that may be identified. Thus, it is the researcher’s responsibility to use the gathered information to identify and describe potential cultural impacts and propose appropriate mitigation as necessary.

As part of the current investigation, Lokelani Brandt met with community members with genealogical ties to the La‘aloa-Pāhoehoe area. Individuals contacted included: Curtis Tyler and Malia Kipapa. Additionally, a complete copy of the current study was provided to the Office of Hawaiian Affairs.

CURTIS TYLER

On August 4, 2017, Lokelani Brandt met with Curtis Tyler at La‘aloa Beach Park to discuss the potential cultural impacts at the proposed park site. Curtis was born and raised in Kona and is a recognized lineal descendant of the Kipapa, Kekamakahi, Kaupehe lines, all of whom were awarded Land Grants in Pāhoehoe 3 and 4 during the mid-1800s. Curtis is a former Hawai‘i County council member for North Kona, and he is very familiar with the *ahupua‘a* of Pāhoehoe and La‘aloa. Much of his knowledge of this area comes from oral histories passed down in his family as well as personal research and onsite experience. Curtis believes that Hawaiian culture is a living culture and that cultural and historical properties, including customary and traditional rights and practices associated with them, must be documented, respected, and carefully considered when lands on which such properties are located are being considered for different and/or more modern use. Based on maps showing Historic Period land tenure, the proposed park project is entirely within two ancestral land grants discussed below. This is important to Curtis, because it confirms what was previous speculation on his part. He and his *‘ohana* (family) have and maintain a very strong *kuleana* (concern and responsibility) for the care and conservation of these *‘āina kūpuna* (ancestral lands), especially *nā iwi kūpuna a me nā moe pū* (ancestral remains and funerary objects), which continue to reside within them.

At the onset of the interview, Curtis acknowledged his ancestors who lived and resided from *mauka* to *makai* in Pāhoehoe and Laʻaloa. In discussing the historical and cultural importance of Pāhoehoe, Curtis began by referring to the 1823 written account of William Ellis, who, when passing through Pāhoehoe *makai*, described seeing a large thatched house where many men were observed in the construction of canoes. Curtis noted that this platform is still in existence and in good condition. He added that prior to the widening and elevating of the old beach road, which was formerly the *Ala loa* and what is now present day Aliʻi Drive, canoes constructed on this platform and finished in near proximity to it, would have had easy and direct access to Keoneohuihui (also known as White Sand Beach, Disappearing Sands, Magic Sands, Magics, and Laʻaloa Beach Park), one of the very few white sand beaches along the entire Kona Coast. Curtis pointed out that during certain times of the year when large surf arrives, it causes the sand to move offshore. Curtis believes that these attributes made this *wahi* (place) a choice location for launching and landing canoes used for fishing, transportation and other purposes. Curtis also explained that the coastal areas of Pāhoehoe and Laʻaloa historically contained multiple Traditional Cultural Properties (TCPs), including *heiau*, springs, burials, trails, agricultural features, and *kūʻula* (fishing shrine) and many of these traditional sites are still found scattered within these areas. He believes that the existence of these cultural sites is a direct result of his ancestors close relationships with and personal services to the high chiefs who had residences in nearby royal centers, namely, Kahaluʻu-Keauhou, Hōlualoa (Keolonahihi and Keakealaniwahine), and the *ahupuaʻa* between Puapuaʻa to Keahuolū.

While most of the residential sites were concentrated along the coast, Curtis explained that a network of *kaolo* (trails) connected the coastal area with the *kula* lands, a zone where agriculture and food production took place, and continued further *mauka* to the *wao lāʻau* and sometimes even into the *wao akua*. Curtis referred to one such trail as "Kipapa's trail," which extends from the coastal *ala loa* to a point roughly equivalent with present-day Kuakini Highway and appears to be the same trail depicted in Figure 14. According to Curtis, portions of this trail are extant with walls on each side, and still accessible today. Curtis explained that this trail was documented by Ching et al. in their 1973 study for the Aliʻi Realignment Project.

Curtis did not have access to the Archaeological Inventory Survey (AIS) that covered the current project area prior to the interview (ASM provided Curtis with a copy of the AIS subsequent to the interview), and suggested that the former route of Kipapa's Trail may have traversed the current project area. The AIS did not identify a trail extending through the parcel, however a *mauka-makai* trail (SIHP Site 6350) matching portions of the mapped location of a trail extend *mauka* from Kipapa's coastal grant (Grant 1927) as shown in Figure 14, was archaeologically recorded on the adjoining property to the north. The existence of Site 6350 on the neighboring property however, does not negate the possibility that another trail once existed within the current project area.

Curtis pointed out that, among other significant cultural and natural resources, the *mauka* areas are intimately connected to the natural fresh water resources that emerge along the coast. He described historical references to the presence of several freshwater *punawai* (springs) that originate in the uplands of Pāhoehoe and emerge along the coast (e.g. Ka Wai a Kāne, Umukahi Spring, Mokuloulu Spring, and the spring/well most recently used in conjunction with at least one, if not both of the former residences located on TMK parcels (3) 7-7-008:100 and 020 just *mauka* of Aliʻi Drive). Curtis believes that the comparatively narrow nature of Pāhoehoe 3 and 4 reflects the extent of significant fresh water sources, relating the definition of the *ahupuaʻa* boundaries to the distribution of the water sources. Curtis cautioned that ground disturbance occurring *mauka* of these *punawai* could very negatively impact the transport fresh water down to the coast, and, thereby, directly impacting the extent and location of water resources within these springs. At present, due to modern ground disturbances and land uses, he is unsure of the current status and output of each of these water sources.

In reflecting on the Land Grants of his ancestors, Curtis commented that oral histories maintained in their family indicate that these lands were frequented by the *aliʻi* (high chiefs) and inhabited by *kaukau aliʻi* (lesser chiefs). In particular, oral history within Curtis' family tells of Queen Emma and Kamehameha IV frequenting Pāhoehoe and visiting their ancestors whenever they came to Kona (their lands and home were in Waiʻaha). Curtis shared his genealogy that showed a familial relationship between several grantees, Kipapa, Kaupehe, and Kekamakahi. Curtis clarified that Kipapa's parents were Kaupehe (w) and Kekamakahi (k). In conversations Curtis had with an elder *kūpuna*, now deceased, Curtis was told that Kipapa's father was the chief in charge of Kamehameha I's *peleleu* (war canoe) fleet that sailed from Kawaihae and whose armies ultimately defeated the Oʻahu chiefs during the Battle of Nuʻuanu in 1795. He believes that this relationship may explain why these lands were granted to them by Kamehameha III and IV.

When asked about his thoughts on the proposed park site, Curtis was pleased to see the project moving forward. Curtis expressed his support and noted the importance of having more public recreational meeting facilities for the *keiki* (children) and other residents living in the nearby communities, especially since more homes have been constructed in this area. Curtis pointed out that there is a lack of parks in Kona, and that having one more centrally located where people live will be very beneficial. Curtis indicated that the project parcel itself has experienced severe ground disturbance and, likely, only a few traditional cultural sites remain, particularly the agricultural sites and perhaps portions of the old *mauka-makai* trail. Curtis hopes the developer considers conserving and protecting any remaining sites of cultural and historical significance, especially since many of the old cultural sites in the area have been destroyed or damaged because of neglect, a lack of knowledge, and modern development of the *ʻāina*. Curtis suggested that interpretive signs be developed and installed at the park that will educate people about traditional Hawaiian land use in the area with an emphasis on *mauka-makai* relationships within these *ahupuaʻa*. Curtis also recommended that if portions of the old trails connect to the parcel, that the developer consider restoring the trails and incorporate them into the long-term park plans. In addition, he recommends the planting of endemic and other native plants, which need little watering and tell a story of their own. Finally, Curtis extended his appreciation for the opportunity to participate in this Cultural Impact Assessment (CIA) and requested that he and other interested descendants of *nā kūpuna kahiko o kēiaʻāina* (the ancestors of this land) be kept informed of any further plans for and development of this project and how he may be of further assistance in the spirit of *e mau ke ea o ka ʻāina i ka pono*.

MALIA KIPAPA

On August 10, 2017, Lokelani Brandt sat down with Malia Kipapa at the Kamehameha Schools West Hawaiʻi offices in Keauhou to discuss any potential cultural impacts related to development of the proposed park site. Malia grew up and was raised on Hawaiian homestead in Keaukaha but has been living in North Kona since 2009. Her paternal lineage connects her with the lands of Pāhoehoe while her maternal lineage traces to the neighboring *ahupuaʻa* of Hōlualoa. Malia is Curtis Tyler's niece and thus a direct descendant of Kipapa, Kaupehe, and Kekamakahi, whom have historically held land grants in the area of Pāhoehoe. Since moving to Kona, Malia and her uncle Curtis have taken leadership roles in the preservation of their *iwi kupuna* (ancestral remains) located on the *makai* portion of Pāhoehoe (TMK: (3)7-7-008:031) to the west of the project area. In addition to caring for their ancestral burial grounds a Friends of the Park Agreement between Hawaiʻi County and the Kipapa ʻOhana was established. Malia and Curtis have been working with the County of Hawaiʻi to assist with the future plans of Kipapa Park and ensuring that this cultural park is established with respect to place and to encourage the restoration and reuse the old *mauka-makai* trails.

Malia shared a lot about her family's history as it relates to Pāhoehoe as well as current preservation efforts occurring in the area. At the onset of the interview she identified the family burial grounds and felt that sharing this information is important given its proximity to the project area. She recounted an old family *moʻolelo* (story) about how her ancestors used to transport the remains of the deceased relatives via canoe from Maui to Pāhoehoe for burial. She also specified that the most recent family burial in Pāhoehoe was for her great-great-great grandmother Kekapahaukea, who was the wife of Kipapa. According to Malia, Kekapahaukea was living on Oʻahu with her third husband (Robinson) when she died. Upon her death, her remains were brought from Oʻahu to Pāhoehoe for burial. Malia clarified that Land Grant 1927 (awarded to Kipapa) located *makai* of the proposed project area is the location of the reinternments and burials. She reflected on this traditional family practice and commented that Pāhoehoe was and still is an important place for her family.

Malia also stated that her family had parcels in both the *mauka* and *makai* portions of Pāhoehoe, and that the current project area is located amid some of the old trail routes. She pointed out that traversing the land via the *mauka-makai* trails was a traditional cultural practice regularly exercised by her family. As previously mentioned, one of the outcomes of their current restoration efforts is to get their family and the public to reestablish the tradition of traversing the trails and learning about the history of this place to make connections and develop that sense of appreciation and respect for Pāhoehoe. Malia shared firsthand accounts from several uncles who recalls traveling on these trails during the 20th century between the coast and the old *mauka* family home. She indicated that some of the trails in the area are double-walled, meaning both sides of the trail are delineated by a stone wall. She shared that these double walled trails are still visible in some areas. Malia acknowledged that the *mauka* lands were vital to her family's survival as these areas are where her *kūpuna* (ancestors) produced food to sustain their family. She emphasized the importance of maintaining the *mauka-makai* continuity, which is a traditional concept reflected in the ancient *ahupuaʻa* system.

When asked about her thoughts on the proposed park plans, Malia believes the plans could be improved to reflect traditional land use practices specific to Laʻaloa and Pāhoehoe. To make the park plans more culturally appropriate, Malia proposed a more integrated approach that expresses continuity between the project parcel and currently owned County lands located *makai* of the project area, specifically TMKs: (3) 7-7-008:100 and 020. Malia surmises that through integrative planning, the traditional *mauka-makai* concept can be creatively applied in a modern context and can aid in the preservation and promote restoration of the cultural sites in the area. Malia also notes that both Aliʻi Drive and Laʻaloa Beach Park have become increasingly crowded with pedestrians and park users. She believes that restoring the *mauka-makai* trails can help to reconnect the project parcel with the *makai* areas and may alleviate some of the foot traffic along Aliʻi Drive.

Malia spoke about the importance of having more public spaces for Kona families to gather. Malia pointed out that currently there are only two areas (Hale Hālāwai and Makaʻeo) in North Kona that can host large family gatherings. To make the park plans culturally appropriate, she believes that having an open concept park with large pavilions would help to fulfill a current community need. With regard to pavilion concept, Malia recommends drawing inspiration from traditional *kauhale*.

She acknowledged that the subject area has experienced major ground disturbance, except for a small portion of the parcel. She believes that the undisturbed area containing the agricultural sites should be integrated into the park plans and could be restored and used as community gardens. She noted that there is adequate soil built up in various locations throughout Pāhoehoe and the preservation of these sites would be valuable to the community. She also indicated that there are potential local businesses and individuals that would be interested in reestablishing the old food systems specific to Pāhoehoe.

She recommends the developer and future park managers continue to engage in dialogue with the Kipapa ʻOhana to develop a plan to connect both the *makai* parcels and the current project area. Malia feels that through a partnership, the old *mauka-makai* trails can be restored and utilized for modern recreation. In this way, traditional cultural practices can be restored, and the ancient sites maintained.

4. IDENTIFICATION AND MITIGATION OF POTENTIAL CULTURAL IMPACTS

The OEQC guidelines identify several possible types of cultural practices and beliefs that are subject to assessment. These include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The guidelines also identify the types of potential cultural resources, associated with cultural practices and beliefs that are subject to assessment. Essentially these are natural features of the landscape and historic sites, including traditional cultural properties. In the Hawaiʻi Revised Statutes–Chapter 6E the following definition is provided.

> "Traditional cultural property" means any historic property associated with the traditional practices and beliefs of an ethnic community or members of that community for more than fifty years. These traditions shall be founded in an ethnic community's history and contribute to maintaining the ethnic community's cultural identity. Traditional associations are those demonstrating a continuity of practice or belief until present or those documented in historical source materials, or both.

The origin of the concept of traditional cultural property is found in National Register Bulletin 38 published by the U.S. Department of Interior-National Park Service. "Traditional" as it is used, implies a time depth of at least 50 years, and a generalized mode of transmission of information from one generation to the next, either orally or by act. "Cultural" refers to the beliefs, practices, lifeways, and social institutions of a given community. The use of the term "Property" defines this category of resource as an identifiable place. Traditional cultural properties are not intangible, they must have some kind of boundary; and are subject to the same kind of evaluation as any other historic resource, with one very important exception. By definition, the significance of traditional cultural properties should be determined by the community that values them.

An inherent contradiction lies within this definition of "Property" that is exacerbated by difficulties in the process of identification and evaluation of potential Hawaiian traditional cultural properties, because the concept of boundaries runs counter to the traditional Hawaiian belief system. The sacredness of a particular landscape feature is often cosmologically tied to the rest of the landscape as well as to other features within it. To limit a property to a specifically defined area may actually disconnect it from what makes it significant in the first place.

However offensive the concept of boundaries may be, it is nonetheless the regulatory benchmark for defining and assessing traditional cultural properties. As the OEQC guidelines do not contain criteria for assessing the significance for traditional cultural properties, this study will adopt the state criteria for evaluating the significance of historic properties, of which traditional cultural properties are a subset. To be significant, the potential historic property or traditional cultural property must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

a Be associated with events that have made an important contribution to the broad patterns of our history;

b Be associated with the lives of persons important in our past;

c Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

d Have yielded, or is likely to yield, information important for research on prehistory or history;

e Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

While it is the practice of the DLNR-SHPD to consider most historic properties significant under Criterion d at a minimum, it is clear that traditional cultural properties by definition would also be significant under Criterion e. A further analytical framework for addressing the preservation and protection of customary and traditional native practices specific to Hawaiian communities resulted from the *Ka Paʻakai O Kaʻāina* v. Land Use Commission court case. The court decision established a three-part process relative to evaluating such potential impacts: first, to identify whether any valued cultural, historical, or natural resources are present; and identify the extent to which any traditional and customary native Hawaiian rights are exercised; second, to identify the extent to which those resources and rights will be affected or impaired; and third, specify any mitigation actions to be taken to reasonably protect native Hawaiian rights if they are found to exist.

A review of the culture-historical background material reveals that Pāhoehoe and Laʻaloa area was frequented by *aliʻi* (chiefs), and was the home to some of Hawaiʻi Island's *kaukau aliʻi* (lesser chiefs). Additionally, the subject parcel once contained several traditional cultural sites of which only two remain, a Historic Period stone boundary wall separating the *ahupuaʻa* of Pāhohoehoe 2 and Pāhoehoe 3 (SIHP Site 6352) and the remnants of a modified outcrop (SIHP Site 20841). Sites 6352 and 20841 have been determined to be significant under Criterion d. These archaeological sites have been successfully mitigated (Hammatt and Clark 1980; Henry and Wolforth 1998; Henry et al. 1996; Latinis et al. 1998), thus by definition the proposed project will not impact these historic properties. However, archaeological mitigation of the physical sites does not necessarily serve as mitigation for any past cultural practices that may have occurred at these sites. Through our consultation efforts, it was evident that culturally significant places like the coastal area of Pāhoehoe are still being cared for by lineal descendants and accessed for specific cultural practices like maintaining the *kūʻula* and nearby family burial grounds. Both Curtis Tyler and Malia Kipapa expressed the importance of maintaining a *mauka-makai* continuity as this is how the families from this area utilized and conceptualized the landscape, a concept that is fundamentally linked to the traditional *ahupuaʻa* system. Although both of the consulted parties indicated that there are currently no ongoing cultural practices associated with the project area, the former practices associated with the no longer extant archaeological sites remain nonetheless significant. They note that historically, a network of *kuolo* (trails) connected the people of old with the agricultural lands located *mauka* and the house lots and fisheries located *makai*. One such trail was located in the vicinity of the Site 6352 boundary wall. The proposed project provides a good opportunity for public interpretation that can help with highlighting the area's history relative to *mauka-makai* connections and the use of the trail network.

While cultural impact studies generally assess specific sites and practices that may be negatively impacted by a proposed project, the current authors suggest that the current project provides an opportunity to explore a more integrative planning approach that can promote the restoration and reuse of the conceptual traditional *mauka-makai* trail network. Through this integrative planning approach, a trail route can be incorporated into the contemporary park plans, connecting the project parcel to the *makai* cultural areas in Pāhoehoe and Laʻaloa, thus allowing for a traditional cultural experience in contemporary times. Figure 18 depicts a location for a potential future trail to be developed in consultation with the area's lineal and cultural descendants.

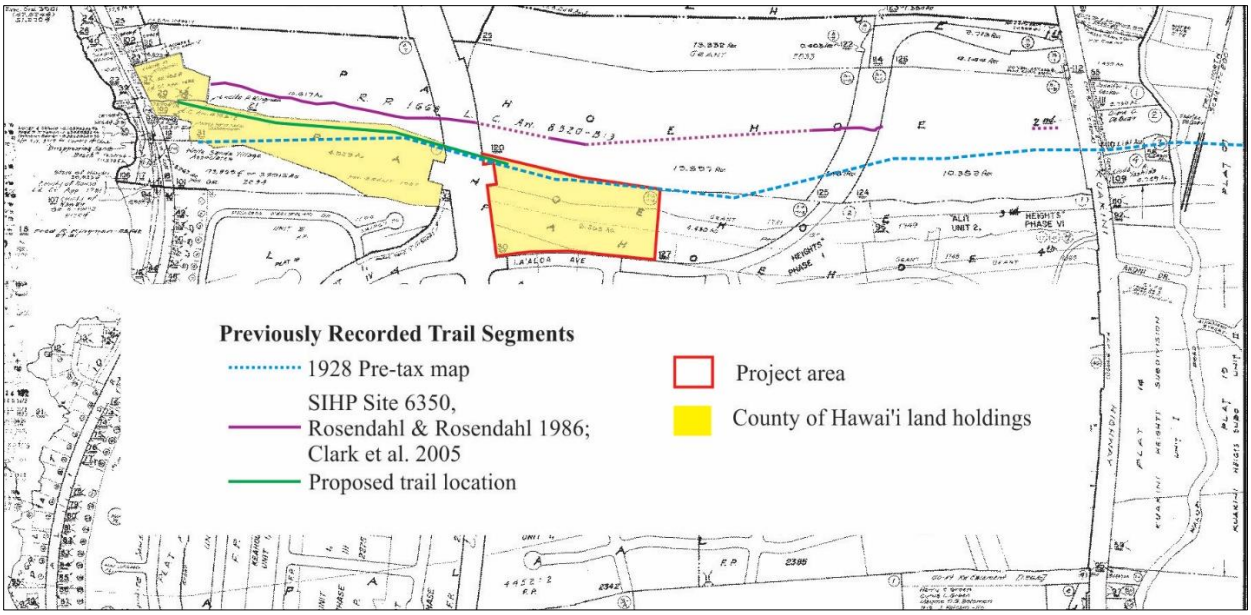


Figure 18. TMK map with previously recorded trail segments and proposed trail location.

Additionally, as mentioned by Curtis Tyler, for cultural as well as other reasons, it is critical to maintain the quality of water that either enters the ground and thus the basal aquifer, or is transported overland to sensitive coastal ecosystems. For these reasons, it is important to ensure that the erosion, sedimentation and pollution-prevention BMPs that might be required of grading and related permits are strictly followed during construction. Maintaining the existing fresh water output into the nearby bay is critical to maintaining a healthy and biologically diverse marine ecosystem, which helps to perpetuate traditional cultural practices associated with that ecosystem.

Currently absent from the proposed park plans is a covered gathering space to host cultural- and community-based events. We recommend that any future park planning effort consider the feasibility of including a covered pavilion where cultural groups and families from Kona can gather.

Attention to and potential implementation of the above-described planning considerations will help to ensure that no cultural practices and beliefs or associated cultural resources will be adversely affected by the proposed development of the park.

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Environmental Assessment

La‘aloa Avenue New Park Development

APPENDIX 3
Phase I Environmental Site Assessment

Note: some appendices not included, available upon request to rterry@hawaii.rr.com

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PHASE I ENVIRONMENTAL SITE ASSESSMENT REPORT
FOR
77-237 LAALOA AVENUE
KAILUA-KONA, HAWAII 96740

TMK (3) 6-7-008:030

6.365 ACRES

MNA PROJECT 2362_5

JULY 5, 2017

Myounghee Noh & Associates

Environmental Studies and Consulting Services

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This Phase I ESA report is prepared for:
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PHASE I
ENVIRONMENTAL SITE ASSESSMENT REPORT
FOR
77-237 LAALOA AVENUE
KAILUA-KONA, HAWAII 96740

TMK (3) 7-7-008:030

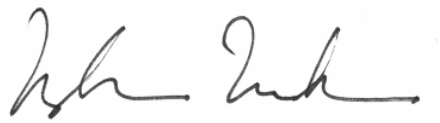
6.365 acres

MNA Job No. 2362_5

July 5, 2017

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental professional* as defined in §312.10 of 40 CFR 312.

I have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the *subject property*. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR 312.



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LIST OF ABBREVIATIONS

AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generators
CORRACTS	RCRA Facilities that are undergoing "corrective action"
EC/ IC	Engineering Control / Institutional Control
EDR	Environmental Data Resources, Inc.
EPA	Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FINDS	Facility Index System/Facility Registry System
FUDS	Formerly Utilized Defense Site
HDOH	Hawaii Department of Health
HEER	Hazard Evaluation and Emergency Response
HELCO	Hawaii Electric and Light Company
HFD	County of Hawaii Fire Department
HREC	Historical REC
LQG	Large Quantity Generator
MEC	Munitions and Explosives of Concern
MNA	Myounghee Noh & Associates, L.L.C.
NFA	No Further Action
NFRAP	No Further Remedial Action Planned
NLR	No Longer Regulated Generators
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
PCB	Polychlorinated Biphenyls
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Conditions
SEMS	Superfund Enterprise Management System (Archive)
SHWB	Solid and Hazardous Waste Branch
SQG	Small Quantity Generator
TMK	Tax Map Key
TSD	Treatment, Storage, and Disposal
USGS	United States Geological Survey
UIC	Underground Injection Control

UST	Underground Storage Tank
VRP	Voluntary Response Program
YMCA	Young Men's Christian Association

EXECUTIVE SUMMARY

Myounghee Noh & Associates, L.L.C. (MNA), was retained in May 2017 to conduct a Phase I Environmental Site Assessment (ESA) for the *subject property* located at 77-237 Laaloa Avenue in Kailua-Kona, Island of Hawaii, occupying a 6.365-acre parcel, identified by Tax Map Key (TMK) Island 3, Zone 7, Section 7, Plat 008, and Parcel 030 [TMK (3) 7-7-008:030]. The subject property was owned by the County of Hawaii. This Phase I ESA was completed for Geometrician Associates, LLC, in support of the development of the subject property as a park for compensatory mitigation related to development of a separate property in closer proximity to Kahaluu.

The purpose of this Phase I ESA is to identify *recognized environmental conditions (REC)* at the subject property, with respect to a range of contaminants within the scope of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and petroleum products.

The subject property is located approximately 3.5 miles south of Kailua-Kona, in the west of the Island of Hawaii, approximately ⅓-mile inland. Located ½-mile west of the Hawaii Belt Road (State Route 11) on Laaloa Avenue, the property is predominantly vacant land. There was a gravel access road leading from Laaloa Avenue at the center of the southern property boundary. No structures were observed on the subject property.

FINDINGS

Subject Property

No records of National Priorities List (NPL) sites, Federal Resource Conservation and Recovery Act (RCRA) CORRACTS and Non-CORRACTS Treatment Storage Disposal Facilities, Delisted NPL sites, Federal or state Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites, Federal CERCLIS No Further Remedial Action Planned (NFRAP) sites, landfill or solid waste disposal sites, State Leaking Underground Storage Tank (UST) List sites, State Voluntary Cleanup sites, Federal RCRA Generator sites, State registered UST sties, Institutional Controls/Engineering Controls registries, Federal Emergency Response Notification System (ERNS) list sites, Federal or State Brownfields sites were identified at the subject property. Review of additional records for the subject property did not identify any potential *RECs*.

According to a review of the aerial photographs and interviews, the subject property was used as a construction staging area from approximately 2000 to 2015 by Towne Development Hawaii. The subject property was likely used to store construction vehicles and equipment. Although it is possible that hazardous substances or petroleum products were stored on the subject property, records reviews, interviews, and the site reconnaissance indicated no evidence of a historical release. As a result, the past use of the subject property as a construction staging area is not considered a *REC*.

Information provided as part of the user questionnaire did not indicate any *RECs*.

One pad-mounted transformer was located adjacent to the sidewalk on the southeast boundary of the subject property. Hawaii Electric and Light Company (HELCO) indicated that the transformer

did not contain polychlorinated biphenyls (PCB). As a result, the presence of the pad-mounted transformer is not considered a *REC*.

Based on the records review, a review of additional records, research regarding the historical use of the subject property, and site reconnaissance, there were no obvious *RECs* in connection with the subject property.

Surrounding Area

No records of NPL sites, Federal RCRA CORRACTS and Non-CORRACTS Treatment Storage Disposal Facilities, Delisted NPL sites, Federal CERCLIS sites, landfill or solid waste disposal sites, State Voluntary Cleanup sites, Federal RCRA Generator sites, Institutional Controls/Engineering Controls registries, Federal ERNS list sites, Federal or State Brownfields sites were identified in the area surrounding the subject property. Review of additional records for adjoining properties did not identify any potential *RECs*.

Information provided as part of the interviews conducted or the user questionnaire did not indicate any *RECs*.

In summary, there was no evidence of use of hazardous substances or petroleum products in connection with the adjoining or surrounding properties with the potential to impact the subject property.

DATA GAPS AND DEVIATIONS

There were no limitations or deviations from the ASTM method during this Phase I ESA. Due to the ground being covered by gravel and vegetation, however, limited surface and subsurface information regarding the former construction baseyard constitutes a data gap. This has an adverse effect to the completeness of the Phase I assessment.

RECOGNIZED ENVIRONMENTAL CONDITIONS

MNA performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM E 1527-13 of the 6.365-acre subject property identified as TMK (3) 7-7-008:030 in Kailua-Kona, Island of Hawaii. This assessment has revealed no obvious evidence of *recognized environmental conditions*, as defined by ASTM, in connection with the *subject property*, except for the following:

- Due to gravel surface areas and vegetative cover throughout the subject property, surface and subsurface conditions and potential for contamination associated with the land use as a construction baseyard and staging area over the last 15 to 20 years, is unknown.
- During construction baseyard and staging activities, it is likely that heavy and or light equipment were parked or fueled onsite using fuel tanks, which may have been stored on the subject property. Therefore, any future discoveries of contaminations below ground surface may potentially be a *REC*.

1.0 INTRODUCTION

This report presents the results of a Phase I Environmental Site Assessment (ESA) conducted during May and June 2017 for the subject property at 77-237 Laaloa Avenue, occupying a 6.365-acre parcel identified by Tax Map Key (TMK) Island 3, Zone 7, Section 7, Plat 008, and Parcel 030 [TMK (3) 7-7-008:030] in Kailua-Kona, Island of Hawaii. The location of the subject property is identified in Figure 1.

This Phase I ESA was conducted by Myounghee Noh & Associates, L.L.C., herein referred to as MNA, for Geometrician Associates, LLC, to provide information to be incorporated into the Environmental Assessment being conducted for proposed development at the subject property.

1.1 PURPOSE

The purpose of this Phase I ESA is to identify any *recognized environmental conditions* (RECs) at the subject property, with respect to a range of contaminants within the scope of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and petroleum products. This practice is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner defense to CERCLA liability, "all appropriate inquiry into the previous ownership and uses of the site consistent with good commercial or customary practice." The term *recognized environmental condition* denotes the presence, or likely presence, of any hazardous substances or petroleum products on the property under conditions that indicate an existing release, a past release, or a material threat of a release into structures on the property or into the ground, groundwater, or surface water of the property (ASTM International, 2013).

This report is part of the Phase I ESA conducted for the subject property. The assessment was conducted in accordance with the practices described in Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM International, 2013).

1.2 DETAILED SCOPE OF SERVICES

A Phase I ESA has four components: records review, site reconnaissance, interview, and report. MNA conducted this ESA using information sources with the potential to identify past or current releases of hazardous substances or petroleum products into the subject property. Adjoining properties were also evaluated for their potential to impact the subject property. Per the ASTM International Phase I ESA Standard, adjoining properties include parcels touching the subject property as well as those properties across a roadway (ASTM International, 2013).

1.2.1 Site History

Where available and as needed, MNA researched historical and current topographic maps, tax records, fire insurance maps, regulatory agency websites, and aerial photographs to identify previous and current uses of the property, adjoining properties, and the surrounding area.

Scale

120'

Figure 1. Site Location Map
Phase I Environmental Site Assessment
77-237 Laaloa Avenue
TMK (3) 7-7-008:030
Kailua-Kona, Island of Hawaii

1.2.2 Regulatory Records

MNA examined government records with respect to environmental conditions, citations, complaints, and permits at the subject property, at adjoining properties, and within the surrounding area. MNA utilized a records search provided by Environmental Data Resources, Inc. (EDR), to review records from the following federal and state programs:

- National Priorities List (NPL)
- Delisted NPL
- Resource Conservation and Recovery Act (RCRA) facilities that are undergoing "corrective action" (CORRACTS)
- RCRA-Treatment, Storage, & Disposal (TSD)
- Comprehensive Environmental Response, Compensation & Liability Information System (CERCLIS) List
- Superfund Enterprise Management System Archive [SEMS; formerly CERCLIS No Further Remedial Action Planned (NFRAP) List]
- Federal and Hawaii State Brownfields
- Hawaii Solid Waste & Landfill
- Leaking Underground Storage Tank (Leaking UST)
- RCRA-Violators/Enforcement
- Underground Storage Tank (UST)
- Emergency Response Notification System (ERNS)
- RCRA – Generators, including those No Longer Regulated (NLR)
- Hawaii Sites of Interest
- Hawaii Releases
- Federal and Hawaii State Land Use Controls
- Hawaii Voluntary Cleanup Sites
- Tribal Lands

Additionally, MNA requested state environmental case files from the Hawaii Department of Health (HDOH), the Hawaii Electric Light Company (HELCO), and the County of Hawaii Fire Department (HFD).

1.2.3 Site Reconnaissance

MNA performed a site reconnaissance to obtain information indicating the likelihood of contamination, to interview available site personnel, and to conduct a brief assessment of the adjoining properties. During the site reconnaissance, MNA looked for a variety of indicators of environmental hazards including, but not limited to, stained surface soil, dead or stressed vegetation, hazardous substances, aboveground and underground storage tanks, disposal areas, groundwater wells, drywells, and sumps. Sampling and testing of soil, surface water, or groundwater were not part of this assessment.

1.2.4 Site Geology and Hydrogeology

MNA reviewed published information for the property and surrounding area on surface and subsurface conditions such as topography, drainage, surface water bodies, subsurface geology, and groundwater. MNA used this information to assess the potential for migration and impact of the subject property by releases of hazardous substances or petroleum products at off-site properties.

1.2.5 Data Evaluation and Reporting

MNA evaluated the information collected, and prepared this report as part of the assessment. Section 2 presents the site background information; Section 3 user provided information; Section 4 information collected from records review; Section 5 site reconnaissance; Section 6 interviews; Section 7 data gaps; Section 8 key findings and opinion; and Section 9 conclusion.

1.3 SIGNIFICANT ASSUMPTIONS

The conclusion presented in this report is based upon the assumption that reasonably ascertainable and relevant information pertaining to the environmental condition of the subject property was made available to MNA during the assessment. Information obtained from government agencies and other resources is presumed to be accurate and updated. Additionally, information collected in interviews is collected in "good faith" and believed to be true and accurate to the best knowledge of the interviewee.

1.4 LIMITATIONS AND EXCEPTIONS

The Phase I ESA provides a "snapshot" of the property conditions at the time of the assessment. Findings, opinions, and conclusions apply to property conditions existing at the time of the investigation and those reasonably foreseeable. They do not apply to conditions at, or changes to, the property, of which MNA is not aware, could not reasonably be aware, and has not had the opportunity to evaluate.

This report is based upon visual observations of the subject property and its vicinity, interpretation of the available historical and regulatory information and documents reviewed, and interviews of individuals with knowledge of the subject or surrounding property. MNA cannot ensure the accuracy of the historical or regulatory information. This report is intended exclusively for the purpose outlined and applies only to the subject property.

This Phase I ESA excludes asbestos, lead paint, unexploded ordnance, munitions and explosives of concern, and investigation of geotechnical concerns. No surface or subsurface investigation was involved.

1.5 SPECIAL TERMS AND CONDITIONS

This Phase I ESA was conducted and prepared by MNA for the exclusive use of Geometrician Associates, LLC. This report shall not be relied upon or transferred to any other party without written authorization from Geometrician Associates, LLC.

1.6 USER RELIANCE

This report is an instrument of service of MNA, which summarizes its findings and opinions with respect to *recognized environmental conditions* at the subject property. Findings and opinions are predicated on information that MNA obtained on the dates and from individuals stated herein, from public records reviewed, a site reconnaissance, and ancillary Phase I ESA activities. This assessment relies upon the accuracy and completeness of the information provided. The information obtained for this assessment is used without extraordinary verification. It is possible that other information exists and is discovered, or environmental conditions change subsequent to the submittal of this Phase I ESA report, to which MNA shall not be held responsible for exclusion.

2.0 SITE DESCRIPTION

This section contains location and legal description; site and vicinity general characteristics; current subject property use; structures, roads, and other improvements; past subject property use; and current and past use of adjoining properties.

2.1 LOCATION AND LEGAL DESCRIPTION

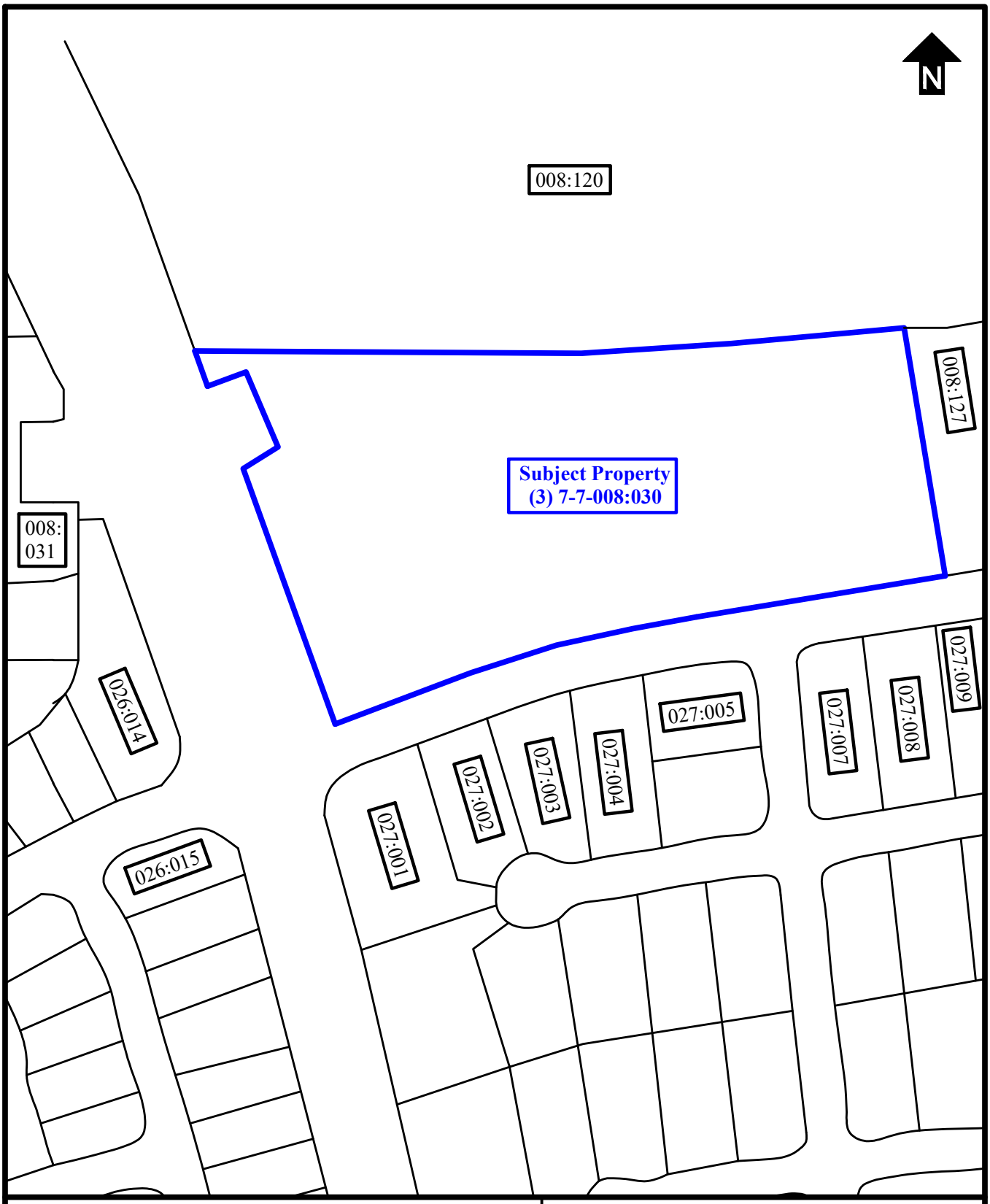
The subject property is a 6.365-acre parcel, TMK (3) 7-7-008:030, in the community of Kailua-Kona, Keauhou District, Island of Hawaii. According to the County of Hawaii tax records, the physical address of the property is 77-237 Laaloa Avenue, Kailua-Kona 96740 (County of Hawaii, 2017). The subject property is located approximately 3.5 miles south of Kailua-Kona, in the west of the Island of Hawaii, approximately 1/3 mile inland. Located ½ mile west of the Hawaii Belt Road (State Route 11) on Laaloa Avenue, the property is predominantly vacant land. A TMK map is presented in Figure 2.

2.2 SITE AND VICINITY GENERAL CHARACTERISTICS

The subject property is located in an area of residential subdivisions, off Laaloa Avenue. The subject property contained no structures. The subject property was a sparsely vegetated gravel lot. The Pacific Ocean is approximately 1/3 mile west of the subject property.

2.3 GEOLOGY

The Island of Hawaii is of volcanic origin and was accumulated by the combination of Kohala, Mauna Kea, Mauna Loa, Kilauea, and Hualalai volcanoes. The island is comprised of numerous thin, extremely permeable tholeiitic (relatively rich in silicon and iron) basalt lava flows (Stearns, 1985).



Scale

100'

Figure 2. TMK Map
Phase I Environmental Site Assessment
77-237 Laaloa Avenue
TMK (3) 7-7-008:030
Kailua-Kona, Island of Hawaii

Hawaii, the youngest and largest Hawaiian Island, is larger than all the other Hawaiian Islands combined. Hazlett and Hyndman (1996) describe the island as follows:

> It [Hawaii Island] sprawls over an area the size of Connecticut, spanning 90 miles from north to south and 80 miles from east to west. Five large volcanoes coalesce to make the visible part of the Big Island; a sixth lies buried beneath the surface. The southern part of the island is still volcanically active and building out along much of the coastline. To the north, volcanism is in the waning stages. Of all the Hawaiian Islands, the Big Island shows the greatest diversity of rocks and landscapes (Hazlett & Hyndman, 1996).

The subject property is located approximately 25 miles west of the peak of Mauna Loa. Mauna Loa, a shield volcano, is the largest volcano in both mass and volume, and has historically been considered the largest volcano on Earth.

The United States Department of Agriculture Natural Resources Conservation Service classifies the soil at the subject property as soils of the Waimea medial very fine sandy loam complex, formed of ash fields on lava flows with 0 to 6% slopes. This is a well-drained soil with a low to moderately low capacity to transmit water (0.00 to 0.06 inches per hour), and a depth to bedrock of approximately 42 to 52 inches (United States Department of Agriculture, 2017).

2.4 HYDROLOGY AND HYDROGEOLOGY

The HDOH Safe Drinking Water Branch established an Underground Injection Control (UIC) line to serve as a boundary between drinking water and non-drinking water portions of aquifers. Areas above (mountain side) the UIC line are within drinking water portions of the aquifer, while areas below (ocean side) the UIC line are in non-drinking water portions of the underlying aquifer. The subject property is below the UIC line in a non-drinking water portion of the aquifer (Hawaii Department of Health Safe Drinking Water Branch, 2014).

The hydraulic gradient, and therefore the expected direction of travel, of the basal groundwater within the basaltic formation is, in general, from mountain areas to the shoreline. According to Mink and Lau (1990), the subject property is located above the Hualalai aquifer sector and the description of hydrogeology and aquifer are as follows:

> Aquifer Sector: Hualalai. The Hualalai Aquifer Sector encloses the Hualalai Volcano as traced along the Hualalai/Mauna Loa contact. Shaped roughly like half a circle, its north-south distance is 22 miles (35.4 kilometers) and its east-west distance is 20 miles (32.2 kilometers). It is composed exclusively of Hualalai Volcanics. All surface exposures belong to the alkali basalt series; the basement basalt is not exposed. Included among the rock units is the Waawaa Trachyte, which emanated from the Pu'u Wa'awa'a vent. The volcano is still active, having erupted in 1801. Two aquifer systems constitute the Hualalai Aquifer Sector: Keauhou and Kiholo (Table 1) (Mink & Lau, 1990).

Aquifer System: Keauhou (80901). Boundaries. The boundary starts at Kuamo'o Point, follows the geological contact inland to the crest of the rift zone, then follows the rift zone to the sea at Papiha Point (Mink & Lau, 1990).

Geology. All rocks belong to the Hualalai Volcanics, including the 1801 lava flow just north of Keahole Point. The rift zone is marked by cinder and spatter cones. Sediment accumulations are insignificant (Mink & Lau, 1990).

Hydrology. The minimum average annual rainfall of 20 inches (508 millimeters) occurs at the coast and near the summit of the volcano. Rainfall reaches a maximum of about 80 inches (2,032 millimeters per year) inland of Kailua. The high-rainfall belt at the 3,500 feet (1,066.8 meter) elevation transitions into a fog belt that reaches to about the 6,500 feet (1,981.2 meter) elevation. Most flanks of the volcano are weakly eroded, but one stream, Wai'aha, often carries water (Mink & Lau, 1990).

Groundwater. Within about two miles (3.2 kilometers) of the coast the groundwater is basal and generally blackish. High-level water occurs farther inland. High-level water was discovered in recent years, but its mode of occurrence is not understood. Along the rift zone dike-impounded water probably occurs at depth. Basal springs discharge brackish, cool water at the coast (Mink & Lau, 1990).

The Federal Emergency Management Agency (FEMA) flood map for the area (1551660927D and 1551660929, June 2, 1995) indicates that the subject property is Flood Zone X, or areas outside of the 500-year flood zone (Federal Emergency Management Agency, 1988).

Table 1. Keauhou Aquifer System

Aquifer Code	**80901111**
Island Code	8–Hawaii
Aquifer Sector	09–Hualalai
Aquifer System	01–Keauhou
Aquifer Type, hydrology	1–Basal
Aquifer Condition	1–Unconfined
Aquifer Type, geology	1–Flank
Status Code	**11211**
Development Stage	1–Currently used
Utility	1–Drinking
Salinity (in mg/L Cl^-)	2–Low (250-1,000)
Uniqueness	1–Irreplaceable
Vulnerability to Contamination	1–High

mg/L Cl^--milligrams per liter of chloride

2.5 CURRENT USE OF THE SUBJECT PROPERTY

The subject property was owned by the County of Hawaii, although the County of Hawaii Real Property Tax record currently shows Island of Hawaii YMCA as the owner. The subject property

was currently undeveloped but has been used as a construction staging area during the construction of the residential subdivision adjacent to the subject property over the last 15 to 20 years

2.6 STRUCTURES, ROADS, AND OTHER IMPROVEMENTS

No structures were present on the subject property, except for one pad-mounted transformer and an underground utility box. Electrical, cable and phone, and sewer utilities were observed at the subject property. The subject property is accessed from Laaloa Avenue. Most of the subject property is graded, although the northwest corner is ungraded and vegetated. A site map is presented in Figure 3 and photographs in Appendix B.

2.7 PAST USES OF THE SUBJECT PROPERTY

Information regarding past uses of the subject property was obtained from a review of tax records (County of Hawaii, 2017), historic topographic maps and aerial photographs, U.S. Army Corps of Engineers' Formerly Utilized Defense Site (FUDS) website, and interviews. According to the County of Hawaii Real Property Tax Office, the Island of Hawaii YMCA owns the subject property; however, it is currently owned by the County of Hawaii. Table 2 summarizes available information regarding the current and past uses and users of the subject property.

Table 2. Users and Primary Uses of Subject Property

Period (approx.)	Owner/Lessee/Sub-Lessee	Area (acres)	Primary Use
TMK (3) 7-7-008:030; 77-237 Laaloa Avenue, Kailua-Kona			
2015-Present	Island of Hawaii YMCA	6.365	Open Lot
2015	**4.428 acres to TMK (3) 7-7-008:127 Area revised to 10.762 acres**		
2003-2015	Island of Hawaii YMCA	10.758	Open Lot
2003	0.723 acre dropped into Roadway		
2002-2003	Island of Hawaii YMCA	11.481	Open Lot
2001-2002	Towne Keauhou, LLC	11.481	Commercial
2001	**10.013 acres to TMK (3) 7-7-008:011 11.481 acres from TMK (3) 7-7-008:011**		
1999-2001	Towne Keauhou, LLC	10.013	Commercial
1999	Towne-Kona LTD Partnership Karen Kobayashi Katherine Staton	10.013	Agriculture/Ranching
1999	Towne-Kona LTD Partnership	10.013	Agriculture/Ranching
1999	**5.839 acres from TMK (3) 7-7-008:096 Area revised to 14.013 4 acres to TMK (3) 7-7-008:096**		
1996-1999	Towne-Kona LTD Partnership	7.23	Agriculture/Ranching
1996	Towne Development of Kona, Inc	7.23	Agriculture/Ranching
1986-1996	Taiyo Hawaii Company, Ltd.	7.23	Agriculture/Ranching
1980-1986	Kazuo Haida	7.23	Agriculture/Ranching

Period (approx.)	Owner/Lessee/Sub-Lessee	Area (acres)	Primary Use
	Taiyo Fudosan Kogyo Company, Ltd.		
1972-1980	Louis Berke Robert Ginter	7.23	Agriculture/Ranching
1972	Casper Blackburn Carl Seiersen	7.23	Agriculture/Ranching
1969-1972	Carl Seiersen Jack Dalbey, Jr. Casper Blackburn Louis Berke	7.23	Agriculture/Ranching
1967-1969	DBA MRS Co.	7.23	Agriculture/Ranching
1967	Barbara Kobayashi	7.23	Agriculture/Ranching
1967	Herman Reich	7.23	Agriculture/Ranching
1964-1967	Casper Blackburn Carl Seiersen Jack Dalbey, Jr Jas Penney	7.23	Agriculture/Ranching
1964	**Area revised to 7.23 acres**		
1963-1964	Lloyd Mannes; Robert Yerxa; Reuben Casey; Herman Reich; Andrew Unotic; Richard Wilkes; Lester Sherden	6.297	Agriculture/Ranching
1954-1963	Antone Couvoia; Emily Couvoia	6.297	Agriculture/Ranching
1954	**0.133 acre dropped into road** **0.57 acre to TMK (3)7-7-008:060**		
Prior to 1954	Frances de Guair, et al. Anna De Aopia	7	Agriculture/Ranching

TMK - Tax Map Key

2.8 CURRENT AND PAST USES OF ADJOINING PROPERTIES

Information regarding past uses of the adjoining properties was obtained from review of tax records (County of Hawaii, 2017), historic topographic maps and aerial photographs, FUDS website, and interviews. The current property use information is summarized in Table 3, and former users are listed in Appendix A.

Table 3. Current Users and Primary Uses of Adjoining Properties

Period (approx.)	Owner/Lessee/Sub-Lessee*	Area (acres)	Primary Use
TMK (3) 7-7-008:127; 77-237 Laaloa Avenue, Kailua-Kona Adjoining property to the East			
2015-Present	Island of Hawaii YMCA	4.43	Residential
2015	**Area revised to 4.43 acres**		

Period (approx.)	Owner/Lessee/Sub-Lessee*	Area (acres)	Primary Use
	4.428 acres from TMK (3) 7-7-008:030		
2003-2015	Island of Hawaii YMCA	10.758	Open Lot
2003	**0.723 acre dropped into Roadway**		
2002-2003	Island of Hawaii YMCA	11.481	Open Lot
TMK (3) 7-7-008:120; Kailua-Kona Adjoining property to the North			
2012-Present	BNP Paribas VPG Brookline CRE, LLC	19.567	Commercial
2012	**10.352 acres to TMK (3) 7-7-008:124 1.487 acres to TMK (3) 7-7-008:125 Area revised to 31.436 acres**		
TMK (3) 7-7-026:014; 77-181 Laaloa Avenue, Kailua-Kona Adjoining property to the West			
2006-Presnet	Michael Robertson	0.704	Residential
2003-2006	Michael Robertson Loretta Cordova	0.704	Residential
TMK (3) 7-7-008:031; 77-6467 Alii Drive, Kailua-Kona Adjoining property to the West			
2012-Present	County of Hawaii	4.525	Agricultural
TMK (3) 7-7-027:001; 77-199 Hoomohala Road, Kailua-Kona Adjoining property to the South			
Present	Lester and Julie Lederer Trust	0.716	Residential
TMK (3) 7-7-027:002; 77-201 Hoomohala Road, Kailua-Kona Adjoining property to the South			
2006-Present	James Stead Trust	0.384	Residential
2004-2006	James Stead	0.384	Residential
TMK (3) 7-7-027:003; 77-203 Hoomohala Road, Kailua-Kona Adjoining property to the South			
2003-Present	Hormat Natasha Katouzian	0.422	Residential
2003	**0.422 acres from TMK (3) 7-7-008:011**		
TMK (3) 7-7-027:004; 77-205 Hoomohala Road, Kailua-Kona Adjoining property to the South			
2009-Present	Garlock Family Trust	0.446	Residential
2005-2009	Garlock Trust	0.446	Residential
TMK (3) 7-7-027:005; 77-152 Kapukapu Street, Kailua-Kona Adjoining property to the South			
2007-Present	John Creaser Trust	0.344	Residential
2003-2007	John Creaser	0.344	Residential
2003	**0.344 acre from TMK (3) 7-7-008:011**		
TMK (3) 7-7-027:007; 77-217 Hoomohala Road, Kailua-Kona Adjoining property to the South			
2015-Present	Mark Wormley Trust	0.441	Residential

Period (approx.)	Owner/Lessee/Sub-Lessee*	Area (acres)	Primary Use
	Nannette Wormley Trust		
2015	Mark Wormley Nannette Wormley	0.441	Residential
2013-2015	Wormley Trust	0.441	Residential
TMK (3) 7-7-027:008; 77-219 Hoomohala Road, Kailua-Kona Adjoining property to the South			
2006-Present	Kyle Phillips Holly Jones	0.449	Residential
TMK (3) 7-7-027:009; 77-221 Hoomohala Road, Kailua-Kona Adjoining property to the South			
2003-Present	Thomas Morton Rene Morton	0.449	Residential
2003	**0.449 acre from TMK (3) 7-7-008:011**		
TMK (3) 7-7-026:015; 77-153 Mahiehie, Kailua-Kona Adjoining property to the South			
2014-Present	Gary Patulski Christine Patulski	0.284	Residential

TMK - Tax Map Key; *Former users of the properties are listed in Appendix A.

3.0 USER PROVIDED INFORMATION

User provided information was obtained by having a representative of the County of Hawaii, James Komata, complete a "User Questionnaire" administered by MNA. The information in the following sections was obtained from the questionnaire.

3.1 ENVIRONMENTAL LIENS OR ACTIVITY AND USE LIMITATIONS

Mr. Komata was unaware of any environmental cleanup liens or activity and land use limitations for the subject property.

3.2 SPECIALIZED KNOWLEDGE

Mr. Komata indicated that he had no specialized knowledge or experience related to the property or nearby properties, nor did he have reasonably ascertainable information of any spills, chemical releases, or environmental cleanups at the site. He indicated that there is no known contamination believed to be present. Mr. Komata stated that the past use of the subject property included a construction base yard by the developer of the adjacent residential subdivision with the approval of one of the prior owners of the property, and that the site was also used as a base of operations for the contractor that constructed the more recent Laaloa Avenue extension under the County of Hawaii Department of Public Works, also with approval from the previous owner, the YMCA of Hawaii.

3.3 VALUATION REDUCTION

Mr. Komata had no information pertaining to the valuation reduction of the site.

3.4 REASON FOR PERFORMING THE PHASE I ESA

The purpose of this Phase I ESA is to identify any *recognized environmental conditions* at the subject property, within the scope of ASTM Standard 1527-13, for due diligence related to the construction of a park.

4.0 RECORDS REVIEW

Under ASTM 1527-13, records are to be reviewed by the environmental professional who may help identify RECs in connection with the subject property.

4.1 STANDARD ENVIRONMENTAL RECORD SOURCES

MNA used Environmental Data Resources, Inc. (EDR), to search standard federal and state government databases for hazardous substance or petroleum product releases that could impact the subject property. A copy of the EDR report is provided in Appendix A.

ASTM E 1527-13 specifies a minimum search distance for specific environmental record sources. The following sources are specified for <u>incidents or sites within one mile of the subject property</u>:

- Federal NPL site list
- Federal RCRA CORRACTS TSD facilities list
- State Sites of Interest

The following sources are specified for <u>incidents or sites within ½ mile of the subject property</u>:

- Federal Delisted NPL site list
- Federal CERCLIS list
- Federal SEMS-Archive site list (formerly CERLIS-NFRAP)
- Federal RCRA non-CORRACTS TSD facilities list
- State Brownfield Sites
- State Hazardous Waste Sites
- State landfill and/or solid waste disposal site list
- State leaking UST list
- State voluntary cleanup program sites

The following sources are for <u>incidents on the subject and adjoining properties</u>:

- Federal RCRA generators list
- State registered UST list

Finally, the following are for <u>incidents for the subject property</u>:

- Federal ERNS list
- Federal Institutional Controls (IC) and Engineering (EC) Registries
- State IC and EC Registries
- State releases list

The following subsections summarize the results of the EDR records review for the datasets listed above (Environmental Data Resources, Inc., 2017).

4.1.1 Federal National Priorities List

The NPL, maintained by the U.S. Environmental Protection Agency (EPA), is a list of highly contaminated sites that have been identified by Superfund Amendments and Reauthorization Act of 1986. There were no NPL sites identified within one mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.2 Federal RCRA CORRACTS TSD Facilities List

The RCRA CORRACTS TSD facilities list maintained by the EPA contains generators, transporters, treaters, storers, and disposers of hazardous waste that have reported violations and are subject to corrective actions. No RCRA CORRACTS TSD facilities were identified within one mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.3 Delisted NPL Site List

This list, maintained by the EPA, contains delisted NPL sites. No delisted NPL sites were identified within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.4 Federal CERCLIS List

The CERCLIS list, maintained by the EPA, contains sites that are either proposed to be or are on the NPL list, as well as sites that are in the screening and assessment phase for possible inclusion on the NPL. No federal CERCLIS sites were identified within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.5 Federal SEMS-Archive Site List

SEMS-Archive (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. The SEMS-Archive list, maintained by the EPA, contains designated CERCLA sites that, to the best of the EPA's knowledge, assessment has been completed and has determined that no further steps will be taken to list the sites on the NPL. No SEMS-Archive sites were identified within ½ mile of the subject property the subject property (Environmental Data Resources, Inc., 2017).

4.1.6 Federal RCRA non-CORRACTS TSD Facilities List

The RCRA non-CORRACTS TSD facilities list, maintained by the EPA, contains RCRA permitted facilities that treat, store, or dispose of hazardous waste. No RCRA TSD facilities listed were identified within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.7 State Brownfield Sites

This database, maintained by the HDOH HEER Office, is an inventory of state designated brownfield sites. Under the Small Business Liability Relief and Brownfields Revitalization Act, a brownfield is defined as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." The EPA provides grants and loans to state and local governments for the assessment, cleanup, and redevelopment of these properties. Properties located on the state brownfield list may have received federal funding under this program or be designated a brownfield for state administration or funding purposes. No state brownfield sites were identified within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.8 State Hazardous Waste Sites

The State Hazardous Waste Sites records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds are identified along with sites where cleanup will be paid for by responsible parties. No State Hazardous Waste Sites were identified within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.9 State Landfill/Solid Waste Disposal Sites

The HDOH records contain an inventory of permitted landfills in the State of Hawaii. No permitted solid waste landfills, incinerators, or transfer stations were identified within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.10 State Leaking UST List

The state Leaking UST list, maintained by the HDOH Solid and Hazardous Waste Branch (SHWB), maintains an inventory of sites with Leaking USTs. No Leaking UST within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.11 State Voluntary Cleanup Sites

The state voluntary cleanup sites list, maintained by the HDOH HEER Office, contains sites participating in the state's Voluntary Response Program (VRP). No facilities participating in the state VRP were identified within ½ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.12 Federal RCRA Generators List

The RCRA Generators list, maintained by the EPA, contains small and large quantity generators of RCRA hazardous waste. The determination of generator size is used to establish the risk that the facility poses to public health and the environment and consequently, the amount of regulation and reporting required. Large Quantity Generators (LQG) are facilities that generate more than a 1,000 kg/month of hazardous waste and/or more than 1 kg/month of acute hazardous waste. Small Quantity Generators (SQG) are facilities that generate less than 1,000 kg/month but more than 100 kg/month of hazardous waste and/or less than 1 kg/month of acute hazardous waste.

Conditionally Exempt Small Quantity Generators (CESQG) are facilities that generate less than 100 kg/month of hazardous waste and/or less than 1 kg/month of acute hazardous waste. The EPA also maintains the RCRA NLR list. This list contains facilities that were once on the RCRA generators list, but are no longer in business, no longer in business at the listed address, or are no longer generating hazardous waste substances in quantities that require reporting. No SQG, LQG, or CESQG were identified on the subject or adjoining properties (Environmental Data Resources, Inc., 2017).

4.1.13 State Registered UST List

The HDOH SHWB maintains a database of known UST. No UST facilities within ¼ mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.14 Federal IC and EC Registries

These sites are federally listed sites that are required to implement institutional controls or engineering controls. Because the sites may continue to be impacted by past use, future use of the property may be restricted in order to protect human health and the environment. Land use controls can be either ICs or ECs. Institutional controls are limitations on how the property may be used such as limiting use to industrial activities. Engineering controls are physical structures or devices located on the property that contain or limit exposure to contamination. Engineering controls need to be maintained or protected to be effective. No Federal ICs or ECs were identified within one mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.15 State ICs and ECs Registries

These sites are state listed sites that have either state-required institutional controls or engineering controls in place. Because the sites may continue to be impacted by past use, future use of the property may be restricted in order to protect human health and the environment. Land Use Controls can be either ICs or ECs. ICs are limitations on how the property may be used such as limiting use to industrial activities. ECs are physical structures or devices located on the property that contain or limit exposure to contamination. ECs need to be maintained or protected to be effective. No State IC or EC site were identified within one mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.16 Federal ERNS List

The ERNS list, maintained by the EPA, contains CERCLA hazardous substance releases or spills, as maintained at the National Response Center. No incidents were identified on the subject property (Environmental Data Resources, Inc., 2017).

4.1.17 U.S. Brownfields

U.S. Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence of a hazardous substance, pollutant, or contaminant. No U.S. Brownfields sites were identified within one mile of the subject property (Environmental Data Resources, Inc., 2017).

4.1.18 Hazardous Materials Incident Reporting System

The Hazardous Materials Incident Reporting System, also called SPILLS or SPILLS90, includes hazardous materials spills that were reported to state Department of Transportation. No SPILLS site was identified in proximity to the subject property (Environmental Data Resources, Inc., 2017).

4.1.19 Facility Index System/Facility Registry System

The Facility Index System/Facility Registry System (FINDS) is a centrally managed EPA database that identifies facilities, sites, or places of environmental interest in the United States. EDR identified two FINDS listings at the subject property. Both listings were for expired National Pollutant Discharge Elimination System (NPDES) permits and have no relationship to petroleum products or hazardous materials with the potential to impact the subject property.

4.2 ADDITIONAL RECORD SOURCES

MNA reviewed additional environmental records as needed and available. Additional records filed by the HDOH SHWB, HFD, and the HELCO were requested. MNA reviewed available online records for the subject and adjoining properties. The U.S. Army Corps of Engineers documents made available on its FUDS website were also reviewed.

4.2.1 Subject Property

MNA requested records for review from the HDOH SHWB and HFD on May 24, 2017, and HELCO on June 16, 2017. HFD and SHWB responded that they had no records on file for the subject property.

MNA reviewed publicly available information posted on the HDOH HEER Office website, http://eha-web.doh.hawaii.gov/eha-cma/Leaders/HEER/public-records, and found that the subject property was not listed on the HEER Sites of Interest Lookup Spreadsheet or the HEER Emergency Response Lookup Spreadsheet. MNA reviewed the HDOH Environmental Health Warehouse (http://eha-web.doh.hawaii.gov/ehw/), and found that there were no sites of interest shown on the subject property.

FUDS documents were available at http://www.poh.usace.army.mil/Missions/Environmental/FUDS/Waikoloa.aspx. FUDS map was downloaded from http://www.poh.usace.army.mil/Portals/10/docs/fuds/Waikoloa%20Map%20March%202013.pdf.

4.2.2 Surrounding Properties

MNA requested records for review from the HDOH and HFD on 24 May 2017, and HELCO on 16 June 2017. HDOH and HFD responded that they had no records on file for the surrounding properties.

4.3 HISTORICAL USE INFORMATION ON THE SUBJECT PROPERTY

MNA reviewed historical use information for the subject property, including aerial photographs and United States Geological Survey (USGS) topographic maps, and FUDS documents. No fire insurance maps were available.

4.3.1 Historical Aerial Photographs

Aerial photographs of the subject, adjoining, and surrounding properties were provided by EDR (Environmental Data Resources, Inc., 2017). Photographs from the years 1954, 1974, 1985, 1995, and 2001 were reviewed. Table 4 provides the details for those photos.

Table 4. Aerial Photograph Details

Date	Image Type	Approximate Scale
2001	C	1”:500’
1995	False Color	1”:500’
1985	False Color	1”:500’
1974	False Color	1”:500’
1954	B/W	1”:500’

B/W - Black and white photograph
C – Color

For the reviewed aerial photographs, the following observations were made:

1954: The subject property appeared to be highly vegetated and undeveloped. Hawaii Belt Road was apparent far east of the subject property and Alii Drive to the west. Laaloa Avenue is not depicted in the photograph. Other areas surrounding the subject property were also undeveloped, vacant, and likely pastureland or unutilized.

1974: The subject property is undeveloped, with no structures or other uses apparent. Medium and large structures, likely for residential and commercial use, appear just southwest and farther northeast of the subject property. Other connecting roads are depicted to the east of Alii Drive.

1985: No changes from the 1974 aerial photograph were apparent on the subject property. Additional structures are visible in the areas southwest and northeast of the subject property.

1995: Roads extending east of Alii Drive and west of Hawaii Belt Road are visible. The subject property and adjoining properties contained no structures and was vegetated, with the exception of an area west of the subject property, which appear to be more populated with buildings, structures, and major roads.

2001: The southern portion of the subject property appears to be cleared, with vegetation still apparent along the north and east boundaries of the subject property. Approximately five to eight small structures are visible on the subject property. Laaloa Avenue is visible to the south, but does not fully extend east to Hawaii Belt Road.

MNA reviewed historical aerial imagery available from Google Earth. Photographs from the years 2010 and 2014 were reviewed. For the reviewed aerial photographs, the following observations were made:

2010: In this Google Earth photograph dated January 2, 2010, the subject property appeared to be vacant and mostly vegetated. A cleared road, with access from Laaloa Avenue, is visible along the south boundary of the subject property. A large building approximately 4,400 square feet, two smaller structures north and south of the building, and one parked vehicle was present on the adjoining property to the west.

2014: In this Google Earth image dated December 19, 2014, no changes to the subject property from the 2010 image were observed. Approximately six vehicles are visible in and around the subject property. The two smaller structures west of the subject property are no longer visible, while the larger building is present in this photograph.

4.3.2 Historical Topographic Maps

USGS topographic maps that cover the subject property and vicinity were reviewed. Maps were available for the years 1924, 1928, 1960, 1982, 1996, and 2013 (Environmental Data Resources, Inc., 2017). A copy of the historical topographic maps provided by EDR is included in Appendix A. The maps of the subject property and surrounding area depicted the following:

1924: The southern boundary of the subject property was situated directly on a trail, which ran west from Kahaluu Bay to east of a light duty road. The southern boundary of the subject property also lied on a rock wall. The widely spaced contour lines displayed in the topographic map indicates the ground, within the subject property, is relatively level.

1928: The contour lines from the 1924 map was slightly shifted from west to east within the subject property. The trail traverses the southwest corner of the subject property, and the west boundary was vegetated. The rock wall was no longer visible from the 1924 map.

1960: The entire subject property was vegetated, and the trail no longer visible within or around the subject property.

1982: Small to large buildings and light duty roads were depicted to the west of the subject property and east of Alii Road. The rock wall was no longer depicted.

1996: No changes at the subject property were observed from the 1982 map. An increase in building and road developments, and a decreased vegetated areas were depicted in the surrounding areas. The area south of the subject property was not depicted as vegetated.

2013: Streets and roads were present just south of the subject property, with Laaloa Avenue bordering its south boundary. The area in and around the subject property was not depicted as vegetated.

4.3.3 Sanborn Fire Insurance Map

No Sanborn Fire Insurance maps were available for the subject property.

4.3.4 FUDS

The subject property and vast surrounding area was not part of the FUDS site.

5.0 SITE RECONNAISSANCE

The site reconnaissance was conducted by Phillip Cabanila of MNA on 16 June 2017. The site reconnaissance focused on identifying *recognized environmental conditions* with the ability to impact the subject property. A site map of the subject property is presented in Figure 3.

5.1 METHODOLOGY AND LIMITING CONDITIONS

The site reconnaissance was conducted by visually inspecting the subject property and adjoining properties on foot. MNA looked for a variety of environmental hazard indicators including, but not limited to, stained surface soil, dead or stressed vegetation, hazardous substances, aboveground and underground storage tanks, disposal areas, groundwater wells, drywells, and sumps. Figure 3 presents the path walked and other notable features. Photographs from the site reconnaissance are presented in Appendix B.

5.2 GENERAL SITE SETTING

The subject property was located approximately 3.5 miles south of Kailua-Kona, on the west side of the Island of Hawaii, approximately 1/3 mile inland. Located ½ mile west of the Hawaii Belt Road (State Route 11) on Laaloa Avenue, the property was predominantly vacant land. Part of the subject property was graded, covered with gravel, and used as a staging area for construction materials (Photographs 1 and 2). The wooden structure on a concrete slab, previously located on the property, had been removed prior to the site recon. The north and east adjoining properties were vacant, undeveloped land. Residential subdivisions were located on the west adjoining property and south across Laaloa Street (Photographs 3 and 4).

Subject Property Boundary

Path Walked

Pad Mounted Transformer

Underground Utility Box

Concrete Debris

Scale

15'

Myounghee Noh & Associates, L.L.C.

2362_5

Figure 3. Site Map
Phase I Environmental Site Assessment
77-237 Laaloa Avenue
TMK (3) 7-7-008:030
Kailua-Kona, Island of Hawaii

5.3 EXTERIOR OBSERVATIONS

The center-east area of the subject property contained a low-lying area that appeared to have been excavated during previous use of the site (Photograph 5). Most of the western side of the subject property was a mix of gravel and vegetation (Photograph 6). The northern end of the subject property appeared naturally elevated from the rest of the property and contained heavy vegetation (Photograph7).

One pad-mounted transformer was observed along the sidewalk on the south end of the property along Laaloa Street (Photograph 8). In this area, several electrical boxes, access for utilities, and a storm drain were observed on the sidewalk on the southern boundary of the subject property (Photographs 9 to 13). Construction debris was observed in the west-central area and concrete boxes were observed in the east-central area of the subject property (Photographs 14 and 15). Concrete debris was also observed at the entrance to the property near the access gate (Photograph 16).

5.4 INTERIOR OBSERVATIONS

No structures were observed on the subject property; therefore, no interior observations were performed. The wooden structure and concrete slab previously located on the property were no longer present on the property.

5.5 HAZARDOUS SUBSTANCES AND PETROLEUM PRODUCTS

No hazardous substances and petroleum products were observed on the subject property during the site reconnaissance.

5.6 ABOVE GROUND AND UNDERGROUND STORAGE TANKS

MNA did not observe any indications of above ground or underground storage tanks or associated accessories, such as vent pipes, fill ports, or dispensers, on the subject property.

6.0 INTERVIEWS

MNA interviewed Wayne Kamitaki, Volunteer Consultant for YMCA. The interview was administered via email by Kristin Cabanila of MNA on June 8, 2017. MNA also interviewed Chris Lau, President of Towne Development of Hawaii. The interview was administered by telephone on June 16, 2017.

6.1 Wayne Kamitaki, Volunteer Consultant to Hawaii Island YMCA

On June 8, 2017, MNA interviewed Wayne Kamitaki, Volunteer Consultant with YMCA. Mr. Kamitaki indicated that to his knowledge and experience, the subject property has been under conditional ownership by the YMCA for over 20 years, but that the agency had not used it for any purpose during that time. However, the site had been used as a home base and staging site for Towne Development of Hawaii during construction of adjacent residential development.

Mr. Kamitaki indicated that he had no knowledge of any spills, chemical releases, environmental cleanups, environmental cleanup liens, engineering controls, land use restrictions, or institutional controls at the site.

6.2 Chris Lau, President, Towne Development of Hawaii

On June 20, 2017, MNA interviewed Chris Lau, President of Towne Development of Hawaii. Mr. Lau indicated that the subject property was used by Towne Development of Hawaii as a staging area during construction of adjacent residential developments between 2000 and 2015. During this time, Towne Development poured a concrete slab and built a wooden structure on the slab to store equipment and supplies. They also utilized portable office trailers on the subject property. All structures were removed in 2015 when the adjacent residential development project was completed.

Mr. Lau indicated that he had no knowledge of any chemicals, spills, chemical releases, environmental cleanups, environmental cleanup liens, engineering controls, land use restrictions, or institutional controls at the site.

7.0 DATA GAPS AND DEVIATIONS

There were no limitations or deviations from the ASTM method during this Phase I ESA. Due to the ground being covered by gravel and vegetation, limited surface and subsurface information regarding the former construction baseyard constitutes a data gap. This has an adverse effect on the completeness of the Phase I assessment.

8.0 KEY FINDINGS AND OPINION

This section evaluates the key findings of this assessment and makes a determination as to the presence of RECs, if any.

8.1 Subject Property

No records of NPL sites, Federal RCRA CORRACTS and Non-CORRACTS Treatment Storage Disposal Facilities, Delisted NPL sites, Federal or state CERCLIS sites, Federal CERCLIS NFRAP sites, landfill or solid waste disposal sites, State Leaking Underground Storage Tank List sites, State Voluntary Cleanup sites, Federal RCRA Generator sites, State registered UST sites, Institutional Controls/Engineering Controls registries, Federal ERNS list sites, Federal or State Brownfields sites were identified at the subject property. Review of additional records for the subject property did not identify any potential *RECs*.

According to a review of the aerial photographs and interviews, the subject property was used as a construction staging area from approximately 2000 to 2015 by Towne Development Hawaii. The subject property was used to store construction vehicles and equipment. Although it is possible that hazardous substances or petroleum products were stored on the subject property, records reviews, interviews, and the site reconnaissance indicated no evidence of a historical release. As a result, the past use of the subject property as a construction staging area is not considered a *REC*.

Information provided as part of the user questionnaire did not indicate any *RECs*. However, a thorough surface soil inspection was not feasible due to gravel and vegetation ground covers. This is a data gap.

One pad-mounted transformer was located adjacent to the sidewalk on the southeast boundary of the subject property. HELCO indicated that the transformer did not contain PCB. As a result, the presence of the pad-mounted transformer is not considered a *REC*.

Based on the records review, a review of additional records, research regarding the historical use of the subject property, and site reconnaissance, there were no obvious *RECs* in connection with the subject property. However, as mentioned above, visual observation of surface soil was not feasible. Moreover, subsurface conditions are unknown. This is a data gap.

According to the information reviewed in the USACE FUDS website, no munitions and explosives of concern (MEC) exist on the subject property.

8.2 Surrounding Area

No records of NPL sites, Federal RCRA CORRACTS and Non-CORRACTS Treatment Storage Disposal Facilities, Delisted NPL sites, Federal CERCLIS sites, landfill or solid waste disposal sites, State Voluntary Cleanup sites, Federal RCRA Generator sites, Institutional Controls/Engineering Controls registries, Federal ERNS list sites, Federal or State Brownfields sites were identified in the area surrounding the subject property. Review of additional records for adjoining properties did not identify any potential *RECs*.

Information provided as part of the interviews conducted or user questionnaire did not indicate any *RECs*.

In summary, there were no evidence of use of hazardous substances or petroleum products in connection with the adjoining or surrounding properties.

9.0 CONCLUSION

MNA performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM E 1527-13 of the 6.365-acre subject property identified as TMK (3) 7-7-008:030 in Kailua-Kona, Island of Hawaii. Any exceptions to, or deletions from, this practice are described in Section 7.0 of this report. This assessment has revealed no obvious *recognized environmental conditions*, as defined by ASTM, in connection with the *subject property*, except for the following:

- Due to gravel surface areas and vegetative cover throughout the subject property, surface and subsurface conditions and potential for contamination associated with the land use as a construction baseyard and staging area over the last 15 to 20 years, is unknown.
- During construction baseyard and staging activities, it is likely that heavy and or light equipment were parked or fueled onsite using fuel tanks, which may have been stored on the subject property. Therefore, any future discoveries of contaminations below ground surface may potentially be a *REC*.

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Environmental Assessment

La‘aloa Avenue New Park Development

APPENDIX 4
Traffic Impact Assessment Report

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FINAL

Laaloa Avenue County Park
Tax Map Key 7-7-008:030

Traffic Impact Analysis Report

Kailua-Kona, Island of Hawaii

September 12, 2017

Prepared for

Hawaii One1 Investors, LLC and the County of Hawaii

Prepared by

SSFM International

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I. PROJECT DESCRIPTION

In a cooperative arrangement, Hawaii One1 Investors, LLC, and the County of Hawaii are developing a new park on Laaloa Avenue in the town of Kailua in the North Kona District of the County of Hawaii. The site has been planned for a park for several decades. The project site is a 6.365-acre parcel on Laaloa Avenue, identified as Tax Map Key (TMK) (3) 7-7-008:030 (see Figure 1). The County Park will include a soccer field, tennis court, comfort station, playground, basketball court, a 6-foot wide jogging path and other recreational amenities. The initial phase of the development will include the soccer field, comfort station and 35 parking spaces. The construction of the tennis court, basketball court, jogging path and other recreational amenities will occur at a later date. However, it is assumed that it will all be completed by 2027. Access to this development will be through a proposed driveway across of Kapukapu Street. The proposed site plan is shown in Figure 2.

This traffic impact analysis report (TIAR) will evaluate existing (2017) conditions, assess future (2027) changes for the study area and impacts to the surrounding area as a result of the proposed development. This TIAR will be in support of an Environmental Assessment (EA) for the park.

Figure 1: Project Location Map

Laaloa Avenue County Park – Kailua-Kona, Hawaii

SSFM International

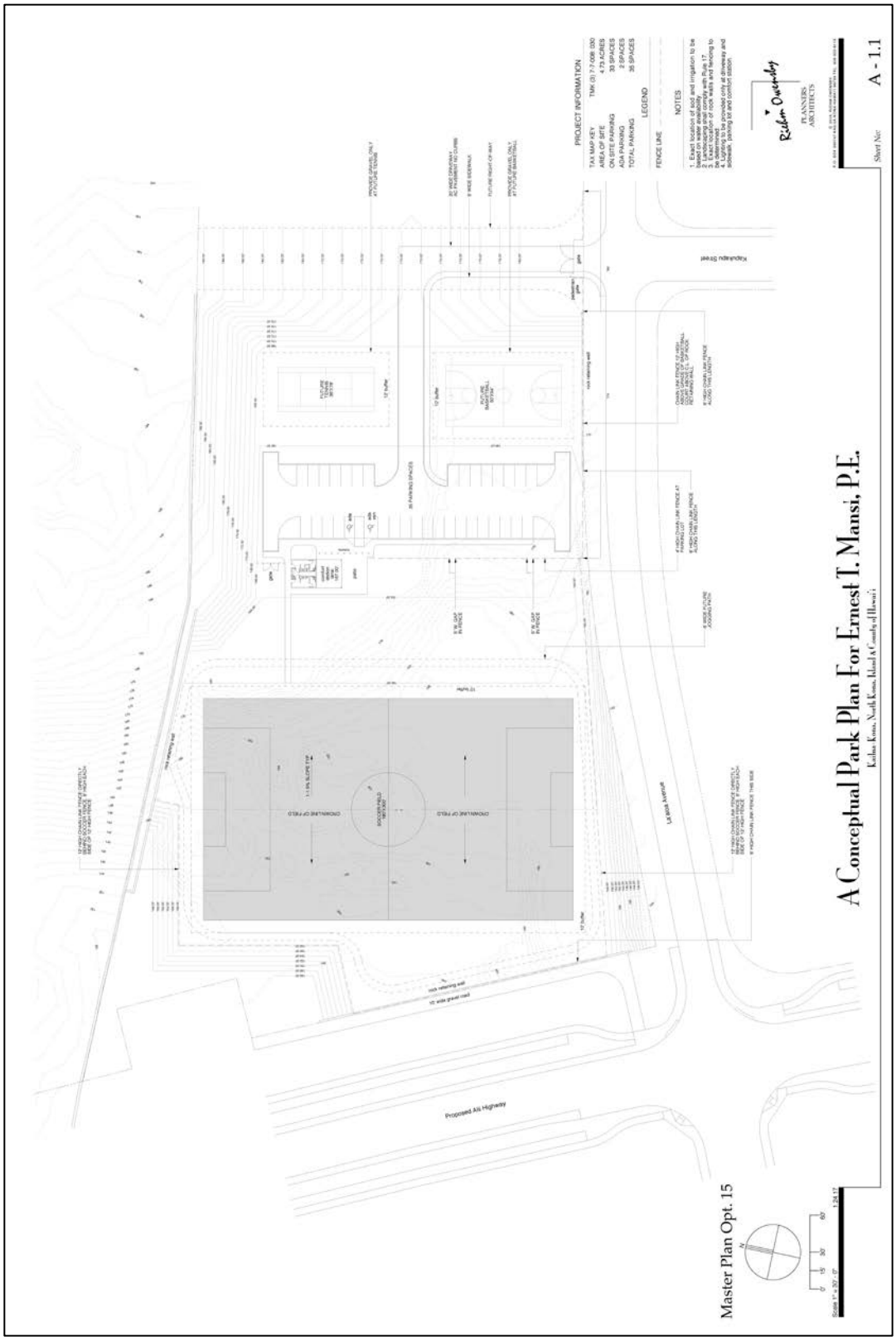

Figure 2: Project Site Plan

II. EXISTING CONDITIONS

A. Geometric Configuration

1. Roadway Configuration

Laaloa Avenue is a two-lane, undivided roadway, with an east-west orientation connecting Kuakini Highway to the east and Alii Drive to the west. The extension of Laaloa Avenue was completed in January 2015, which resulted in this connection. Laaloa Avenue is a County of Hawaii-owned roadway which provides access to residential areas. The posted speed limit is 25 miles per hour (mph). There are paved concrete sidewalks and bike lanes in either direction.

Alii Drive is a two-lane, two-way, undivided roadway oriented in the north-south direction along the coast of Kailua-Kona. It is a County of Hawaii-owned road with the functional classification of urban major collector. The posted speed limit along Alii Drive is 30 mph. The roadway provides access to residential, commercial, parks and hotel areas. No parking is allowed along either side near the study area.

Kuakini Highway (State Route 11) is an undivided, two-lane, two-way highway oriented in the north-south direction. It is owned by the State of Hawaii with the functional classification of urban principle arterial. The posted speed limit near Laaloa Avenue is 45 mph, however the posted speed limit along the corridor varies from 25 mph to 55 mph. There are paved shoulders of various widths between five to ten feet wide on both sides of Kuakini Highway and no designated sidewalks or bicycle facilities.

2. Intersection Configuration

The study intersections include the following:

1. Laaloa Avenue and Alii Drive
2. Laaloa Avenue and Kapukapu Street
3. Laaloa Avenue and Kuakini Highway

Existing (2017) lane configurations, marked pedestrian crosswalks, and traffic controls at the study intersections are shown in Figure 3.

The intersection of Laaloa Avenue at Alii Drive is a three-legged, all-way stop controlled intersection. It is located approximately 2,600 feet (0.5 miles) west of Kapukapu Street. The westbound approach is Laaloa Avenue. The northbound and southbound approaches are Alii Drive. The westbound approach has one left-turn lane and one right-turn lane. The northbound approach has a shared right-turn/through lane, and the southbound approach has a shared left-turn/through lane. There are marked crosswalks crossing the south leg, east leg and north leg.

The intersection of Laaloa Avenue at Kapukapu Street is a three-legged unsignalized intersection. The northbound approach is Kapukapu Street. It is stop sign controlled and has one lane for the right-turn and left-turn movement. The westbound and eastbound approaches are Laaloa Avenue. There is a left-turn lane and a through lane on the westbound approach of Laaloa Avenue. The eastbound approach has a shared right-turn/through lane. There is a bike lane on each side of Laaloa Avenue in each direction. On street parking is prohibited along Laaloa Avenue at this intersection. This intersection has one marked crosswalk crossing the south leg of Kapukapu Street.

The intersection of Laaloa Avenue and Kuakini Highway is located approximately 2,600 feet (0.5 miles) east of Kapukapu Street. The intersection is a three-legged signalized intersection. The southbound and northbound approaches are Kuakini Highway. The southbound approach has one through lane and one right-turn lane. The northbound approach has one left-turn lane and one through lane. The eastbound approach is Laaloa Avenue. It has one left-turn lane and one right-turn lane. The southbound and eastbound right-turn lanes are channelized. There are marked crosswalks crossing the west leg and south leg.

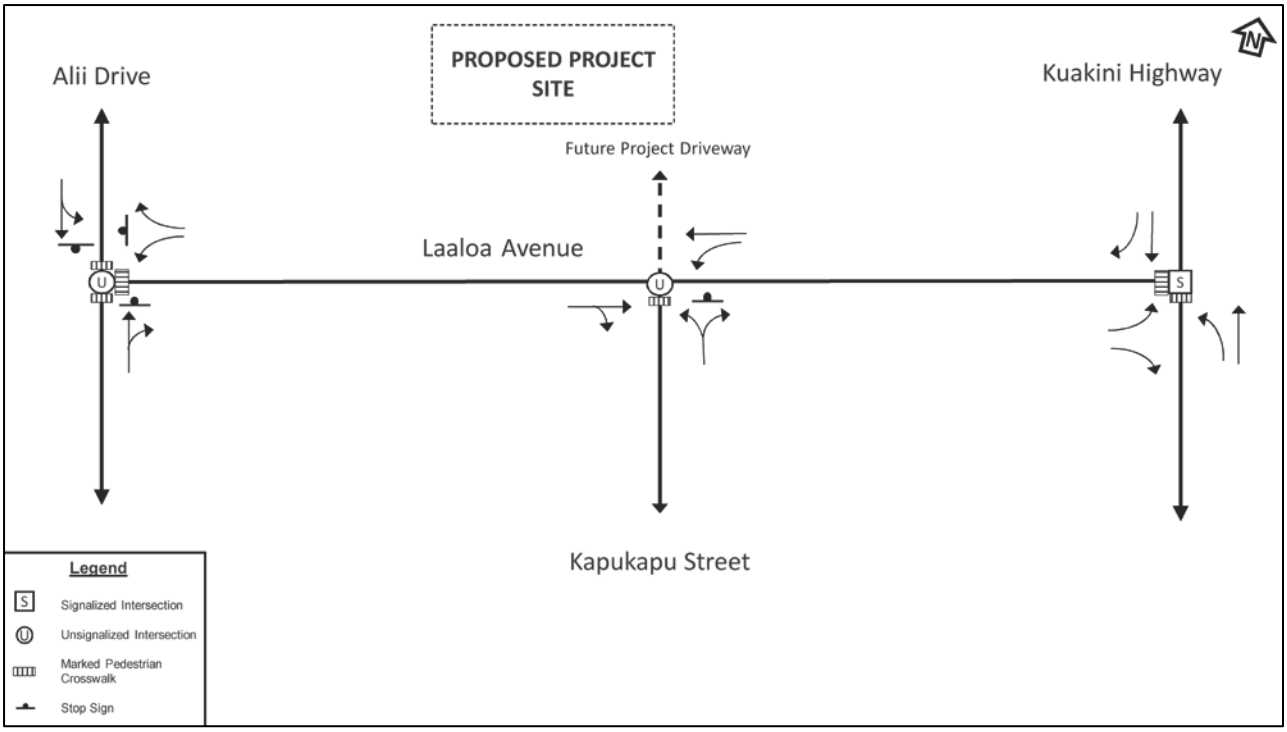

Figure 3: Existing (2017) Lane Configuration

B. Volumes

1. Vehicular Volume

a) Roadway Traffic Volumes

Average daily traffic (ADT) and peak hour volumes along Alii Drive and Kuakini Highway in the surrounding area are shown in Table 1. The ADT is based on Hawaii DOT traffic counts included in *Historical Traffic Station Maps*. Location of these traffic count stations are shown on Figure 1. The traffic count station on Alii Drive is located approximately 800 feet (0.15 miles) south of Laaloa Avenue between Laaloa Avenue and Queen Kalama Avenue and the ADT is 5,700 vehicles per day (vpd). The traffic count station on Kuakini Highway is located approximately 5,000 feet (0.95 miles) north of Laaloa Avenue between Nalani Street and Lako Street and the ADT is 19,800 vpd.

Table 1: Roadway Traffic Volumes

Roadway	Location	2015 ADT
Alii Drive	Between Laaloa Avenue and Queen Kalama Avenue	5,500
Kuakini Highway	Between Nalani Street and Lako Street	19,800

Source: *Historical Traffic Station Maps* (HDOT)

The 24-hour traffic volume distribution along Alii Drive and Kuakini Highway at the traffic count stations shows the variation in travel patterns in the project area (see Figures 4 and 5). The AM/PM peak hours for Alii Drive is identified on the 24-hour roadway traffic volume figure in Figure 4 as 7:15-8:15 AM/3:30-4:30 PM. The traffic volume data in Figure 4 shows that along Alii Drive, between Laaloa Avenue and Queen Kalama Avenue, during the AM peak hour there are about 195 vehicles per hour (vph) travelling northbound and about 190 vph travelling southbound with a total of 385 vph. During the PM peak hour, there are about 250 vph travelling northbound and 230 travelling southbound with a total of 480 vph.

The AM/PM peak hours for Kuakini Highway is 7:45-8:45 AM/1:45-2:45 PM and is identified in Figure 5. The traffic volume data in Figure 5 shows that along Kuakini Highway, between Nalani Street and Lako Street, during the AM peak hour there are about 650 vph travelling northbound and 530 vph travelling southbound with a total of 1,180 vph. During the PM peak hour, there are about 650 vph travelling northbound and 740 vph travelling southbound with a total of 1,390 vph. There is another peak in traffic that occurs in the afternoon, but has fewer vehicles travelling than the 1:45-2:45 PM peak. This occurs around 4:45-5:45 PM in which the total vehicles travelling are around 1,300 vph, with 540 vph travelling northbound and 760 vph travelling southbound. The highest volume traveling in the southbound direction occurred from 5:15-6:15 PM with 785 vph.

Detailed 24-hour counts are included in Appendix A.

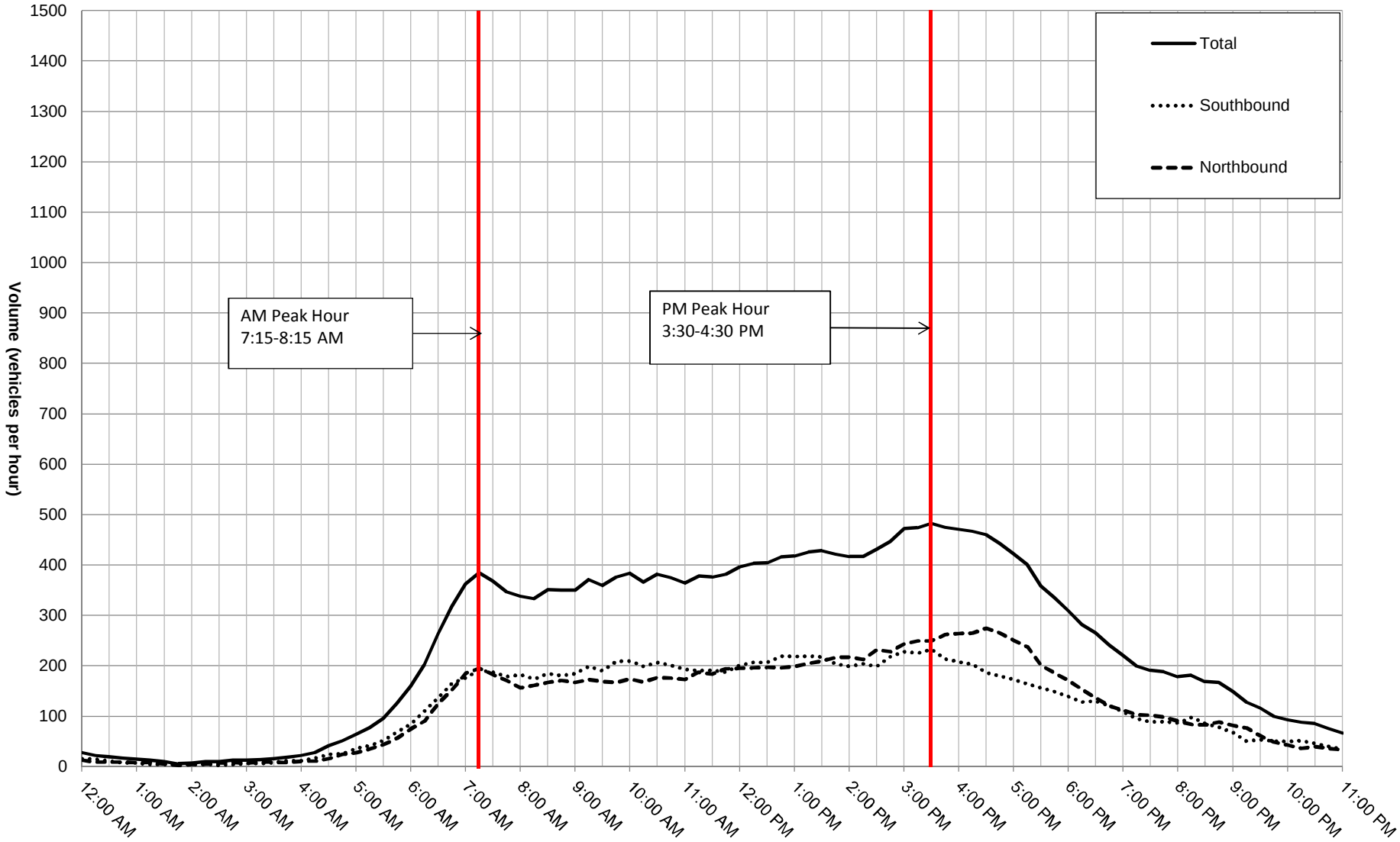

Figure 4: Alii Drive between Laaloa Avenue and Queen Kalama Avenue, 24-Hour Volume Distribution

Laaloa Avenue County Park TIAR – Kailua-Kona, Hawaii

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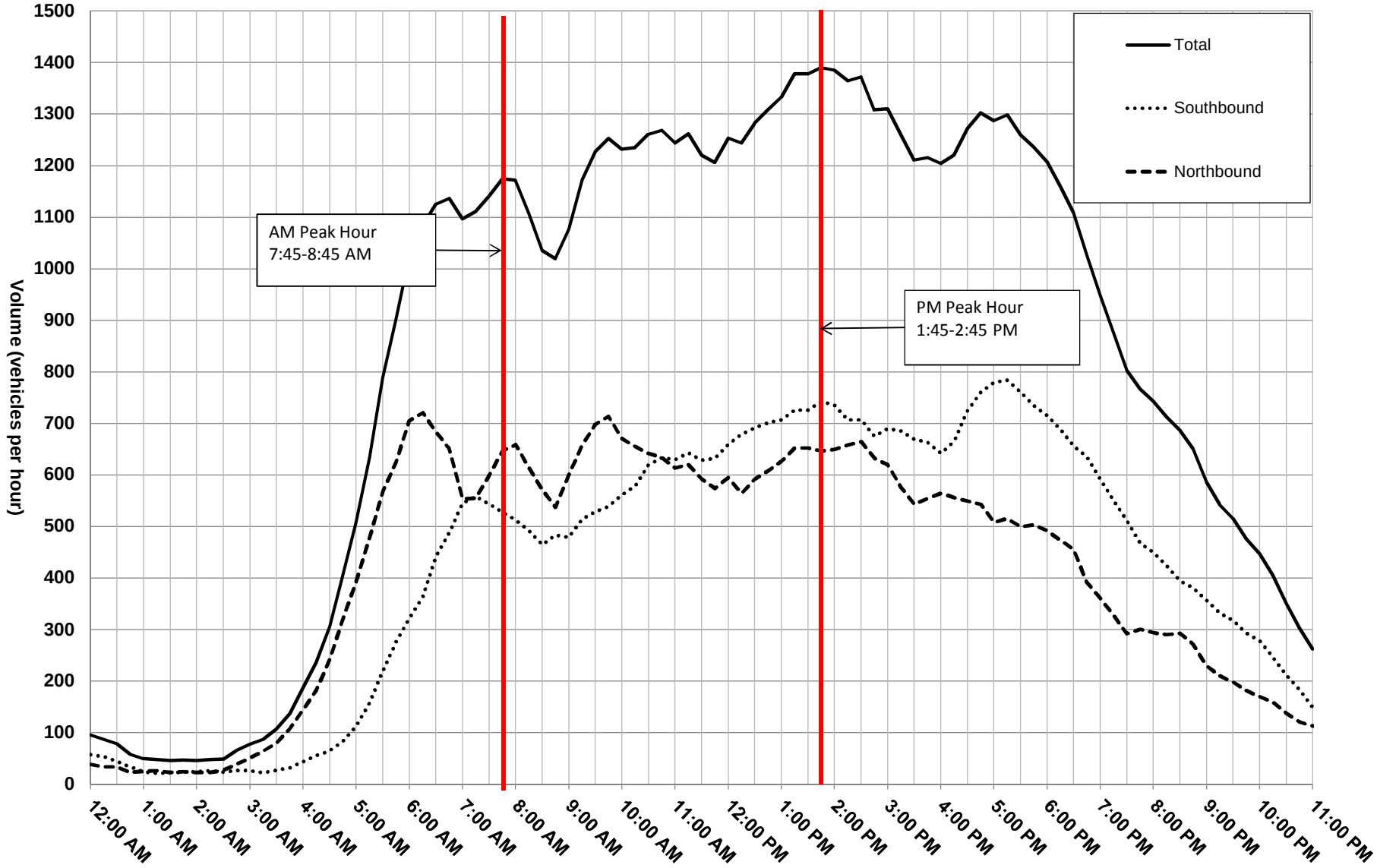


Figure 5: Kuakini Highway between Nalani Street and Lako Street, 24-Hour Volume Distribution

Laaloa Avenue County Park TIAR – Kailua-Kona, Hawaii

SSFM INTERNATIONAL

b) Intersection Peak Hour Volumes

Manual intersection turning movement traffic counts were taken at the three intersections: 1) Alii Drive and Laaloa Avenue, 2) Laaloa Avenue and Kapukapu Street, and 3) Laaloa Avenue and Kuakini Highway on Tuesday, May 2, 2017. Counts were conducted during the AM and PM peak periods which occurred at 6:30-8:30 AM and 3:30-5:30 PM. The AM peak hour was 7:15-8:15 AM for Alii Drive and Laaloa Avenue intersection and was 7:00-8:00 AM for Laaloa Avenue at Kapukapu Street and at Kuakini Highway. The PM peak hour was 4:30 – 5:30 PM for all three intersections. The Existing (2017) peak hour volumes are shown in Figure 6. Detailed peak period counts are included in Appendix A.

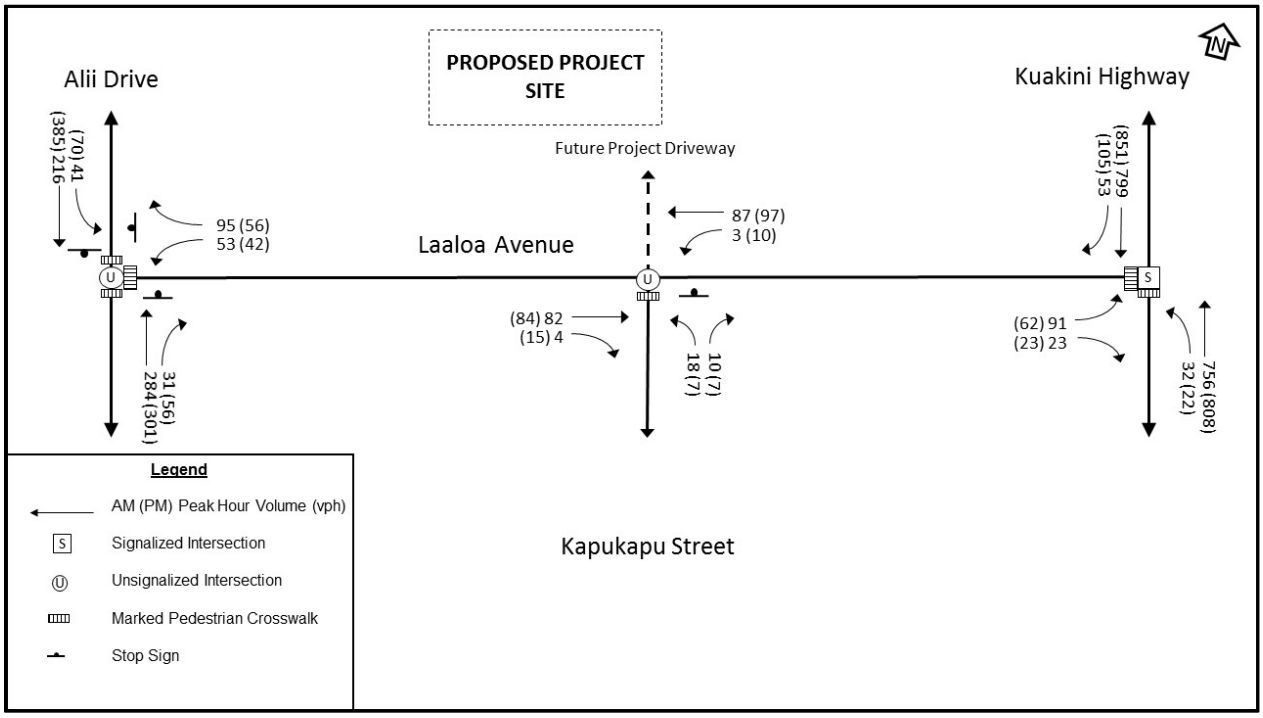


Figure 6: Existing (2017) Peak Hour Volumes

2. Bus Transit Volumes

The Hawaii County transit system (Hele-On Bus) has four bus routes passing Alii Drive near the project area. The four bus routes are “Intra-Kona”, “Pahala to South Kohala Resorts”, “North Kohala to Kona” and “Kona to Hilo”. The “Intra-Kona” bus route runs from 5:00 AM to 8:25 PM typically from Monday through Saturday and services the Kona area from Kona International Airport at the north to the Captain Cook area at the south. There are 10 buses that travel in each direction. There are three and four buses in each direction that pass the project site during the AM and PM peak hour, respectively. The “Pahala to South Kohala Resorts” runs from 3:30 AM to 7:45 PM typically Monday through Saturday. There are three buses that travel in each direction. During the AM and PM peak hour, one bus passes the stop at Alii Drive. The “North Kohala to Kona” runs typically from 6:45 AM to 4:55 PM from Monday through Friday. There is one bus that passes the Alii Drive bus stop once in the morning and once in the afternoon. No buses pass the project site during peak hour. The “Kona to Hilo” bus route runs from 3:40 AM to 7:00 PM. There are

three buses that travel in each direction (Kona to Hilo and Hilo to Kona). One bus passes along Alii Drive during each peak hour. Appendix B includes the detailed bus route schedule and map for these routes.

3. Pedestrian and Bicycle Volumes

Pedestrian and bicycle volumes were counted at the three intersections during the AM and PM peak periods. Pedestrian and bicycle volumes in the other two intersections are minimal due to the suburban nature of the development along Kuakini Highway and Laaloa Avenue. Figure 7 shows the Pedestrian and Bicycle peak hour volumes.

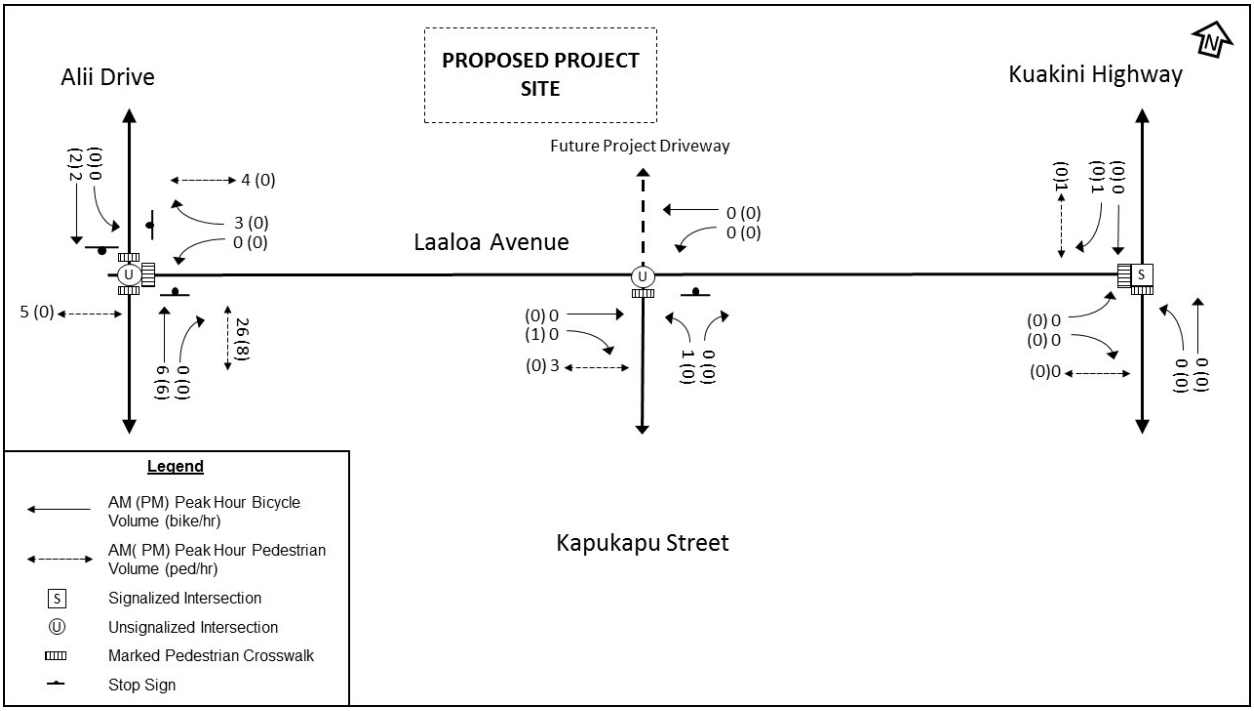


Figure 7: Existing (2017) Pedestrian and Bicycle Peak Hour Volumes

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. According to *Federal-Aid Functional Classification Update: Policy and Procedures* (HDOT, 2012), the classification of Kuakini Highway is an urban arterial while Alii Drive is an urban connector. Guidelines from *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011) state that an appropriate LOS for an urban arterial functional class road is LOS C or D and for an urban connector is LOS D or better. Thus, LOS D or better will be sought for operations at the intersections.

a) All-Way and Two-Way Stop Controlled Intersection LOS

As stated in the *Highway Capacity Manual 6th Edition (HCM6)* (TRB, 2016), LOS for an all-way stop controlled (AWSC) and a two-way stop controlled (TWSC) intersection is determined by the measured control delay (see Table 2). Delay at an AWSC intersection is defined for the intersection as a whole and for each movement. Delay at a TWSC intersection is defined by 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. Those vehicles approaching the intersection along the minor movement (side-street) 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: *HCM6* (TRB, 2016)

b) Signalized Intersection LOS

The LOS analysis for signalized intersection is based on the average total vehicle delay based on the methodologies of *HCM6* (TRB, 2016) shown in Table 3. High number of vehicles passing the intersection, long cycle lengths, inappropriate signal phasing, or a poor signal progression can result in long delays, and consequently poor LOS.

Table 3: LOS Criteria for Signalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

Source: *HCM6* (TRB, 2016)

Another measure of intersection operation 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. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F per the *HCM* (TRB, 2010). 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.

2. Intersection Level of Service Results

Existing intersection and movement LOS and delay (in seconds per vehicle) was determined for the AM and PM peak hours. All movements resulted in appropriate LOS D or better which suggests acceptable operations at all intersections (see Table 4). Appendix C provides the detailed analysis reports for the Existing (2017) conditions.

Table 4: Existing (2017) Intersection Level of Service

Intersection	Traffic Control		AM Peak Hour			PM Peak Hour		
	Approach	Movement	Delay	v/c	LOS	Delay	v/c	LOS
Laaloa Avenue and Alii Drive	All-Way Stop Controlled		10.4	-	B	13.8	-	B
	WB	Left	9.9	0.10	A	10.5	0.09	B
		Right	8.8	0.14	A	9.1	0.10	A
	NB	Thru-Right	11.0	0.42	B	12.5	0.51	B
	SB	Left-Thru	10.3	0.35	B	15.7	0.64	C
Laaloa Avenue and Kapukapu Street	Two-Way Stop Controlled		-	-	-	-	-	-
	WB	Left	7.4	0.01	A	7.4	0.01	A
	NB	Left -Right	9.3	0.03	A	9.4	0.02	A
Laaloa Avenue and Kuakini Highway	Signalized		21.6	-	C	19.0	-	B
	EB	Left	24.0	0.22	C	25.8	0.16	C
	NB	Left	38.8	0.27	D	39.6	0.20	D
		Thru	11.5	0.67	B	11.2	0.67	B
	SB	Thru	30.3	0.90	C	25.4	0.86	C

III. FUTURE CONDITIONS

The new County Park will consist of a soccer field, a tennis court, a basketball court, a jogging path, a playground and other recreational amenities. Full build-out and occupancy are expected by 2027.

A. Surrounding Area Conditions

There are two additional developments proposed in the surrounding area that are expected to have an impact on roads adjacent to the project: Parcel 26 at Kahaluu Residential Project[1] and Royal Alii Planned Unit Development. Parcel 26 at Kahaluu Residential Project will have approximately 321 multi-family time share units and 17 single-family detached units. The proposed development is located less than a mile south of Laaloa Avenue along Alii Drive. It is expected that the development will be completed by 2027 and was included in this analysis.

Royal Alii Planned Unit Development is located less than a mile north Laaloa Avenue along Alii Drive. This development is planned to include 19 single-family homes on an almost 6-acre parcel. The status of construction is unknown at this time. The development will probably be completed by 2027 and trips generated from this development was included in this analysis.

Laipala Makai is located southwest of the proposed county park on an 11-acre property south of Queen Kalama Avenue (shown in Figure 1). According to the *Traffic Impact Analysis for Laipala Makai* (TMC, 2007), there are 66 single-family homes proposed with access provided on Alii Drive via the extension of Naniloa Drive stub-out at Queen Kalama Avenue. It is anticipated that this development will be fully built and occupied by 2027. The trips associated with Laipala Makai, as calculated in the *TIAR for Laipala Makai* (TMC, 2007) were included in this analysis.

Plans and finances for the extension of Alii Highway (referred to as the Kahului-Keauhou Parkway) are identified in the Statewide Transportation Improvements Program (STIP) in Fiscal Year 2020. This includes a 4.5 mile extension of the existing Alii Highway, from the intersection with Kamehameha III Road to Queen Kaahumanu Highway. The construction of this extension is unknown at this time and was not included in the future analysis. The proposed highway is adjacent to the west boundary of the county park shown in Figure 1.

No additional significant developments or construction are expected in the area that would affect the roadway geometrics or traffic volumes at the study intersection based on research at the State of Hawaii Office of Environmental Quality Control library and Statewide Transportation Improvements Program (STIP).

[1] Recent information indicates that Kahaluu Residential will not be moving ahead which makes the analysis conservative.

B. Volumes

1. Future Without Project Volumes

According to Hawaii DOT *Historical Traffic Maps*, Alii Drive and Kuakini Highway showed a general decrease in ADT from 2006 to 2015. A 1.0% annual growth (resulting in a growth factor of 1.1 from 2017 to 2027) was applied to all the traffic movements at each study intersection to account for the background growth in the surrounding area. In addition to the background growth, trips generated by the future developments mentioned above were also added. Resulting Future (2027) Without Project volume forecasts at the three study intersection are shown in Figure 8.

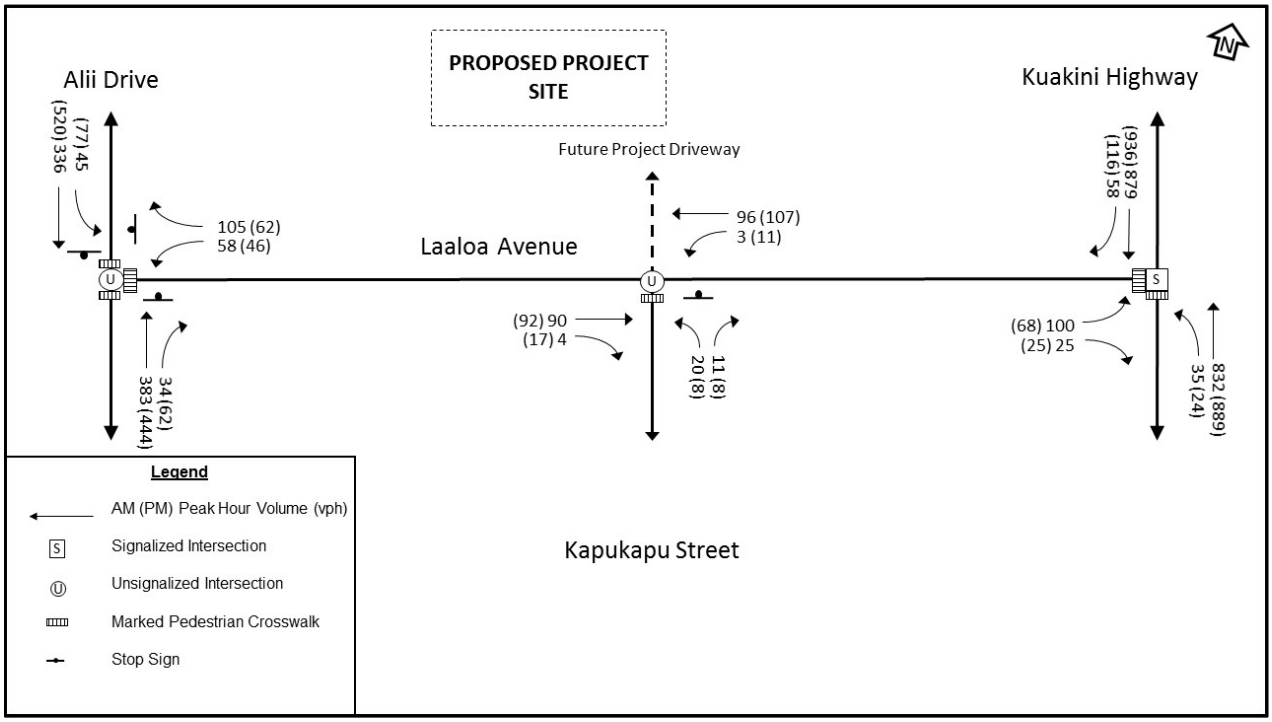


Figure 8: Future (2027) Without Project Peak Hour Volumes

2. Project Related Volumes

The primary trip generators of Laaloa Avenue County Park will be one soccer field, one tennis court and one basketball court. The entire 6.365 acre parcel will be developed into the County Park. Trips generated from the proposed development were calculated using nationally accepted land use rates for a "County Park". The *Trip Generation*, 8th Edition (ITE, 2008) defines a "County Park" as a park that is owned and operated by a county and includes ball fields, picnic facilities and open space which was determined to be applicable for use with this project. The results are shown in Table 5. The rates used to calculate the trips generated were based on the peak hour of the generator, rather than the rates for the adjacent street. The rates based on the peak hour of the generator are higher and provide a more conservative calculation for each land use.

Table 5: Project Related Volumes Trip Generation Based on County Park Land Use Rate

Land Use [ITE Code]	Quantity	Units	Trip Generation							
			AM peak hour				PM peak hour			
			Rate	In	Out	Total	Rate	In	Out	Total
County Park [412]	6.365	Acres	0.52	2	1	3	0.59	1	3	4

Source: *Trip Generation, 8th Edition* (ITE, 2008)

The trip generation rates during the AM and PM weekday peak hours were small, resulting in a negligible impact on intersection and roadway operations. Therefore, for comparison, the trips generated from a proposed soccer field and tennis court were calculated using the *Trip Generation*, 8th Edition (ITE, 2008) rates for "Soccer Complex" and "Tennis Courts" and are shown in Table 6. There were no trip generation rates for "Basketball Courts". Trips generated by the basketball court were estimated assuming that in the morning peak hour two people would use the basketball court (one-on-one practice) and in the afternoon there were 10 people that would use the basketball court (two teams of five people). Table 6 provides the total number of trips generated by the proposed County Park using the land use of soccer complex, tennis court and basketball court.

Table 6: Project Related Volumes Trip Generation Based on Detailed Land Use Rates

Land Use [ITE Code]	Quantity	Units	Trip Generation							
			AM Peak Hour				PM Peak Hour			
			Rate	In	Out	Total	Rate	In	Out	Total
Soccer Complex [488]*	1	Field	2.90	2	1	3	21.77	7	15	22
Tennis Courts [490]*	1	Court	1.83	1	1	2	3.67	2	2	4
Basketball Court	1	Court	n/a	2	2	4	n/a	10	10	20
TOTAL			**-**	**5**	**4**	**9**	**-**	**19**	**27**	**46**

*Source: *Trip Generation, 8th Edition* (ITE, 2008)

New project related trips were distributed based on existing distribution of trips in at the intersection of Laaloa Avenue with Alii Drive and with Kuakini Highway. The anticipated project related peak hour volumes are shown in Figure 9.

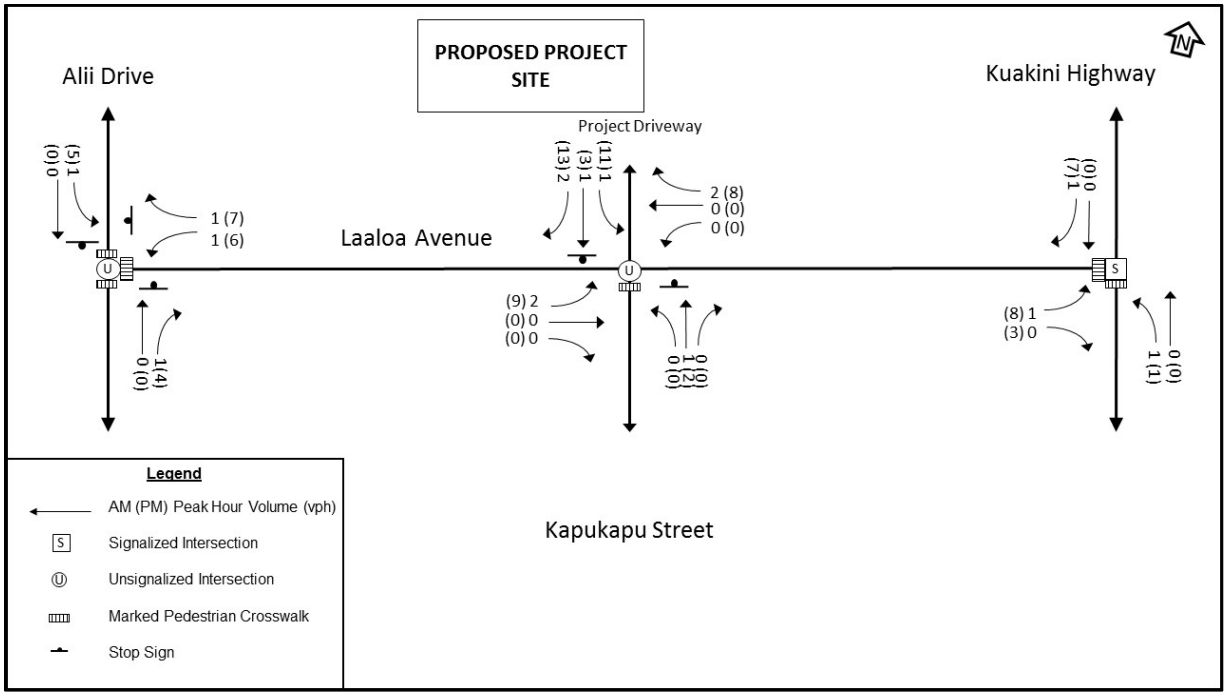


Figure 9: Project Related Peak Hour Volumes

3. Future With Project Volumes

New project related trips were added to the Future (2027) Without Project volumes to estimate the Future (2027) With Project peak hour volumes (see Figure 10).

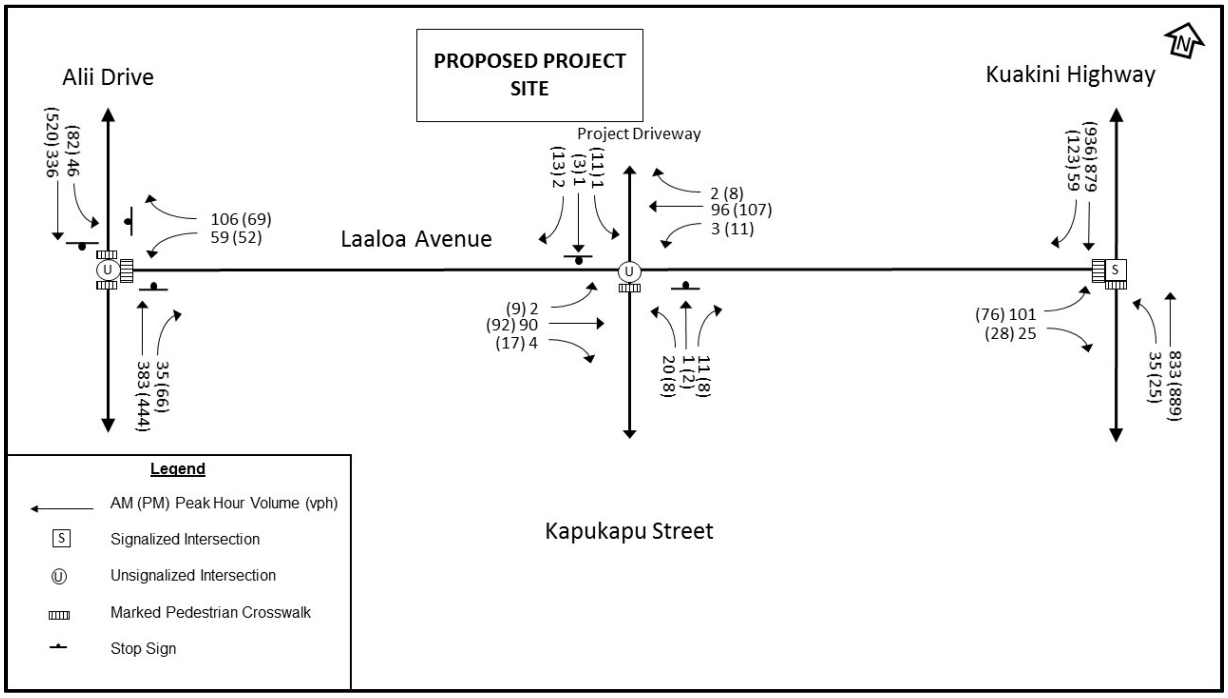


Figure 10: Future (2027) With Project Peak Hour Volumes

C. Future Intersection Level of Service

1. Future (2027) Without Project Results

Most movements for Future (2027) Without Project conditions resulted in appropriate LOS D or better which suggests acceptable operations (see Table 7). The southbound approach at the intersection of Laaloa Avenue and Alii Drive resulted in LOS E during the PM peak hour, however, the intersection itself resulted in an appropriate LOS D. These results are associated with conservative volume forecasts which include trips from the proposed Parcel 26 at Kahaluu Residential Project. Since Kahaluu Residential is not planning to move forward, the traffic volumes projected at the intersection would decrease, thus decreasing the delay. Appendix D provides the detailed analysis reports for the Future (2027) Without Project conditions.

Table 7: Future (2027) Without Project Intersection Level of Service

Intersection	Traffic Control		AM Peak Hour			PM Peak Hour		
	Approach	Movement	Delay	v/c	LOS	Delay	v/c	LOS
Laaloa Avenue and Alii Drive	All-Way Stop Controlled		13.4	-	B	28.5	-	D
	WB	Left	10.7	0.12	B	11.6	0.11	B
		Right	9.7	0.17	A	10.2	0.12	B
	NB	Thru-Right	14.6	0.59	B	23.0	0.76	C
	SB	Left-Thru	13.6	0.54	B	**36.4**	0.89	**E**
Laaloa Avenue and Kapukapu Street	Two-Way Stop Controlled		-	-	-	-	-	-
	WB	Left	7.4	0.01	A	7.5	0.01	A
	NB	Left -Right	9.4	0.04	A	9.5	0.02	A
Laaloa Avenue and Kuakini Highway	Signalized		30.1	-	C	24.9	-	C
	EB	Left	24.3	0.24	C	26.0	0.18	C
	NB	Left	39.6	0.30	D	40.1	0.22	D
		Thru	13.3	0.74	B	13.0	0.74	B
	SB	Thru	46.2	0.99	D	35.8	0.95	D

2. Future (2027) With Project Results

Most movements for Future (2027) With Project conditions resulted in appropriate LOS D or better which suggests acceptable operations (see Table 8). The southbound approach at the intersection of Laaloa Avenue and Alii Drive will continue to result in LOS E during the PM peak hour. Appendix E provides the detailed analysis reports for the Future (2027) With Project conditions.

Table 8: Future (2027) With Project Intersection Level of Service

Intersection	Traffic Control		AM Peak Hour			PM Peak Hour		
	Approach	Movement	Delay	v/c	LOS	Delay	v/c	LOS
Laaloa Avenue and Alii Drive	All-Way Stop Controlled		13.5	-	B	30.7	-	D
	WB	Left	10.7	0.12	B	11.8	0.12	B
		Right	9.7	0.18	A	10.4	0.14	B
	NB	Thru-Right	14.7	0.59	B	24.5	0.78	C
	SB	Left-Thru	13.7	0.54	B	**39.9**	0.92	**E**
Laaloa Avenue and Kapukapu Street	Two-Way Stop Controlled		-	-	-	-	-	-
	EB	Left-Thru-Right	7.4	0.01	A	7.5	0.01	A
	WB	Left	7.4	0.01	A	7.5	0.01	A
	NB	Left-Thru-Right	9.6	0.04	A	10.0	0.03	B
	SB	Left-Thru-Right	9.4	0.01	A	10.1	0.04	B
Laaloa Avenue and Kuakini Highway	Signalized		30.1	-	C	24.9	-	C
	EB	Left	24.3	0.24	C	26.3	0.20	C
	NB	Left	39.6	0.30	D	40.4	0.23	D
		Thru	13.3	0.74	B	13.0	0.74	B
	SB	Thru	46.2	0.99	D	35.8	0.95	D

D. Dedicated Turn Lanes

Traffic turn movements to the proposed development will come through the intersection of Laaloa Avenue and Kapukapu Street and the proposed driveway. With the proposed driveway, the intersection will become a four-legged intersection. Factors included in the determination of whether turn lanes are needed include:

- Travel speed - Posted speed limits in this section are 25 mph.
- Sight distance – There are no sight distance concerns in this area.
- Corridor design consistency – There are two adjacent intersections along Laaloa Avenue, including Laaloa Avenue and Alii Drive and Laaloa Avenue and Kuakini Highway, which are both in the study area. They are three-leg intersections and both of them have dedicated turn lanes.
- Vehicle type – Most traffic expected at these intersections will be standard passenger vehicles.
- Vehicular volumes – Anticipated volumes were substantially below capacity and Levels of Service were LOS D and better, which is acceptable.

Another way to analyze the need for dedicated turn lanes is through technical warrants. Therefore, the need for dedicated left and right-turn lanes were analyzed using guidelines from *NCHRP Report 745, Left-Turn Accommodations at Unsignalized Intersections* (TRB, 2013) and *NCHRP Report 457, Evaluating Intersection Improvements: An Engineering Study Guide* (TRB, 2001). It is noted that while technical warrants are an important element of the decision-making process, other factors should also be considered when deciding whether to install a dedicated left or right-turn lane, including sight distance and design consistency within the corridor.

1. Dedicated Left-Turn Lane

Graphs provided in *NCHRP 745* can be used for determining the need for dedicated left-turn lanes along an urban and suburban arterial with four legs. The projected number of vehicles making a left-turn during the AM and PM peak hour are two and nine vehicles, respectively. The AM peak hour turn volume falls below the trend line, while the PM peak hour turn volume falls above the trend line with the full build out of the park. A left-turn lane was not warranted when using the trips generated only from the soccer field. Considering the existing painted median along Laaloa Avenue, the eastbound approach is recommended to include a dedicated left-turn lane (see Figure 11) at full buildout of the park. The initial phase of the park development (with only the soccer field, comfort station and 35 parking stalls) does not warrant a dedicated left-turn lane.

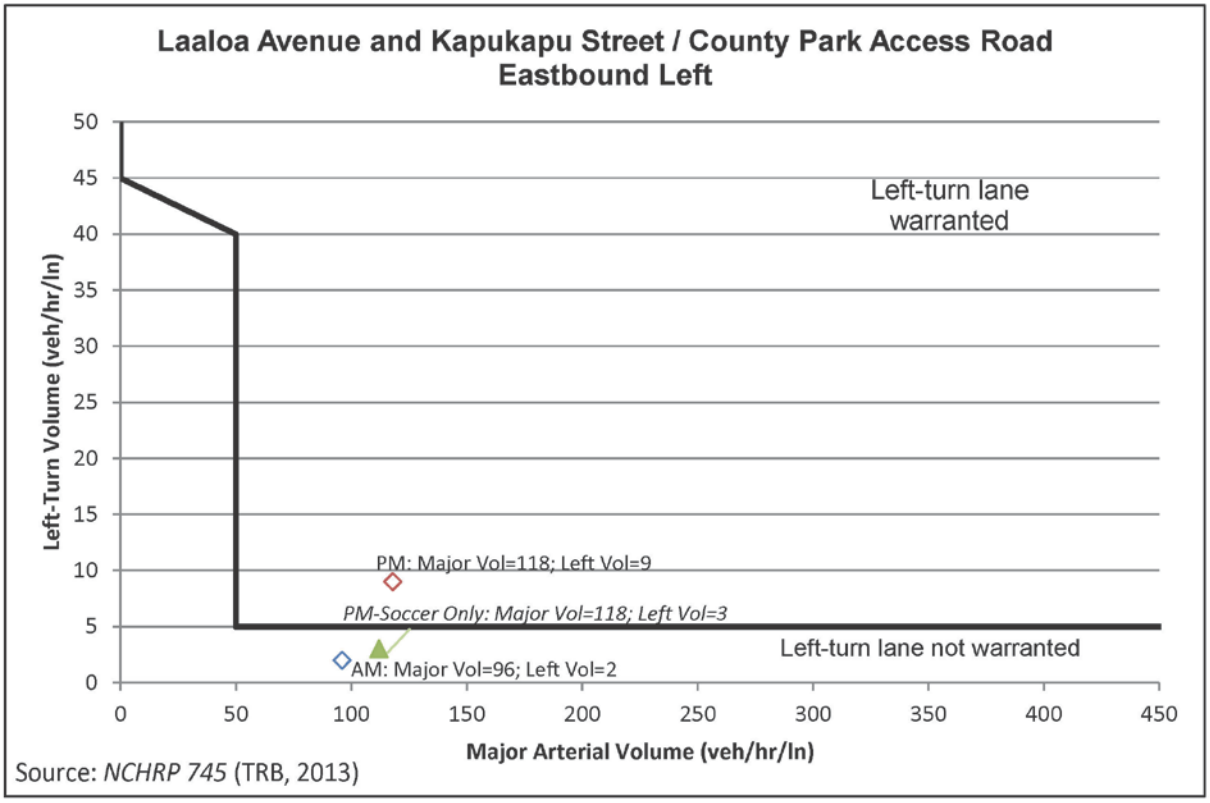
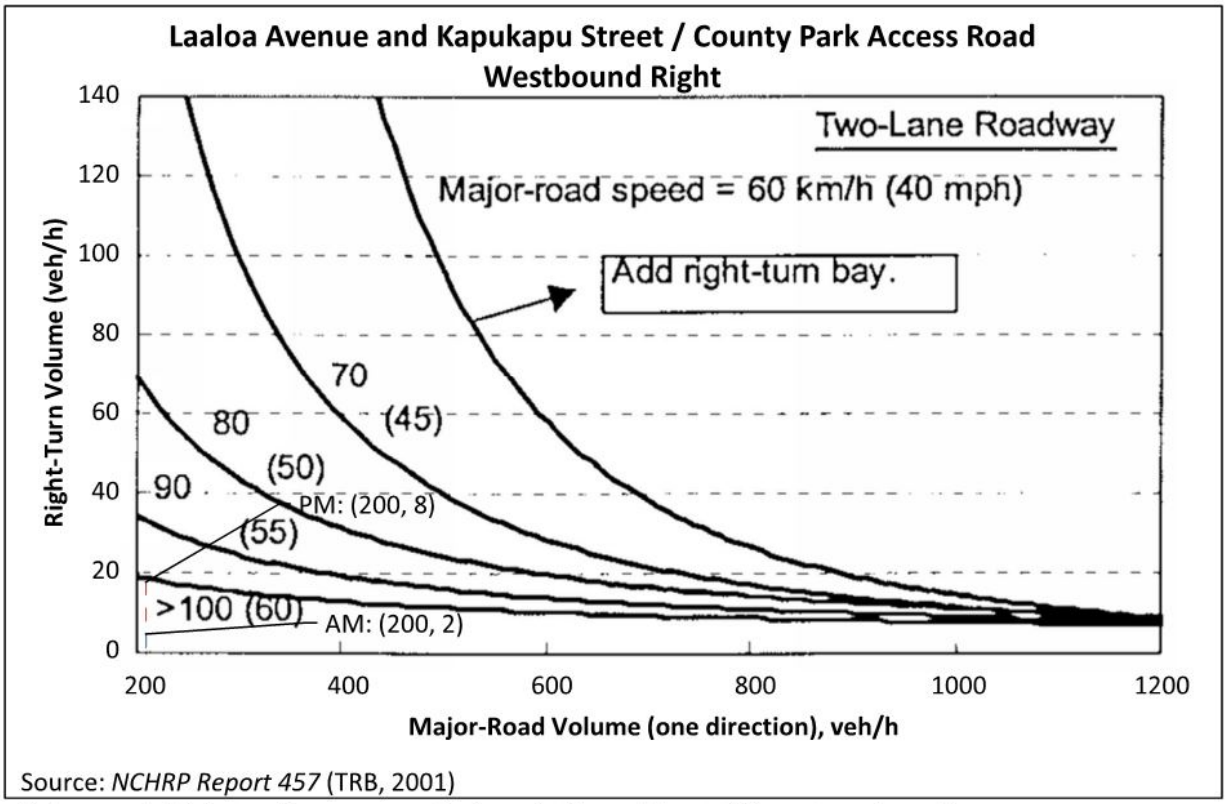


Figure 11: Determining Need for Left-Turn Lane

2. Dedicated Right-Turn Lane

Guidance provided in *NCHRP Report 457* states that if the combination of major-road approach volume and right-turn volume intersects above or to the right of the trend line corresponding to the major-road operating speed, then a right-turn bay is a viable alternative.

Laaloa Avenue is a two-lane roadway. Using the posted speed of 25 mph, the maximum number of vehicles making a right-turn during a given hour does not fall above the trend line during the AM or PM peak hours (see Figure 12). Therefore, a dedicated right-turn lane is not warranted in the westbound approach along Laaloa Avenue.



Source: *NCHRP Report 457* (TRB, 2001)

Notes: 1. Major-road turn movement volume for the peak hour of the average day and
2.Major-road 85th percentile speed (posted speed can be substituted if data are unavailable.

Figure 12: Determining Need for Right-Turn Lane

IV. SUMMARY AND RECOMMENDATIONS

In a cooperative arrangement, Hawaii One1 Investors, LLC, and the County of Hawaii are developing a new park on a 6.356-acre parcel Laaloa Avenue in the town of Kailua in the North Kona District of the County of Hawaii. This park is proposed to be comprised of a soccer field, tennis court, comfort station, playground, basketball court, a 6-foot wide jogging path and other recreational amenities. Access to the County Park will be through a new driveway off of Laaloa Avenue, across of Kapukapu Street.

Existing AM and PM peak hour LOS at the intersections of Laaloa Avenue and Alii Drive, and Laaloa Avenue and Kapukapu Street resulted in LOS C or better for all movements. Existing (2017) conditions resulted in appropriate LOS for the signalized intersection at Laaloa Avenue and Kuakini Highway.

The resulting LOS for Future (2027) Without Project and Future (2027) With Project conditions were LOS D or better for most movements. Further analysis determined that the addition of project related trips warrant a dedicated left-turn lane for eastbound traffic along Laaloa Avenue at Kapukapu Street/project driveway. A dedicated right-turn lane for westbound traffic is not warranted at the intersection of Laaloa Avenue at Kapukapu Street/project driveway. A marked pedestrian crosswalk crossing Laaloa Avenue at the park access driveway and Kapukapu Street should be installed. This is to provide a connection between the park and the residential area. Visibility of the crosswalk needs to be considered, especially in the westbound direction, due to the downhill grade. The proposed county park will have negligible impact on the traffic in the surrounding areas.

V. REFERENCES

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Appendix A

24-Hour and Peak Period Traffic Counts

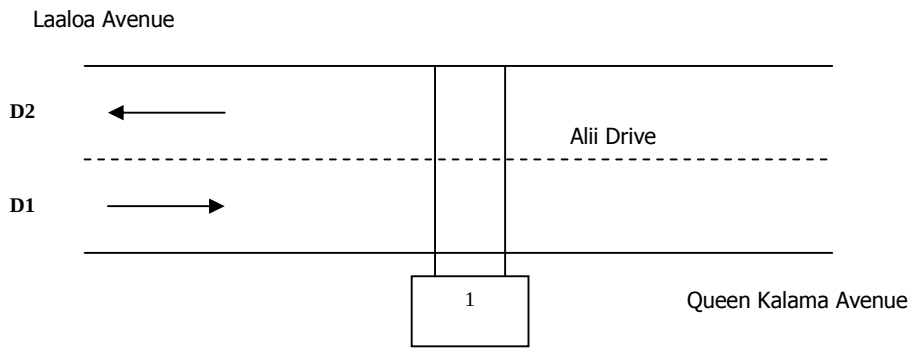
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii
Area: Kona

Section ID/Station #: B71018600408



Meter #	File Name	GPS
1. CH58	D0910025_B71018600408 D0910026_B71018600408	19.58884, -155.9715

Station Description:

Alii Drive: Laaloa Avenue to Queen Kalama Avenue

Survey Beginning Date/Time: 9/10/15@ 0000		Survey Ending Date/Time: 9/11/15@ 2400

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	1346		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Alii Drive		17		0186	

D1= Direction to End
D2= Direction to Begin

D1: Queen Kalama Avenue / Mamalahoa Bypass
D2: Laaloa Avenue / Kuakini Highway

Run Date: 2016/05/18

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2015 Program Count - Summary

Site ID: B71018600408 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 5500
Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 186
Location: Alii Dr - Laaloa Ave to Queen Kalama Ave

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 : 09/10/2015															
12:00-12:15	4	7	11	06:00-06:15	11	11	22	12:00-12:15	52	57	109	06:00-06:15	32	42	74
12:15-12:30	5	3	8	06:15-06:30	20	15	35	12:15-12:30	50	46	96	06:15-06:30	32	34	66
12:30-12:45	4	4	8	06:30-06:45	26	27	53	12:30-12:45	42	57	99	06:30-06:45	23	39	62
12:45-01:00	1	1	2	06:45-07:00	29	25	54	12:45-01:00	59	35	94	06:45-07:00	38	34	72
01:00-01:15	1	0	1	07:00-07:15	38	32	70	01:00-01:15	50	66	116	07:00-07:15	36	35	71
01:15-01:30	2	3	5	07:15-07:30	47	64	111	01:15-01:30	50	58	108	07:15-07:30	40	28	68
01:30-01:45	0	3	3	07:30-07:45	50	52	102	01:30-01:45	63	47	110	07:30-07:45	24	17	41
01:45-02:00	1	1	2	07:45-08:00	32	59	91	01:45-02:00	57	48	105	07:45-08:00	23	29	52
02:00-02:15	0	1	1	08:00-08:15	50	40	90	02:00-02:15	57	67	124	08:00-08:15	18	24	42
02:15-02:30	1	0	1	08:15-08:30	38	41	79	02:15-02:30	50	49	99	08:15-08:30	27	25	52
02:30-02:45	0	0	0	08:30-08:45	41	38	79	02:30-02:45	45	52	97	08:30-08:45	18	20	38
02:45-03:00	2	3	5	08:45-09:00	47	52	99	02:45-03:00	56	45	101	08:45-09:00	19	19	38
03:00-03:15	0	2	2	09:00-09:15	41	52	93	03:00-03:15	50	58	108	09:00-09:15	33	14	47
03:15-03:30	0	2	2	09:15-09:30	51	50	101	03:15-03:30	44	81	125	09:15-09:30	6	19	25
03:30-03:45	2	2	4	09:30-09:45	44	40	84	03:30-03:45	64	60	124	09:30-09:45	12	27	39
03:45-04:00	5	0	5	09:45-10:00	41	38	79	03:45-04:00	60	68	128	09:45-10:00	8	13	21
04:00-04:15	1	4	5	10:00-10:15	55	54	109	04:00-04:15	50	69	119	10:00-10:15	11	12	23
04:15-04:30	1	3	4	10:15-10:30	46	41	87	04:15-04:30	49	80	129	10:15-10:30	18	10	28
04:30-04:45	4	1	5	10:30-10:45	54	43	97	04:30-04:45	55	68	123	10:30-10:45	13	11	24
04:45-05:00	2	3	5	10:45-11:00	54	46	100	04:45-05:00	51	66	117	10:45-11:00	5	9	14
05:00-05:15	7	2	9	11:00-11:15	54	40	94	05:00-05:15	46	78	124	11:00-11:15	17	5	22
05:15-05:30	11	5	16	11:15-11:30	52	53	105	05:15-05:30	33	76	109	11:15-11:30	13	11	24
05:30-05:45	8	8	16	11:30-11:45	58	42	100	05:30-05:45	43	46	89	11:30-11:45	7	11	18
05:45-06:00	12	6	18	11:45-12:00	44	36	80	05:45-06:00	59	57	116	11:45-12:00	3	5	8

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM		
AM - PEAK HR VOLUME	179	215	394
AM - K FACTOR (%)			6.80
AM - D (%)	45.43	54.57	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM	07:15 AM to 08:15 AM	
AM - PEAK HR VOLUME	179	215	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 PM to 04:30 PM		
PM - PEAK HR VOLUME	223	277	500
PM - K FACTOR (%)			8.64
PM - D (%)	44.60	55.40	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 PM to 04:30 PM	04:15 PM to 05:15 PM	
PM - PEAK HR VOLUME	223	292	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	10:45 AM to 11:45 AM		
AM - PEAK HR VOLUME	218	181	399
AM - K FACTOR (%)			6.89
AM - D (%)	54.64	45.36	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 PM to 04:30 PM		
PM - PEAK HR VOLUME	223	277	500
PM - K FACTOR (%)			8.64
PM - D (%)	44.60	55.40	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:15 PM to 02:15 PM		
PEAK HR VOLUME	227	220	447
DIRECTIONAL PEAK			
PEAK HR TIME	01:15 PM to 02:15 PM	01:15 PM to 02:15 PM	
PEAK HR VOLUME	227	220	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	1,023	991	2,014
AM 12-HR PERIOD (00:00-12:00)	1,097	1,055	2,152
PM 6-HR PERIOD (12:00-18:00)	1,235	1,434	2,669
PM 12-HR PERIOD (12:00-24:00)	1,711	1,927	3,638
24 HOUR PERIOD	2,808	2,982	5,790
D (%)	48.50	51.50	100.00

Run Date: 2016/05/18

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2015 Program Count - Summary

Site ID: B71018600408 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 5500
Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 186
Location: Alii Dr - Laaloa Ave to Queen Kalama Ave

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 : 09/11/2015															
12:00-12:15	4	3	7	06:00-06:15	12	11	23	12:00-12:15	38	52	90	06:00-06:15	48	59	107
12:15-12:30	6	2	8	06:15-06:30	20	17	37	12:15-12:30	58	45	103	06:15-06:30	31	54	85
12:30-12:45	4	2	6	06:30-06:45	22	18	40	12:30-12:45	52	41	93	06:30-06:45	40	37	77
12:45-01:00	3	2	5	06:45-07:00	29	25	54	12:45-01:00	51	54	105	06:45-07:00	31	41	72
01:00-01:15	4	1	5	07:00-07:15	37	22	59	01:00-01:15	51	46	97	07:00-07:15	24	33	57
01:15-01:30	2	2	4	07:15-07:30	45	38	83	01:15-01:30	58	36	94	07:15-07:30	26	23	49
01:30-01:45	2	2	4	07:30-07:45	54	48	102	01:30-01:45	57	49	106	07:30-07:45	22	29	51
01:45-02:00	1	1	2	07:45-08:00	49	56	105	01:45-02:00	51	48	99	07:45-08:00	22	29	51
02:00-02:15	0	0	0	08:00-08:15	55	31	86	02:00-02:15	47	56	103	08:00-08:15	15	26	41
02:15-02:30	3	0	3	08:15-08:30	45	36	81	02:15-02:30	54	54	108	08:15-08:30	25	24	49
02:30-02:45	1	1	2	08:30-08:45	45	37	82	02:30-02:45	46	58	104	08:30-08:45	29	18	47
02:45-03:00	0	0	0	08:45-09:00	42	36	78	02:45-03:00	42	52	94	08:45-09:00	20	25	45
03:00-03:15	1	2	3	09:00-09:15	46	27	73	03:00-03:15	63	56	119	09:00-09:15	22	21	43
03:15-03:30	0	1	1	09:15-09:30	55	39	94	03:15-03:30	50	61	111	09:15-09:30	22	28	50
03:30-03:45	2	2	4	09:30-09:45	33	43	76	03:30-03:45	67	42	109	09:30-09:45	20	22	42
03:45-04:00	0	1	1	09:45-10:00	57	42	99	03:45-04:00	56	62	118	09:45-10:00	11	17	28
04:00-04:15	0	3	3	10:00-10:15	61	37	98	04:00-04:15	57	56	113	10:00-10:15	11	14	25
04:15-04:30	2	1	3	10:15-10:30	44	40	84	04:15-04:30	61	62	123	10:15-10:30	16	8	24
04:30-04:45	8	0	8	10:30-10:45	59	37	96	04:30-04:45	38	58	96	10:30-10:45	13	13	26
04:45-05:00	4	4	8	10:45-11:00	45	48	93	04:45-05:00	52	68	120	10:45-11:00	13	8	21
05:00-05:15	5	5	10	11:00-11:15	39	39	78	05:00-05:15	51	49	100	11:00-11:15	8	7	15
05:15-05:30	9	9	18	11:15-11:30	53	46	99	05:15-05:30	44	85	129	11:15-11:30	8	14	22
05:30-05:45	6	11	17	11:30-11:45	43	36	79	05:30-05:45	37	60	97	11:30-11:45	6	5	11
05:45-06:00	14	8	22	11:45-12:00	40	51	91	05:45-06:00	31	48	79	11:45-12:00	4	8	12

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM		
AM - PEAK HR VOLUME	203	173	376
AM - K FACTOR (%)			6.72
AM - D (%)	53.99	46.01	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM	07:15 AM to 08:15 AM	
AM - PEAK HR VOLUME	203	173	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 PM to 04:30 PM		
PM - PEAK HR VOLUME	241	222	463
PM - K FACTOR (%)			8.28
PM - D (%)	52.05	47.95	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 PM to 04:30 PM	04:45 PM to 05:45 PM	
PM - PEAK HR VOLUME	241	262	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	09:45 AM to 10:45 AM		
AM - PEAK HR VOLUME	221	156	377
AM - K FACTOR (%)			6.74
AM - D (%)	58.62	41.38	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 PM to 04:30 PM		
PM - PEAK HR VOLUME	241	222	463
PM - K FACTOR (%)			8.28
PM - D (%)	52.05	47.95	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	209	207	416
DIRECTIONAL PEAK			
PEAK HR TIME	09:45 AM to 10:45 AM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	221	220	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	1,030	860	1,890
AM 12-HR PERIOD (00:00-12:00)	1,111	923	2,034
PM 6-HR PERIOD (12:00-18:00)	1,212	1,298	2,510
PM 12-HR PERIOD (12:00-24:00)	1,699	1,861	3,560
24 HOUR PERIOD	2,810	2,784	5,594
D (%)	50.23	49.77	100.00

Run Date: 2016/05/19

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2015

Site ID:	**B71018600408**	**Route No:**	**186**	**Date From:**	2015/09/10 0:00
Town:	**Hawaii**	**Direction:**	+MP	**Date To:**	2015/09/11 23:45
Location:	**Alii Dr - Laaloa Ave to Queen Kalama Ave**				

Functional Classification: 17 URBAN:COLLECTOR

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	213	1.87%	426
PC	9633	84.62%	19266
2A-4T	1342	11.79%	2684
LIGHT VEHICLE TOTALS	11188	98.28%	22376
	HEAVY VEHICLES		
Bus	39	0.34%	98
SINGLE UNIT TRUCK			
2A-6T	75	0.66%	150
3A-SU	39	0.34%	117
4A-SU	12	0.11%	48
SINGLE-TRAILER TRUCKS			
4A-ST	15	0.13%	60
5A-ST	0	0.00%	0
6A-ST	2	0.02%	12
MULTI-TRAILER TRUCKS			
5A-MT	1	0.01%	5
6A-MT	9	0.08%	54
7A-MT	4	0.04%	28
HEAVY VEHICLE TOTALS	196	1.72%	572
CLASSIFIED VEHICLES TOTALS	11384 (A)	100.00%	22947 (B)
UNCLASSIFIED VEHICLES TOTALS	0	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.992

ROADTUBE EQUIVALENT(B/2) = 11474 (C)

PEAK HOUR VOLUME : 488 **2015/09/10 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)	**4**	**(65A-1) 0.82%**	**82**	**5500**	**(65A-2) 1.49%**	**8.87%**
COMBINATION (TYPE 8-13)	**0**	**(65B-1) 0.00%**	**15**		**(65B-2) 0.27%**	**8.87%**

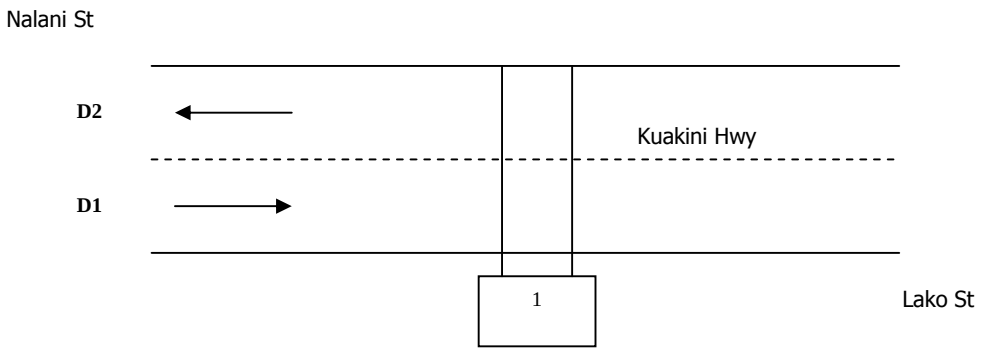
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii
Area: Holualoa

Section ID/Station #: B71001111842



Meter #	File Name	GPS
1. bt29	D0914039_B71001111842 D0914040_B71001111842	19.61076, -155.9657

Station Description:

Kuakini Hwy: Nalani St to Lako St

Survey Beginning Date/Time: 9/14/15@ 0000		Survey Ending Date/Time: 9/15/15@ 2400

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:			

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Kuakini Hwy		14		11	

D1= Direction to End	D1: Lako St / Palani Rd (Rte 190)
D2= Direction to Begin	D2: Nalani St / Kamehameha Ave (Rte 19)

Run Date: 2016/05/18

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2015 Program Count - Summary

Site ID: B71001111842 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 20100
Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** CLASS **Counter Type:** Tube **Route No:** 11
Location: Kuakini Hwy - Nalani St to Lako 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 : 09/14/2015															
12:00-12:15	9	15	24	06:00-06:15	153	57	210	12:00-12:15	171	164	335	06:00-06:15	128	174	302
12:15-12:30	7	20	27	06:15-06:30	186	90	276	12:15-12:30	137	163	300	06:15-06:30	114	193	307
12:30-12:45	17	15	32	06:30-06:45	184	97	281	12:30-12:45	150	161	311	06:30-06:45	148	172	320
12:45-01:00	11	20	31	06:45-07:00	235	97	332	12:45-01:00	137	182	319	06:45-07:00	124	171	295
01:00-01:15	6	11	17	07:00-07:15	137	112	249	01:00-01:15	120	174	294	07:00-07:15	97	167	264
01:15-01:30	9	10	19	07:15-07:30	138	152	290	01:15-01:30	173	153	326	07:15-07:30	90	160	250
01:30-01:45	6	5	11	07:30-07:45	155	167	322	01:30-01:45	160	184	344	07:30-07:45	74	150	224
01:45-02:00	15	7	22	07:45-08:00	111	169	280	01:45-02:00	162	170	332	07:45-08:00	79	120	199
02:00-02:15	4	6	10	08:00-08:15	190	140	330	02:00-02:15	170	191	361	08:00-08:15	90	131	221
02:15-02:30	6	8	14	08:15-08:30	167	149	316	02:15-02:30	145	171	316	08:15-08:30	43	105	148
02:30-02:45	5	8	13	08:30-08:45	222	126	348	02:30-02:45	171	183	354	08:30-08:45	89	93	182
02:45-03:00	8	4	12	08:45-09:00	113	140	253	02:45-03:00	178	167	345	08:45-09:00	83	94	177
03:00-03:15	7	4	11	09:00-09:15	113	67	180	03:00-03:15	168	162	330	09:00-09:15	63	97	160
03:15-03:30	8	3	11	09:15-09:30	176	117	293	03:15-03:30	143	170	313	09:15-09:30	76	79	155
03:30-03:45	10	8	18	09:30-09:45	142	141	283	03:30-03:45	87	151	238	09:30-09:45	48	107	155
03:45-04:00	23	5	28	09:45-10:00	172	121	293	03:45-04:00	173	183	356	09:45-10:00	42	79	121
04:00-04:15	21	6	27	10:00-10:15	182	107	289	04:00-04:15	155	187	342	10:00-10:15	46	75	121
04:15-04:30	23	11	34	10:15-10:30	175	132	307	04:15-04:30	130	157	287	10:15-10:30	55	82	137
04:30-04:45	43	12	55	10:30-10:45	196	131	327	04:30-04:45	157	149	306	10:30-10:45	46	75	121
04:45-05:00	57	18	75	10:45-11:00	166	142	308	04:45-05:00	179	166	345	10:45-11:00	33	78	111
05:00-05:15	58	18	76	11:00-11:15	134	157	291	05:00-05:15	136	195	331	11:00-11:15	27	54	81
05:15-05:30	85	20	105	11:15-11:30	166	182	348	05:15-05:30	137	210	347	11:15-11:30	29	45	74
05:30-05:45	108	38	146	11:30-11:45	178	163	341	05:30-05:45	139	170	309	11:30-11:45	20	40	60
05:45-06:00	125	55	180	11:45-12:00	94	152	246	05:45-06:00	145	176	321	11:45-12:00	16	31	47

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM		
AM - PEAK HR VOLUME	690	584	1274
AM - K FACTOR (%)			6.37
AM - D (%)	54.16	45.84	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM	07:15 AM to 08:15 AM	
AM - PEAK HR VOLUME	758	628	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:45 PM to 05:45 PM		
PM - PEAK HR VOLUME	591	741	1332
PM - K FACTOR (%)			6.66
PM - D (%)	44.37	55.63	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM	05:00 PM to 06:00 PM	
PM - PEAK HR VOLUME	621	751	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	10:45 AM to 11:45 AM		
AM - PEAK HR VOLUME	644	644	1288
AM - K FACTOR (%)			6.44
AM - D (%)	50.00	50.00	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	02:00 PM to 03:00 PM		
PM - PEAK HR VOLUME	664	712	1376
PM - K FACTOR (%)			6.89
PM - D (%)	48.26	51.74	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	664	712	1376
DIRECTIONAL PEAK			
PEAK HR TIME	09:45 AM to 10:45 AM	01:30 PM to 02:30 PM	
PEAK HR VOLUME	725	716	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	3,885	3,108	6,993
AM 12-HR PERIOD (00:00-12:00)	4,556	3,435	7,991
PM 6-HR PERIOD (12:00-18:00)	3,623	4,139	7,762
PM 12-HR PERIOD (12:00-24:00)	5,283	6,711	11,994
24 HOUR PERIOD	9,839	10,146	19,985
D (%)	49.23	50.77	100.00

Run Date: 2016/05/18

Hawaii Department of Transportation
Highways Division — Highways Planning Survey Section
2015 Program Count - Summary

Site ID: B71001111842 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 20100
Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** CLASS **Counter Type:** Tube **Route No:** 11
Location: Kuakini Hwy - Nalani St to Lako 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 : 09/15/2015															
12:00-12:15	9	13	22	06:00-06:15	129	63	192	12:00-12:15	156	155	311	06:00-06:15	115	216	331
12:15-12:30	8	10	18	06:15-06:30	160	74	234	12:15-12:30	135	154	289	06:15-06:30	115	185	300
12:30-12:45	10	13	23	06:30-06:45	176	81	257	12:30-12:45	150	171	321	06:30-06:45	123	159	282
12:45-01:00	2	8	10	06:45-07:00	186	82	268	12:45-01:00	153	166	319	06:45-07:00	114	160	274
01:00-01:15	4	9	13	07:00-07:15	177	94	271	01:00-01:15	147	187	334	07:00-07:15	109	167	276
01:15-01:30	6	2	8	07:15-07:30	134	167	301	01:15-01:30	153	186	339	07:15-07:30	103	153	256
01:30-01:45	0	3	3	07:30-07:45	138	100	238	01:30-01:45	172	168	340	07:30-07:45	70	139	209
01:45-02:00	3	1	4	07:45-08:00	114	128	242	01:45-02:00	165	190	355	07:45-08:00	96	123	219
02:00-02:15	8	7	15	08:00-08:15	127	90	217	02:00-02:15	148	208	356	08:00-08:15	51	123	174
02:15-02:30	4	5	9	08:15-08:30	193	142	335	02:15-02:30	181	169	350	08:15-08:30	78	130	208
02:30-02:45	2	1	3	08:30-08:45	168	110	278	02:30-02:45	151	203	354	08:30-08:45	73	109	182
02:45-03:00	7	5	12	08:45-09:00	136	127	263	02:45-03:00	156	177	333	08:45-09:00	78	114	192
03:00-03:15	5	13	18	09:00-09:15	117	120	237	03:00-03:15	165	182	347	09:00-09:15	70	104	174
03:15-03:30	10	5	15	09:15-09:30	96	121	217	03:15-03:30	197	170	367	09:15-09:30	52	97	149
03:30-03:45	22	9	31	09:30-09:45	179	132	311	03:30-03:45	171	171	342	09:30-09:45	70	69	139
03:45-04:00	17	3	20	09:45-10:00	203	136	339	03:45-04:00	134	191	325	09:45-10:00	38	81	119
04:00-04:15	19	4	23	10:00-10:15	164	152	316	04:00-04:15	90	146	236	10:00-10:15	48	76	124
04:15-04:30	24	6	30	10:15-10:30	178	134	312	04:15-04:30	144	151	295	10:15-10:30	49	66	115
04:30-04:45	42	15	57	10:30-10:45	156	162	318	04:30-04:45	122	162	284	10:30-10:45	40	50	90
04:45-05:00	59	14	73	10:45-11:00	122	162	284	04:45-05:00	150	163	313	10:45-11:00	21	51	72
05:00-05:15	57	14	71	11:00-11:15	182	137	319	05:00-05:15	91	187	278	11:00-11:15	46	34	80
05:15-05:30	79	17	96	11:15-11:30	162	164	326	05:15-05:30	125	214	339	11:15-11:30	33	34	67
05:30-05:45	138	27	165	11:30-11:45	157	161	318	05:30-05:45	126	215	341	11:30-11:45	30	27	57
05:45-06:00	137	35	172	11:45-12:00	154	144	298	05:45-06:00	114	192	306	11:45-12:00	23	31	54

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM		
AM - PEAK HR VOLUME	673	424	1097
AM - K FACTOR (%)			5.62
AM - D (%)	61.35	38.65	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:15 AM to 07:15 AM	07:00 AM to 08:00 AM	
AM - PEAK HR VOLUME	699	489	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM		
PM - PEAK HR VOLUME	667	714	1381
PM - K FACTOR (%)			7.08
PM - D (%)	48.30	51.70	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	05:15 PM to 06:15 PM	
PM - PEAK HR VOLUME	667	837	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	09:45 AM to 10:45 AM		
AM - PEAK HR VOLUME	701	584	1285
AM - K FACTOR (%)			6.58
AM - D (%)	54.55	45.45	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	01:45 PM to 02:45 PM		
PM - PEAK HR VOLUME	645	770	1415
PM - K FACTOR (%)			7.25
PM - D (%)	45.58	54.42	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:45 PM to 02:45 PM		
PEAK HR VOLUME	645	770	1415
DIRECTIONAL PEAK			
PEAK HR TIME	09:30 AM to 10:30 AM	01:45 PM to 02:45 PM	
PEAK HR VOLUME	724	770	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	3,708	2,983	6,691
AM 12-HR PERIOD (00:00-12:00)	4,380	3,222	7,602
PM 6-HR PERIOD (12:00-18:00)	3,496	4,278	7,774
PM 12-HR PERIOD (12:00-24:00)	5,141	6,776	11,917
24 HOUR PERIOD	9,521	9,998	19,519
D (%)	48.78	51.22	100.00

Run Date: 2016/05/19

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2015

Site ID:	**B71001111842**	**Route No:**	**11**	**Date From:**	2015/09/14 0:00
Town:	**Hawaii**	**Direction:**	+MP	**Date To:**	2015/09/15 23:45
Location:	**Kuakini Hwy - Nalani St to Lako St**				

Functional Classification: 14 URBAN:PRINCIPAL ARTERIAL - OTHER

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	478	1.21%	956
PC	32987	83.50%	65974
2A-4T	5274	13.35%	10548
LIGHT VEHICLE TOTALS	38739	98.06%	77478
	HEAVY VEHICLES		
Bus	97	0.25%	242
SINGLE UNIT TRUCK			
2A-6T	187	0.47%	374
3A-SU	271	0.69%	813
4A-SU	31	0.08%	124
SINGLE-TRAILER TRUCKS			
4A-ST	105	0.27%	420
5A-ST	73	0.18%	365
6A-ST	0	0.00%	0
MULTI-TRAILER TRUCKS			
5A-MT	0	0.00%	0
6A-MT	0	0.00%	0
7A-MT	0	0.00%	0
HEAVY VEHICLE TOTALS	764	1.93%	2338
CLASSIFIED VEHICLES TOTALS	39503 (A)	100.00%	79816 (B)
UNCLASSIFIED VEHICLES TOTALS	1	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.990

ROADTUBE EQUIVALENT(B/2) = 39908 (C)

PEAK HOUR VOLUME : 1393 2015/09/15 14:00	**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)	**24**	**(65A-1) 1.72%**	**293**	**20100**	**(65A-2) 1.46%**	**6.93%**
COMBINATION (TYPE 8-13)	**11**	**(65B-1) 0.79%**	**88**		**(65B-2) 0.44%**	**6.93%**

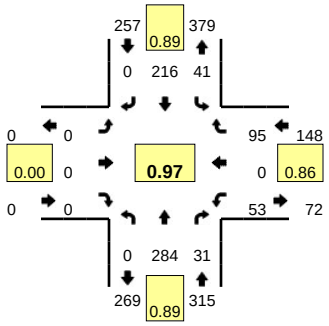
Type of peak hour being reported: Intersection Peak

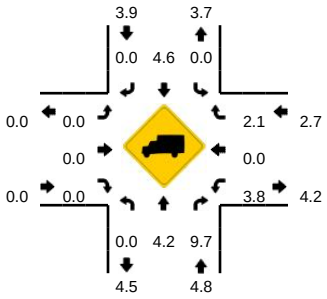
Method for determining peak hour: Total Entering Volume

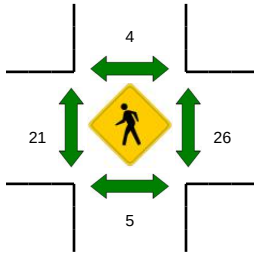
LOCATION: Ali'i Dr -- La'aloa Ave
CITY/STATE: Kailua-Kona, HI

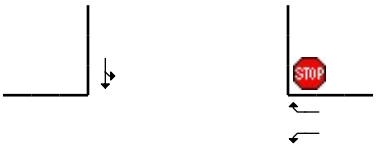
QC JOB #: 14259701
DATE: Tue, May 02 2017

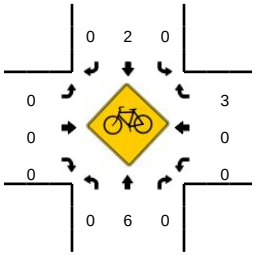
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:15 AM -- 7:30 AM

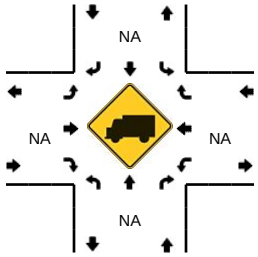


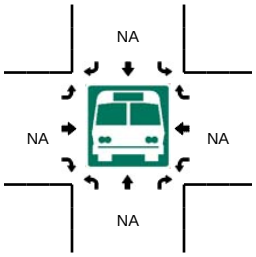












15-Min Count Period Beginning At	Ali'i Dr (Northbound)				Ali'i Dr (Southbound)				La'aloa Ave (Eastbound)				La'aloa Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	38	5	0	7	27	0	0	0	0	0	0	7	0	12	0	96	
6:45 AM	0	61	8	0	2	37	0	0	0	0	0	0	10	0	14	0	132	
7:00 AM	0	53	4	0	6	35	0	0	0	0	0	0	7	0	25	0	130	
7:15 AM	0	71	7	0	11	53	0	0	0	0	0	0	20	0	23	0	185	543
7:30 AM	0	59	10	0	8	57	0	0	0	0	0	0	13	0	29	0	176	623
7:45 AM	0	69	7	0	17	55	0	0	0	0	0	0	12	0	18	0	178	669
8:00 AM	0	85	7	0	5	51	0	0	0	0	0	0	8	0	25	0	181	720
8:15 AM	0	85	7	0	11	45	0	0	0	0	0	0	14	0	13	0	175	710

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	0	284	28	0	44	212	0	0	0	0	0	0	80	0	92	0	740
Heavy Trucks	0	12	4		0	12	0		0	0	0		4	0	0		32
Pedestrians		0				4				20				12			36
Bicycles	0	2	0		0	0	0		0	0	0		0	0	2		4
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/17/2017 11:44 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

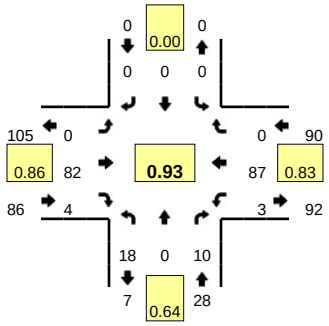
Type of peak hour being reported: Intersection Peak

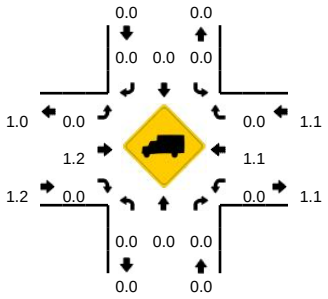
Method for determining peak hour: Total Entering Volume

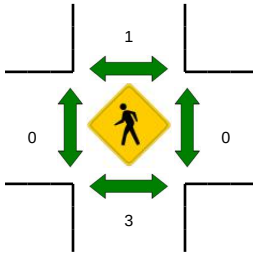
LOCATION: Kapukapu St -- La'aloa Ave
CITY/STATE: Kailua-Kona, HI

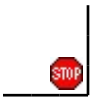
QC JOB #: 14259703
DATE: Tue, May 02 2017

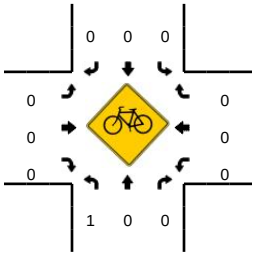
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

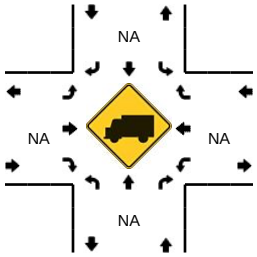


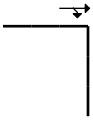


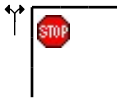


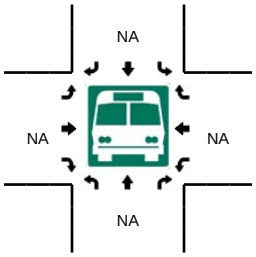












15-Min Count Period Beginning At	Kapukapu St (Northbound)				Kapukapu St (Southbound)				La'aloa Ave (Eastbound)				La'aloa Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	1	0	0	0	0	0	0	0	0	17	0	0	2	8	0	0	28	
6:45 AM	2	0	1	0	0	0	0	0	0	18	0	0	0	13	0	0	34	
7:00 AM	5	0	6	0	0	0	0	0	0	17	0	0	0	20	0	0	48	
7:15 AM	5	0	0	0	0	0	0	0	0	23	0	0	3	20	0	0	51	161
7:30 AM	3	0	1	0	0	0	0	0	0	22	4	0	0	20	0	0	50	183
7:45 AM	5	0	3	0	0	0	0	0	0	20	0	0	0	27	0	0	55	204
8:00 AM	5	0	0	0	0	0	0	0	0	20	0	0	1	19	0	0	45	201
8:15 AM	2	0	2	0	0	0	0	0	0	18	2	0	2	18	0	0	44	194

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	20	0	12	0	0	0	0	0	0	80	0	0	0	108	0	0	220
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		8				4				0				0			12
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/17/2017 11:44 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

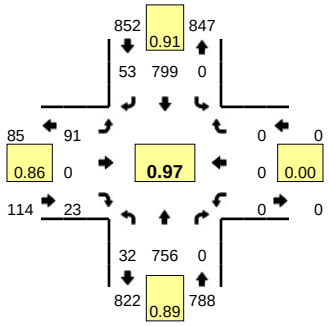
Type of peak hour being reported: Intersection Peak

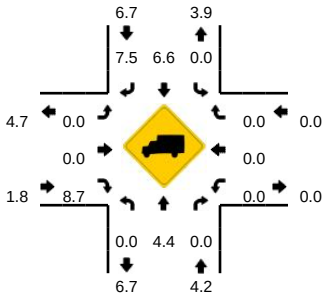
Method for determining peak hour: Total Entering Volume

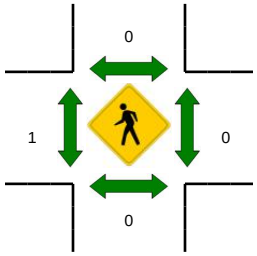
LOCATION: Hawaii Belt Rd (Kuakini Hwy) -- La'aloa Ave
CITY/STATE: Kailua-Kona, HI

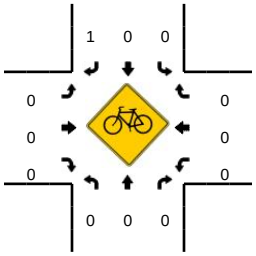
QC JOB #: 14259705
DATE: Tue, May 02 2017

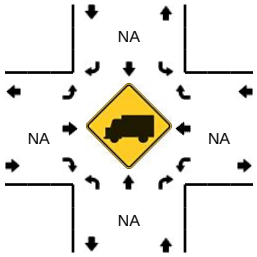
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:00 AM -- 7:15 AM

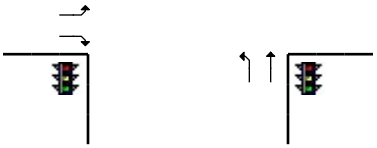


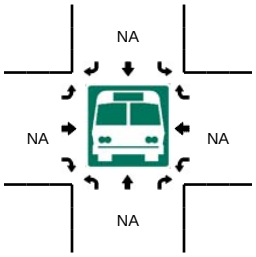












15-Min Count Period Beginning At	Hawaii Belt Rd (Kuakini Hwy) (Northbound)				Hawaii Belt Rd (Kuakini Hwy) (Southbound)				La'aloa Ave (Eastbound)				La'aloa Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	231	0	0	0	120	10	0	19	0	2	0	0	0	0	0	382	
6:45 AM	3	217	0	0	0	172	13	0	21	0	0	0	0	0	0	0	426	
7:00 AM	9	240	0	0	0	163	11	0	22	0	5	0	0	0	0	0	450	
7:15 AM	11	178	0	0	0	216	12	0	22	0	3	0	0	0	0	0	442	1700
7:30 AM	6	161	0	0	0	204	12	0	28	0	5	0	0	0	0	0	416	1734
7:45 AM	6	177	0	0	0	216	18	0	19	0	10	0	0	0	0	0	446	1754
8:00 AM	8	178	0	0	0	140	12	0	19	0	4	0	0	0	0	0	361	1665
8:15 AM	6	188	0	0	0	139	15	0	22	0	3	0	0	0	0	0	373	1596

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	36	960	0	0	0	652	44	0	88	0	20	0	0	0	0	0	1800
Heavy Trucks	0	24	0		0	72	4		0	0	4		0	0	0		104
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/17/2017 11:44 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

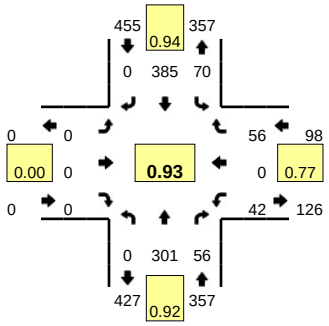
Type of peak hour being reported: Intersection Peak

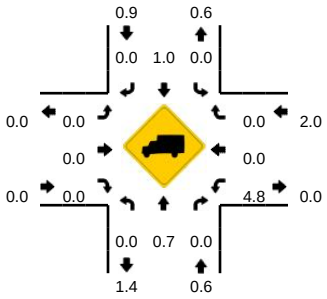
Method for determining peak hour: Total Entering Volume

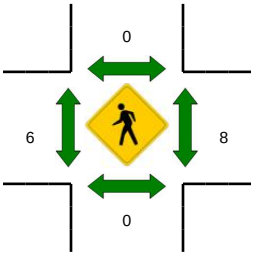
LOCATION: Ali'i Dr -- La'aloa Ave
CITY/STATE: Kailua-Kona, HI

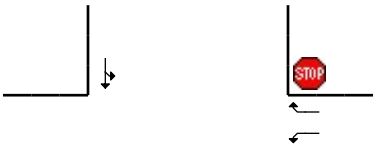
QC JOB #: 14259702
DATE: Tue, May 02 2017

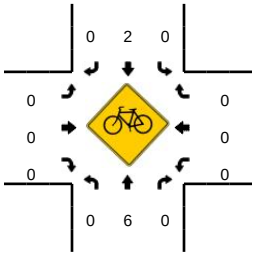
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

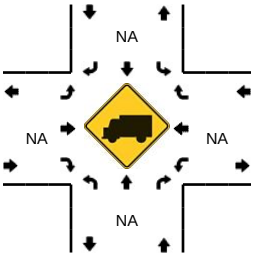


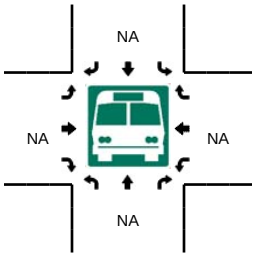












15-Min Count Period Beginning At	Ali'i Dr (Northbound)				Ali'i Dr (Southbound)				La'aloa Ave (Eastbound)				La'aloa Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	0	85	15	0	19	83	0	0	0	0	0	0	6	0	18	0	226	
3:45 PM	0	79	10	0	19	75	0	0	0	0	0	0	12	0	11	0	206	
4:00 PM	0	88	10	0	21	62	0	0	0	0	0	0	15	0	13	0	209	
4:15 PM	0	69	12	0	24	94	0	0	0	0	0	0	3	0	13	0	215	856
4:30 PM	0	72	13	0	16	93	0	0	0	0	0	0	16	0	16	0	226	856
4:45 PM	0	74	16	0	13	95	0	0	0	0	0	0	8	0	15	0	221	871
5:00 PM	0	86	14	0	19	103	0	0	0	0	0	0	6	0	16	0	244	906
5:15 PM	0	69	13	0	22	94	0	0	0	0	0	0	12	0	9	0	219	910

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	0	344	56	0	76	412	0	0	0	0	0	0	24	0	64	0	976
Heavy Trucks	0	0	0		0	8	0		0	0	0		0	0	0		8
Pedestrians		0				0				12				0			12
Bicycles	0	2	0		0	2	0		0	0	0		0	0	0		4
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/17/2017 11:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

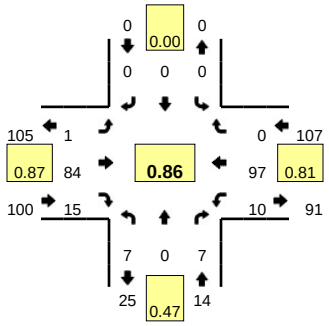
Type of peak hour being reported: Intersection Peak

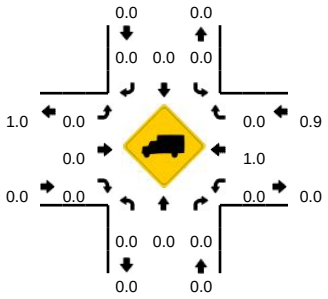
Method for determining peak hour: Total Entering Volume

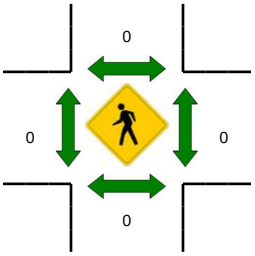
LOCATION: Kapukapu St -- La'aloa Ave
CITY/STATE: Kailua-Kona, HI

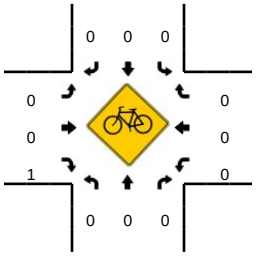
QC JOB #: 14259704
DATE: Tue, May 02 2017

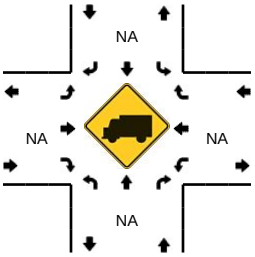
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

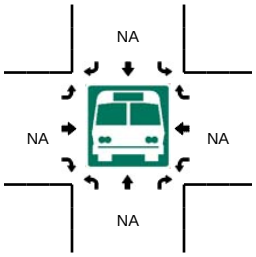












15-Min Count Period Beginning At	Kapukapu St (Northbound)				Kapukapu St (Southbound)				La'aloa Ave (Eastbound)				La'aloa Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	3	0	1	0	0	0	0	0	0	19	3	0	2	25	0	0	53	
3:45 PM	1	0	1	0	0	0	0	0	0	27	3	0	3	16	0	0	51	
4:00 PM	3	0	0	0	0	0	0	0	0	24	3	0	1	21	0	0	52	
4:15 PM	1	0	1	0	0	0	0	0	0	28	4	0	3	15	0	0	52	208
4:30 PM	2	0	6	0	0	0	0	0	0	13	3	1	1	24	0	0	50	205
4:45 PM	1	0	0	0	0	0	0	0	0	21	4	0	3	19	0	0	48	202
5:00 PM	3	0	0	0	0	0	0	0	0	26	3	0	4	23	0	0	59	209
5:15 PM	1	0	1	0	0	0	0	0	0	24	5	0	2	31	0	0	64	221

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	4	0	4	0	0	0	0	0	0	96	20	0	8	124	0	0	256
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/17/2017 11:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

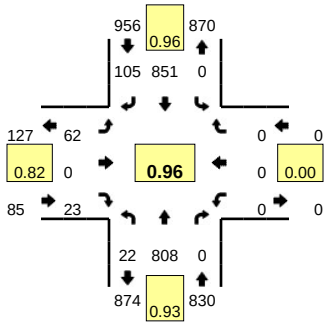
Type of peak hour being reported: Intersection Peak

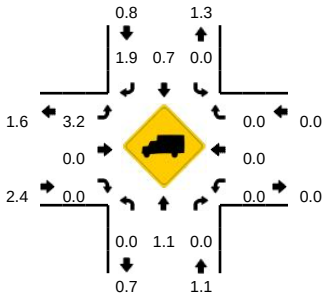
Method for determining peak hour: Total Entering Volume

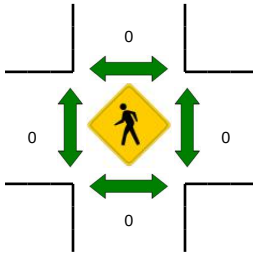
LOCATION: Hawaii Belt Rd (Kuakini Hwy) -- La'aloa Ave
CITY/STATE: Kailua-Kona, HI

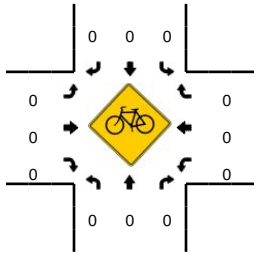
QC JOB #: 14259706
DATE: Tue, May 02 2017

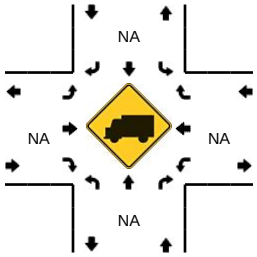
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

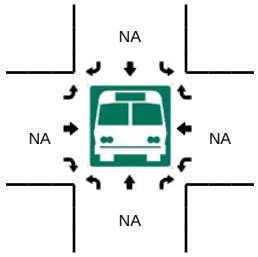












15-Min Count Period Beginning At	Hawaii Belt Rd (Kuakini Hwy) (Northbound)				Hawaii Belt Rd (Kuakini Hwy) (Southbound)				La'aloa Ave (Eastbound)				La'aloa Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	6	203	0	0	0	184	20	0	19	0	2	0	0	0	0	0	434	
3:45 PM	3	172	0	0	0	193	22	0	26	0	6	0	0	0	0	0	422	
4:00 PM	5	192	0	0	0	201	24	0	18	0	4	0	0	0	0	0	444	
4:15 PM	5	182	0	0	0	225	11	0	27	0	6	0	0	0	0	0	456	1756
4:30 PM	4	213	0	0	0	207	28	0	12	0	6	0	0	0	0	0	470	1792
4:45 PM	5	219	0	0	0	218	21	0	20	0	4	0	0	0	0	0	487	1857
5:00 PM	7	186	0	0	0	208	24	0	17	0	8	0	0	0	0	0	450	1863
5:15 PM	6	190	0	0	0	218	32	0	13	0	5	0	0	0	0	0	464	1871

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	20	876	0	0	0	872	84	0	80	0	16	0	0	0	0	0	1948
Heavy Trucks	0	16	0		0	12	0		0	0	0		0	0	0		28
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

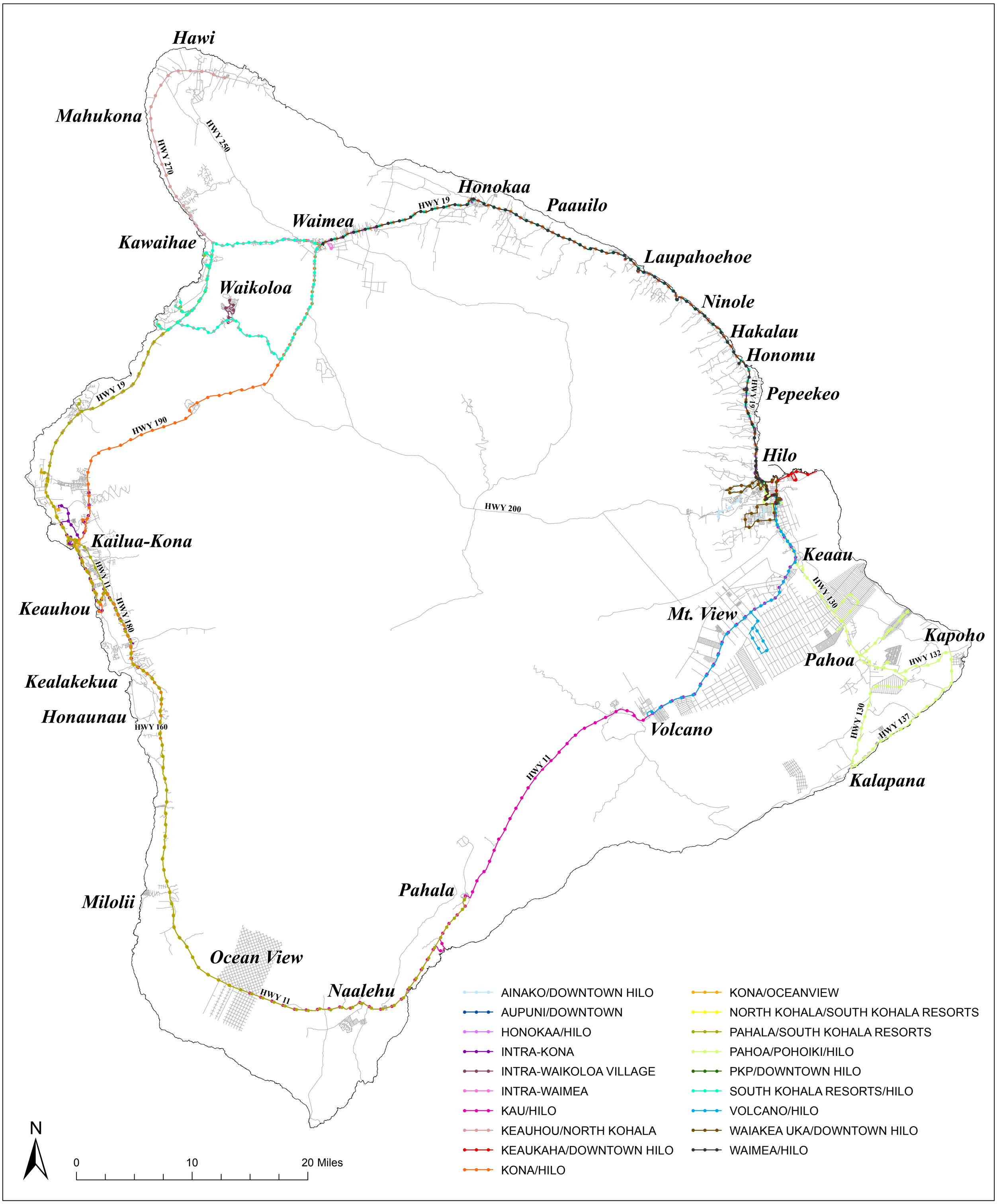
Comments:

Report generated on 7/17/2017 11:45 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix B

Bus Route Schedule and Map



County of Hawaii Mass Transit Agency

Bus Routes

County of Hawai'i
Department of Information Technology
GIS

Note: The County GIS data is intended to be used as a guide for planning purposes and should not be used for boundary interpretations or other spatial analysis beyond the limitations of the data. The tax parcel layer is not survey accurate, so very accurate survey or GPS data may not overlay exactly.

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/Uluwini 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 Apartmets	Costco Uluwini 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

KONA/HILO BUS SCHEDULE

Operates Monday through Saturday

Effective 3/6/2017

KONA TO HILO

Fujihara store	Honaunau	Capt. Cook Yano Hall	Kealakekua Konawaena	Kainaliu Honalo	Sheraton Keauhou Resort	Ali'i Drive	Kona Commons	Kmart	Ali'i Drive	Matsuyama Store	HCC Palamanui Campus	Waikoloa Pyramid Stone	Four Seasons Resorts	Hilton Waikoloa	Marriott	Orchid @ Mauna Lani	Mauna Lani Bay	Hapuna Prince
5:45	5:55	6:00	6:05	6:10	6:20	6:30	---	6:45	---	6:55	---	7:30	---	---	---	---	---	---
---	---	---	---	---	---	**6:35**	**6:40**	**6:45**	---	---	**7:05**	---	**7:35**	**8:00**	**8:05**	**8:15**	**8:20**	---
---	---	---	---	---	---	---	4:00	4:03	4:13	4:20	---	4:55	---	---	---	---	---	---

Waimea - Pukalani Road Bus Shelter	Honokaa 76 Service Station	Paauilo	Laupahoehoe	Papaaloa	Ninole	Hakalau	Honomu Plantation Store	Pepeekeo	Papaikou	Mooheau Bus Terminal	Aupuni Center	Hilo Shopping Center	UH-Hilo	Hawaii Community College	Prince Kuhio Plaza
7:45	**8:30**	**8:35**	**8:55**	**9:00**	**9:05**	**9:15**	**9:25**	**9:30**	**9:35**	**9:45**	**9:55**	**9:57**	**10:00**	**10:02**	**10:05**
8:50	***9:15**	**9:20**	**9:35**	**9:40**	**9:45**	**9:50**	---	**9:55**	**10:00**	**10:05**	---	---	---	---	---
5:15	5:45	5:50	6:10	6:15	6:20	6:30	---	6:45	6:50	7:00	---	---	---	---	---

*Honokaa Gym Complex
Upper Parking Lot

HILO TO KONA

Prince Kuhio Plaza	Hawaii Community College	UH- Hilo	Hilo Shopping Center	Aupuni Center	Mooheau Bus Terminal/*Bayfront Parking Lot	Papaikou	Honomu Plantation Store	Hakalau	Ninole	Papaaloa	Laupahoehoe	Paauilo	Honokaa Blane's Drive Inn	Waimea - Pukalani Road Bus Shelter
---	---	---	---	---	***3:40**	**3:45**	---	**4:00**	**4:05**	**4:25**	**4:30**	**4:45**	**4:50***	**5:10**
9:00	**9:05**	**9:08**	**9:10**	**9:13**	**9:15**	**9:25**	**9:35**	**9:40**	**9:45**	**9:50**	**9:55**	**10:05**	**10:20**	**10:45**
1:10	1:12	1:15	1:17	1:20	1:30	1:40	1:50	1:55	2:00	2:05	2:10	2:25	2:40	3:20

*Honokaa Gym Complex
Upper Parking lot

Mauna Kea Beach Resort	Hapuna Prince	Orchid @ Mauna Lani	Mauna Lani Bay	Hilton Waikoloa	Marriott	Waikoloa Pyramid Stone	Matsuyama Store	Kealakehe	Kmart Macy's	Ali'i Drive	Kona Commons	Kmart Macy's	Sheraton Keauhou	Kainaliu Honalo	Kealakekua Konawaena	Capt. Cook Manago Hotel	Honaunau	Kealia Fujihara Store
5:30	**5:35**	**5:40**	**5:45**	**5:55**	**6:00**	---	---	---	---	**6:35**	**6:40**	**6:45**	---	---	---	---	---	---
---	---	---	---	---	---	**11:05**	**11:35**	---	**11:45**	---	**11:50**	---	---	---	---	---	---	---
---	---	---	---	---	---	3:45	4:15	4:20	4:25	4:30	---	---	---*	5:05	(5:10)	5:15	5:20	5:30

BOLD = MORNINGS

NORTH KOHALA/WAIMEA/KAILUA-KONA

Effective 3/06/2017

Operates Monday through Friday

North Kohala/Waimea/Keauhou

Kapaau Dispensary	Hawi Intersection	Kawaihae Road	Highway 19 & Highway 250 Intersection	Parker Square	Parker School (across by church)	Waimea - Pukalani Road Bus Shelter	Waimea Park	Waikoloa Village Paniolo Ave. (south of Laie Intersection)	Kmart	Alii Drive	Keauhou Shopping Center
6:45	**6:50**	**7:15**	**7:30**	**7:35**	**7:40**	**7:45**	**8:20**	**8:45**	**9:30**	**9:40**	**9:50**

Keauhou/Waimea/North Kohala

***BOLD = MORNINGS

Keauhou Shopping Center	Alii Drive	Kmart	Waikoloa Village Paniolo Ave. (south of Laie Intersection)	Waimea - Pukalani Road Bus Shelter	Parker School	Waimea Park	HPA Lower Campus	Highway 19 & Highway 250 Intersection	Kawaihae Road	Hawi Intersection	Kapaau Dispensary
1:35	1:50	2:00	2:45	3:25	3:30	3:35	3:40	3:45	4:00	4:50	4:55

****SCHEDULE BELOW OPERATES SATURDAY ONLY****

North Kohala to Keauhou shopping Center

Kapaau Dispensary	Hawi Intersection	Waikoloa Village	Kmart	Walmart	Alii Drive	Keauhou Shopping Center
9:15	**9:20**	**10:05**	**11:15**	**11:25**	**11:30**	**11:45**

***BOLD = MORNINGS

Keauhou to North Kohala Shopping Center

Keauhou Shopping Center	Alii Drive	Walmart	Kmart	Waikoloa Post Office	Hawi Intersection	Kapaau Dispensary
2:30	2:40	3:00	3:10	3:55	4:30	4:35

For more information call Mass Transit @ 961-8744

PAHALA TO SOUTH KOHALA BUS SCHEDULE

Effective 8/24/15

PAHALA TO SOUTH KOHALA RESORTS

Pahala Shopping Center	Naalehu	Wong Yuen Store	Ocean View Park & Ride Lot	Fujihara Store	Yano Hall Capt. Cook	Kainaliu Honalo	Keauhou Shopping Center	Ali'i Drive	Old Airport Kona Commons	Kmart/Macy's	Kaiser Permanente	Kona Palisades @ Queen K Hwy	HCC Palamanui Campus	Keahole Airport	Four Seasons @ Hualalai	Hilton Waikoloa	Fairmont Orchid	Mauna Lani Bay	Mauna Kea Beach Hotel	
3:30	*3:50*	*3:55*	*4:20*	*5:00*	*5:05*	*5:20*	---	---	---	*5:30*	---	*5:40*	---	---	*5:55*	*6:20*	*6:35*	*6:40*	*6:55*	Daily
5:40	**6:00**	**6:05**	**6:30**	**7:10**	**7:15**	**7:30**	**7:45**	**7:50**	---	**8:00**	**8:10**	**8:15**	**8:20**	**8:35**	---	---	---	---	---	M-Sat.
8:00	**8:20**	**8:25**	**8:50**	**9:20**	**9:25**	**9:40**	**9:55**	**10:00**	**10:05**	**10:10**	---	**10:20**	---	---	**10:35**	**11:00**	**11:15**	**11:20**	**11:30**	M-Sat.

SOUTH KOHALA RESORTS TO PAHALA

Mauna Kea Beach	Fairmont Orchid	Mauna Lani Bay	Hilton Waikoloa	Four Seasons Resort @ Hualalai	Keahole Airport	Kona Palisades @ Queen K Hwy	HCC Palamanui Campus	West Hawaii Civic Center	Kaiser Permanente	Kmart/Macy's	Kona Commons	Ali'i Drive	Keauhou Shopping Center	Honalo Kainaliu	Yano Hall Capt. Cook	Fujihara Store Kealia	Ocean View Park & Ride Lot	Wong Yuen Store	Naalehu School	Pahala Shopping Center	
7:15	*7:30*	*7:35*	*7:50*	*8:15*	*8:30*	*8:40*	---	---	---	*8:50*	*8:55*	*9:00*	*9:10*	*9:25*	*9:40*	*9:45*	*10:25*	*10:50*	*10:55*	*11:15*	M-Sat
2:30	*2:45*	*2:50*	*3:05*	*3:30*	---	*3:45*	---	---	---	*3:55*	---	---	---	*4:05*	*4:20*	*4:25*	*5:05*	*5:30*	*5:35*	*5:55*	Daily
---	---	---	---	---	4:35	4:40	4:50	5:00	5:05	5:15	5:20	5:25	5:40	5:55	6:10	6:20	6:55	7:20	7:25	7:45	M-Sat.

BOLD = MORNINGS

Hawaii County is an Equal Opportunity Employer & Provider

Appendix C

Analysis Reports Existing (2017) Conditions

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	WBU	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations									
Traffic Vol, veh/h	0	53	95	0	284	31	0	41	216
Future Vol, veh/h	0	53	95	0	284	31	0	41	216
Peak Hour Factor	0.92	0.97	0.97	0.92	0.97	0.97	0.92	0.97	0.97
Heavy Vehicles, %	2	4	1	2	4	7	2	0	4
Mvmt Flow	0	55	98	0	293	32	0	42	223
Number of Lanes	0	1	1	0	1	0	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	2	0
HCM Control Delay	9.2	11	10.3
HCM LOS	A	B	B

Lane	NBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	0%	100%	0%	16%
Vol Thru, %	90%	0%	0%	84%
Vol Right, %	10%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	315	53	95	257
LT Vol	0	53	0	41
Through Vol	284	0	0	216
RT Vol	31	0	95	0
Lane Flow Rate	325	55	98	265
Geometry Grp	2	7	7	2
Degree of Util (X)	0.417	0.097	0.14	0.346
Departure Headway (Hd)	4.621	6.403	5.138	4.708
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	776	557	692	760
Service Time	2.667	4.174	2.908	2.757
HCM Lane V/C Ratio	0.419	0.099	0.142	0.349
HCM Control Delay	11	9.9	8.8	10.3
HCM Lane LOS	B	A	A	B
HCM 95th-tile Q	2.1	0.3	0.5	1.5

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	82	4	3	87	18	10
Future Vol, veh/h	82	4	3	87	18	10
Conflicting Peds, #/hr	0	3	3	0	1	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	82	4	3	87	18	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	89	0	181	90
Stage 1	-	-	-	-	87	-
Stage 2	-	-	-	-	94	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1519	-	813	973
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	935	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1515	-	808	967
Mov Cap-2 Maneuver	-	-	-	-	808	-
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	858	-	-	1515	-
HCM Lane V/C Ratio	0.033	-	-	0.002	-
HCM Control Delay (s)	9.3	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	91	23	32	756	799	53
Future Volume (veh/h)	91	23	32	756	799	53
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1767	1900	1841	1796	1781
Adj Flow Rate, veh/h	95	0	33	788	832	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	9	0	4	7	8
Cap, veh/h	434		121	1178	922	
Arrive On Green	0.24	0.00	0.07	0.64	0.51	0.00
Sat Flow, veh/h	1810	1497	1810	1841	1796	1510
Grp Volume(v), veh/h	95	0	33	788	832	0
Grp Sat Flow(s),veh/h/ln	1810	1497	1810	1841	1796	1510
Q Serve(g_s), s	3.2	0.0	1.3	20.2	31.5	0.0
Cycle Q Clear(g_c), s	3.2	0.0	1.3	20.2	31.5	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	434		121	1178	922	
V/C Ratio(X)	0.22		0.27	0.67	0.90	
Avail Cap(c_a), veh/h	434		121	1178	922	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.9	0.0	33.3	8.5	16.5	0.0
Incr Delay (d2), s/veh	1.2	0.0	5.5	3.0	13.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.7	6.4	13.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.0	0.0	38.8	11.5	30.3	0.0
LnGrp LOS	C		D	B	C	
Approach Vol, veh/h	95	A		821	832	A
Approach Delay, s/veh	24.0			12.6	30.3	
Approach LOS	C			B	C	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	43.0		22.5		52.5
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.0	38.5		18.0		48.0
Max Q Clear Time (g_c+I1), s	3.3	33.5		5.2		22.2
Green Ext Time (p_c), s	0.0	2.4		0.2		5.6

Intersection Summary	
HCM 6th Ctrl Delay	21.6
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	WBU	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations									
Traffic Vol, veh/h	0	42	56	0	301	56	0	70	385
Future Vol, veh/h	0	42	56	0	301	56	0	70	385
Peak Hour Factor	0.92	0.93	0.93	0.92	0.93	0.93	0.92	0.93	0.93
Heavy Vehicles, %	2	5	0	2	2	0	2	1	0
Mvmt Flow	0	45	60	0	324	60	0	75	414
Number of Lanes	0	1	1	0	1	0	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	2	0
HCM Control Delay	9.7	12.5	15.7
HCM LOS	A	B	C

Lane	NBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	0%	100%	0%	15%
Vol Thru, %	84%	0%	0%	85%
Vol Right, %	16%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	357	42	56	455
LT Vol	0	42	0	70
Through Vol	301	0	0	385
RT Vol	56	0	56	0
Lane Flow Rate	384	45	60	489
Geometry Grp	2	7	7	2
Degree of Util (X)	0.501	0.089	0.097	0.637
Departure Headway (Hd)	4.699	7.11	5.803	4.688
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	760	507	621	763
Service Time	2.766	4.81	3.503	2.751
HCM Lane V/C Ratio	0.505	0.089	0.097	0.641
HCM Control Delay	12.5	10.5	9.1	15.7
HCM Lane LOS	B	B	A	C
HCM 95th-tile Q	2.8	0.3	0.3	4.6

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	84	15	10	97	7	7
Future Vol, veh/h	84	15	10	97	7	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	98	17	12	113	8	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	115	0	244	107
Stage 1	-	-	-	-	107	-
Stage 2	-	-	-	-	137	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1487	-	749	953
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	895	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1487	-	743	953
Mov Cap-2 Maneuver	-	-	-	-	743	-
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	895	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	835	-	-	1487	-
HCM Lane V/C Ratio	0.019	-	-	0.008	-
HCM Control Delay (s)	9.4	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	62	23	22	808	851	105
Future Volume (veh/h)	62	23	22	808	851	105
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	1900	1900	1885	1885	1870
Adj Flow Rate, veh/h	65	0	23	842	886	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	0	0	1	1	2
Cap, veh/h	398		113	1249	1025	
Arrive On Green	0.22	0.00	0.06	0.66	0.54	0.00
Sat Flow, veh/h	1767	1610	1810	1885	1885	1585
Grp Volume(v), veh/h	65	0	23	842	886	0
Grp Sat Flow(s),veh/h/ln	1767	1610	1810	1885	1885	1585
Q Serve(g_s), s	2.4	0.0	1.0	21.8	32.4	0.0
Cycle Q Clear(g_c), s	2.4	0.0	1.0	21.8	32.4	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	398		113	1249	1025	
V/C Ratio(X)	0.16		0.20	0.67	0.86	
Avail Cap(c_a), veh/h	398		113	1249	1025	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	24.9	0.0	35.6	8.2	15.7	0.0
Incr Delay (d2), s/veh	0.9	0.0	4.0	2.9	9.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.5	7.0	13.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	25.8	0.0	39.6	11.2	25.4	0.0
LnGrp LOS	C		D	B	C	
Approach Vol, veh/h	65	A		865	886	A
Approach Delay, s/veh	25.8			11.9	25.4	
Approach LOS	C			B	C	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	48.0		22.5		57.5
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.0	43.5		18.0		53.0
Max Q Clear Time (g_c+I1), s	3.0	34.4		4.4		23.8
Green Ext Time (p_c), s	0.0	4.0		0.1		6.4

Intersection Summary	
HCM 6th Ctrl Delay	19.0
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Appendix D

Analysis Reports Future (2027) Without Project Conditions

Intersection	
Intersection Delay, s/veh	13.4
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	58	105	383	34	45	336
Future Vol, veh/h	58	105	383	34	45	336
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	4	1	4	7	0	4
Mvmt Flow	60	108	395	35	46	346
Number of Lanes	1	1	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	2	0
HCM Control Delay	10.1	14.6	13.6
HCM LOS	B	B	B

Lane	NBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	0%	100%	0%	12%
Vol Thru, %	92%	0%	0%	88%
Vol Right, %	8%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	417	58	105	381
LT Vol	0	58	0	45
Through Vol	383	0	0	336
RT Vol	34	0	105	0
Lane Flow Rate	430	60	108	393
Geometry Grp	2	7	7	2
Degree of Util (X)	0.581	0.117	0.174	0.536
Departure Headway (Hd)	4.865	7.057	5.784	4.911
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	731	511	624	727
Service Time	2.958	4.757	3.484	3.006
HCM Lane V/C Ratio	0.588	0.117	0.173	0.541
HCM Control Delay	14.6	10.7	9.7	13.6
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	3.8	0.4	0.6	3.2

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	90	4	3	96	20	11
Future Vol, veh/h	90	4	3	96	20	11
Conflicting Peds, #/hr	0	3	3	0	1	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	0	0	1	0	0
Mvmt Flow	90	4	3	96	20	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	97	0	198	98
Stage 1	-	-	-	-	95	-
Stage 2	-	-	-	-	103	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1509	-	795	963
Stage 1	-	-	-	-	934	-
Stage 2	-	-	-	-	926	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1505	-	790	958
Mov Cap-2 Maneuver	-	-	-	-	790	-
Stage 1	-	-	-	-	929	-
Stage 2	-	-	-	-	925	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	842	-	-	1505	-
HCM Lane V/C Ratio	0.037	-	-	0.002	-
HCM Control Delay (s)	9.4	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	100	25	35	832	879	58
Future Volume (veh/h)	100	25	35	832	879	58
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1767	1900	1841	1796	1781
Adj Flow Rate, veh/h	104	0	36	867	916	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	9	0	4	7	8
Cap, veh/h	434		121	1178	922	
Arrive On Green	0.24	0.00	0.07	0.64	0.51	0.00
Sat Flow, veh/h	1810	1497	1810	1841	1796	1510
Grp Volume(v), veh/h	104	0	36	867	916	0
Grp Sat Flow(s),veh/h/ln	1810	1497	1810	1841	1796	1510
Q Serve(g_s), s	3.5	0.0	1.4	24.0	38.0	0.0
Cycle Q Clear(g_c), s	3.5	0.0	1.4	24.0	38.0	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	434		121	1178	922	
V/C Ratio(X)	0.24		0.30	0.74	0.99	
Avail Cap(c_a), veh/h	434		121	1178	922	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.0	0.0	33.3	9.2	18.1	0.0
Incr Delay (d2), s/veh	1.3	0.0	6.2	4.1	28.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	0.8	7.8	19.5	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.3	0.0	39.6	13.3	46.2	0.0
LnGrp LOS	C		D	B	D	
Approach Vol, veh/h	104	A		903	916	A
Approach Delay, s/veh	24.3			14.3	46.2	
Approach LOS	C			B	D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	43.0		22.5		52.5
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.0	38.5		18.0		48.0
Max Q Clear Time (g_c+I1), s	3.4	40.0		5.5		26.0
Green Ext Time (p_c), s	0.0	0.0		0.2		6.2

Intersection Summary	
HCM 6th Ctrl Delay	30.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	28.5
Intersection LOS	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	62	444	62	77	520
Future Vol, veh/h	46	62	444	62	77	520
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	5	0	2	0	1	0
Mvmt Flow	49	67	477	67	83	559
Number of Lanes	1	1	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	2	0
HCM Control Delay	10.8	23	36.4
HCM LOS	B	C	E

Lane	NBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	0%	100%	0%	13%
Vol Thru, %	88%	0%	0%	87%
Vol Right, %	12%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	506	46	62	597
LT Vol	0	46	0	77
Through Vol	444	0	0	520
RT Vol	62	0	62	0
Lane Flow Rate	544	49	67	642
Geometry Grp	2	7	7	2
Degree of Util (X)	0.769	0.108	0.121	0.901
Departure Headway (Hd)	5.089	7.854	6.537	5.052
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	713	456	548	719
Service Time	3.119	5.604	4.285	3.079
HCM Lane V/C Ratio	0.763	0.107	0.122	0.893
HCM Control Delay	23	11.6	10.2	36.4
HCM Lane LOS	C	B	B	E
HCM 95th-tile Q	7.3	0.4	0.4	11.7

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	92	17	11	107	8	8
Future Vol, veh/h	92	17	11	107	8	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	107	20	13	124	9	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	127	0	267	117
Stage 1	-	-	-	-	117	-
Stage 2	-	-	-	-	150	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1472	-	727	941
Stage 1	-	-	-	-	913	-
Stage 2	-	-	-	-	883	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1472	-	720	941
Mov Cap-2 Maneuver	-	-	-	-	720	-
Stage 1	-	-	-	-	905	-
Stage 2	-	-	-	-	883	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	9.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	816	-	-	1472	-
HCM Lane V/C Ratio	0.023	-	-	0.009	-
HCM Control Delay (s)	9.5	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	68	25	24	889	936	116
Future Volume (veh/h)	68	25	24	889	936	116
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	1900	1900	1885	1885	1870
Adj Flow Rate, veh/h	71	0	25	926	975	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	0	0	1	1	2
Cap, veh/h	398		113	1249	1025	
Arrive On Green	0.22	0.00	0.06	0.66	0.54	0.00
Sat Flow, veh/h	1767	1610	1810	1885	1885	1585
Grp Volume(v), veh/h	71	0	25	926	975	0
Grp Sat Flow(s),veh/h/ln	1767	1610	1810	1885	1885	1585
Q Serve(g_s), s	2.6	0.0	1.1	26.1	39.1	0.0
Cycle Q Clear(g_c), s	2.6	0.0	1.1	26.1	39.1	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	398		113	1249	1025	
V/C Ratio(X)	0.18		0.22	0.74	0.95	
Avail Cap(c_a), veh/h	398		113	1249	1025	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.0	0.0	35.6	9.0	17.2	0.0
Incr Delay (d2), s/veh	1.0	0.0	4.5	4.0	18.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.6	8.6	18.5	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	26.0	0.0	40.1	13.0	35.8	0.0
LnGrp LOS	C		D	B	D	
Approach Vol, veh/h	71	A		951	975	A
Approach Delay, s/veh	26.0			13.7	35.8	
Approach LOS	C			B	D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	48.0		22.5		57.5
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.0	43.5		18.0		53.0
Max Q Clear Time (g_c+I1), s	3.1	41.1		4.6		28.1
Green Ext Time (p_c), s	0.0	1.5		0.1		7.1

Intersection Summary	
HCM 6th Ctrl Delay	24.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Appendix E

Analysis Reports Future (2027) With Project Conditions

Intersection	
Intersection Delay, s/veh	13.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	59	106	383	35	46	336
Future Vol, veh/h	59	106	383	35	46	336
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	4	1	4	7	0	4
Mvmt Flow	61	109	395	36	47	346
Number of Lanes	1	1	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	2	0
HCM Control Delay	10.1	14.7	13.7
HCM LOS	B	B	B

Lane	NBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	0%	100%	0%	12%
Vol Thru, %	92%	0%	0%	88%
Vol Right, %	8%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	418	59	106	382
LT Vol	0	59	0	46
Through Vol	383	0	0	336
RT Vol	35	0	106	0
Lane Flow Rate	431	61	109	394
Geometry Grp	2	7	7	2
Degree of Util (X)	0.583	0.119	0.176	0.538
Departure Headway (Hd)	4.872	7.063	5.791	4.919
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	733	510	623	725
Service Time	2.966	4.763	3.491	3.016
HCM Lane V/C Ratio	0.588	0.12	0.175	0.543
HCM Control Delay	14.7	10.7	9.7	13.7
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	3.8	0.4	0.6	3.2

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	2	90	4	3	96	2	20	1	11	1	1	2
Future Vol, veh/h	2	90	4	3	96	2	20	1	11	1	1	2
Conflicting Peds, #/hr	0	0	3	3	0	0	1	0	3	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	-	-	-	120	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	1	0	0	1	2	0	2	0	2	2	2
Mvmt Flow	2	90	4	3	96	2	20	1	11	1	1	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	98	0	0	97	0	0	205	203	98	208	204	98
Stage 1	-	-	-	-	-	-	99	99	-	103	103	-
Stage 2	-	-	-	-	-	-	106	104	-	105	101	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.52	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.018	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1495	-	-	1509	-	-	757	693	963	749	692	958
Stage 1	-	-	-	-	-	-	912	813	-	903	810	-
Stage 2	-	-	-	-	-	-	905	809	-	901	811	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1495	-	-	1505	-	-	750	689	958	736	688	957
Mov Cap-2 Maneuver	-	-	-	-	-	-	750	689	-	736	688	-
Stage 1	-	-	-	-	-	-	908	810	-	902	808	-
Stage 2	-	-	-	-	-	-	899	807	-	886	808	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	9.6	9.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	808	1495	-	-	1505	-	-	816
HCM Lane V/C Ratio	0.04	0.001	-	-	0.002	-	-	0.005
HCM Control Delay (s)	9.6	7.4	0	-	7.4	-	-	9.4
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	101	25	35	833	879	59
Future Volume (veh/h)	101	25	35	833	879	59
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1767	1900	1841	1796	1781
Adj Flow Rate, veh/h	105	0	36	868	916	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	9	0	4	7	8
Cap, veh/h	434		121	1178	922	
Arrive On Green	0.24	0.00	0.07	0.64	0.51	0.00
Sat Flow, veh/h	1810	1497	1810	1841	1796	1510
Grp Volume(v), veh/h	105	0	36	868	916	0
Grp Sat Flow(s),veh/h/ln	1810	1497	1810	1841	1796	1510
Q Serve(g_s), s	3.5	0.0	1.4	24.1	38.0	0.0
Cycle Q Clear(g_c), s	3.5	0.0	1.4	24.1	38.0	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	434		121	1178	922	
V/C Ratio(X)	0.24		0.30	0.74	0.99	
Avail Cap(c_a), veh/h	434		121	1178	922	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.0	0.0	33.3	9.2	18.1	0.0
Incr Delay (d2), s/veh	1.3	0.0	6.2	4.1	28.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	0.8	7.8	19.5	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.3	0.0	39.6	13.3	46.2	0.0
LnGrp LOS	C		D	B	D	
Approach Vol, veh/h	105	A		904	916	A
Approach Delay, s/veh	24.3			14.4	46.2	
Approach LOS	C			B	D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	43.0		22.5		52.5
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.0	38.5		18.0		48.0
Max Q Clear Time (g_c+I1), s	3.4	40.0		5.5		26.1
Green Ext Time (p_c), s	0.0	0.0		0.2		6.2

Intersection Summary	
HCM 6th Ctrl Delay	30.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	30.7
Intersection LOS	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	52	69	444	66	82	520
Future Vol, veh/h	52	69	444	66	82	520
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	5	0	2	0	1	0
Mvmt Flow	56	74	477	71	88	559
Number of Lanes	1	1	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	2
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	2	0
HCM Control Delay	11	24.5	39.9
HCM LOS	B	C	E

Lane	NBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	0%	100%	0%	14%
Vol Thru, %	87%	0%	0%	86%
Vol Right, %	13%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	510	52	69	602
LT Vol	0	52	0	82
Through Vol	444	0	0	520
RT Vol	66	0	69	0
Lane Flow Rate	548	56	74	647
Geometry Grp	2	7	7	2
Degree of Util (X)	0.786	0.123	0.136	0.921
Departure Headway (Hd)	5.16	7.902	6.584	5.124
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	702	453	544	706
Service Time	3.196	5.655	4.336	3.157
HCM Lane V/C Ratio	0.781	0.124	0.136	0.916
HCM Control Delay	24.5	11.8	10.4	39.9
HCM Lane LOS	C	B	B	E
HCM 95th-tile Q	7.8	0.4	0.5	12.5

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	92	17	11	107	8	8	2	8	11	3	13
Future Vol, veh/h	9	92	17	11	107	8	8	2	8	11	3	13
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	-	-	-	120	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	0	0	0	1	2	0	2	0	2	2	2
Mvmt Flow	10	107	20	13	124	9	9	2	9	13	3	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	133	0	0	127	0	0	301	296	117	298	302	129
Stage 1	-	-	-	-	-	-	137	137	-	155	155	-
Stage 2	-	-	-	-	-	-	164	159	-	143	147	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.52	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.018	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1452	-	-	1472	-	-	655	616	941	654	611	921
Stage 1	-	-	-	-	-	-	871	783	-	847	769	-
Stage 2	-	-	-	-	-	-	843	766	-	860	775	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1452	-	-	1472	-	-	633	606	941	638	601	921
Mov Cap-2 Maneuver	-	-	-	-	-	-	633	606	-	638	601	-
Stage 1	-	-	-	-	-	-	865	778	-	841	762	-
Stage 2	-	-	-	-	-	-	818	759	-	843	770	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.7	10	10.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	736	1452	-	-	1472	-	-	743
HCM Lane V/C Ratio	0.028	0.007	-	-	0.009	-	-	0.042
HCM Control Delay (s)	10	7.5	0	-	7.5	-	-	10.1
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	76	28	25	889	936	123
Future Volume (veh/h)	76	28	25	889	936	123
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	1900	1900	1885	1885	1870
Adj Flow Rate, veh/h	79	0	26	926	975	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	0	0	1	1	2
Cap, veh/h	398		113	1249	1025	
Arrive On Green	0.22	0.00	0.06	0.66	0.54	0.00
Sat Flow, veh/h	1767	1610	1810	1885	1885	1585
Grp Volume(v), veh/h	79	0	26	926	975	0
Grp Sat Flow(s),veh/h/ln	1767	1610	1810	1885	1885	1585
Q Serve(g_s), s	2.9	0.0	1.1	26.1	39.1	0.0
Cycle Q Clear(g_c), s	2.9	0.0	1.1	26.1	39.1	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	398		113	1249	1025	
V/C Ratio(X)	0.20		0.23	0.74	0.95	
Avail Cap(c_a), veh/h	398		113	1249	1025	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.1	0.0	35.7	9.0	17.2	0.0
Incr Delay (d2), s/veh	1.1	0.0	4.7	4.0	18.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.6	8.6	18.5	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	26.3	0.0	40.4	13.0	35.8	0.0
LnGrp LOS	C		D	B	D	
Approach Vol, veh/h	79	A		952	975	A
Approach Delay, s/veh	26.3			13.7	35.8	
Approach LOS	C			B	D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	48.0		22.5		57.5
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.0	43.5		18.0		53.0
Max Q Clear Time (g_c+I1), s	3.1	41.1		4.9		28.1
Green Ext Time (p_c), s	0.0	1.5		0.1		7.1

Intersection Summary	
HCM 6th Ctrl Delay	24.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.