October 31, 2024

Mary Alice Evans, Director
Office of Planning and Sustainable Development
Environmental Review Program
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
Puna District, Island of Hawai'i
Tax Map Key (TMK): (3) 1-5-039:267
Publication of Draft Environmental Assessment and Anticipated Finding of No Significant Impact

Dear Director Evans,

With this letter, the County of Hawai'i Department of Parks and Recreation hereby transmits the Draft Environmental Assessment for the proposed Hawaiian Paradise Park New District Park project for publication in the next available periodic bulletin The Environmental Notice.

In addition to this letter, we are submitting the electronic version of the Environmental Review Program Publication Form and a PDF formatted electronic copy of the Draft EA and Anticipated Finding of No Significant Impact through the online submission platform.

If there are any questions, please feel fere to contact me at (808) 961-8311 or by email at maurice.messina@hawaiicounty.gov.

Sincerely,

Maurice C. Messina
Director of Parks and Recreation

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Thursday, October 31, 2024 5:27:54 PM

Action Name

Hawaiian Paradise Park New District Park

Type of Document/Determination

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

HRS §343-5(a) Trigger(s)

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

Judicial district

Puna, Hawai‘i

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

(3) 1-5-039:267

Action type

Agency

Other required permits and approvals

Community Noise Permit/Variance, NPDES General Permit, Individual Wastewater System Approval to Construct and Occupy, Grading, Building, Site Plan Approval

Proposing/determining agency

County of Hawaii Department of Parks and Recreation

Agency jurisdiction

County of Hawai‘i

Agency contact name

Maurice Messina

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Map It

Is there a consultant for this action?

Yes

Consultant

SSFM International, Inc.

Consultant contact name

Jennifer Scheffel

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Map It

Action summary

The County of Hawai'i Department of Parks and Recreation (DPR) plans to implement a 20-acre District Park as proposed in the Hawaiian Paradise Park (HPP) community of Puna, Hawai'i Island. The District Park would include several sporting facilities and amenities as identified in the Hawaiian Paradise Park District Park Master Plan.

Reasons supporting determination

The Proposed Action would have short-term and temporary impacts during construction that would be less than significant to water resources, biological resources, archaeological and historic resources, cultural practices and beliefs, geology and soils, traffic and transportation, air quality, the existing noise environment, and public facilities and services. BMPs and other measures would be implemented to minimize impacts, as applicable.

The Proposed Action would implement community and recreational facilities within a quickly growing population where the project would respond to a long-standing community need for quality of life improvements. The development of the HPP District Park would be consistent with future growth plans for the area and would not provide any significant singular or cumulative negative environmental impacts.

Attached documents (signed agency letter & EA/EIS)

- 20241031_ERP-Letter.pdf
- 241031-HPPDistrictPark_DraftEA_COMPLETE.pdf

Action location map

- HPP-ProjectLocation.zip

Authorized individual

Jennifer Scheffel

Authorization

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

October 2024

Hawaiian Paradise Park, Puna District, Island of Hawai'i, Hawai'i

Hawaiian Paradise Park District Park Draft Environmental Assessment

Prepared for:
County of Hawai'i Department of Parks and Recreation

Prepared by:
SSFM International, Inc.

SSFM International

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Draft Environmental Assessment

Hawaiian Paradise Park District Park

Hawaiian Paradise Park, Puna District, Island of Hawai‘i, Hawai‘i

Prepared for:

County of Hawai‘i Department of Parks and Recreation

Prepared by:

SSFM International, Inc.

October 2024

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Project Summary

Project Name	Hawaiian Paradise Park District Park
Location	Hawaiian Paradise Park, Puna District, Island of Hawai‘i, Hawai‘i
District	Puna
Project Site Tax Map Key	(3) 1-5-039:267
Landowners	County of Hawai‘i
Project Site Existing Uses	Vacant
State Land Use	Agriculture
County of Hawai‘i Zoning	Open
Proposed Action	The County of Hawai‘i Department of Parks and Recreation (DPR) plans to implement a 20-acre District Park as proposed in the Hawaiian Paradise Park (HPP) community of Puna, Hawai‘i Island. The District Park would include several sporting facilities and amenities as identified in the Hawaiian Paradise Park District Park Master Plan.
Anticipated Impacts	The Proposed Action would have short-term and temporary impacts during construction that would be less than significant to water resources, biological resources, archaeological and historic resources, cultural practices and beliefs, geology and soils, traffic and transportation, air quality, the existing noise environment, and public facilities and services. BMPs and other measures would be implemented to minimize impacts, as applicable. The Proposed Action would implement community and recreational facilities within a quickly growing population where the project would respond to a long-standing community need for quality of life improvements. The development of the HPP District Park would be consistent with future growth plans for the area and would not provide any significant singular or cumulative negative environmental impacts.
Proposing Agency	County of Hawai‘i Department of Parks and Recreation
Anticipated Determination	Finding of No Significant Impact (FONSI)
Project Site Permits/ Approvals Required	See **Table 1**

EA Preparer	SSFM International 99 Aupuni Street, Suite 220 Hilo, Hawai‘i 96720 Contact: Jennifer Scheffel (808) 356-1273
Consultations	See **Section 6.0**

Table of Contents

List of Figures

List of Tables

Appendices

Acronyms

AA	Archaeological Assessment
AADT	Annual Average Daily Traffic
AAQS	Ambient Air Quality Standards
ACS	American Community Survey
ADA	Americans with Disabilities Act
AIS	Archaeological Inventory Survey
ALICE	Asset Limited, Income Constrained, Employed
AWSC	all-way stop-controlled
BMP	Best Management Practices
CCD	Census County Divisions
CDP	Community Development Plan
CREC	Controlled Recognized Environmental Condition
CTAHR	College of Tropical Agriculture and Human Resources
CZM	Coastal Zone Management Act
CZMA	Coastal Zone Management Act of 1972
dBA	Decibels
DEM	County of Hawai‘i Department of Environmental Management
DLNR	Hawai‘i State Department of Land and Natural Resources
DOA	Hawai‘i State Department of Agriculture
DOE	Hawai‘i State Department of Education
DOH	Hawai‘i State Department of Health
DOT	Hawai‘i State Department of Transportation
DPW	County of Hawai‘i Department of Public Works
DWS	County of Hawai‘i Department of Water Supply
EB	east bound
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
GHG	greenhouse gases
HAR	Hawai‘i Administrative Rules
HCCMAC	Hawai‘i Climate Change Minimization and Adaptation Commission
HCM6	Highway Capacity Manual, Sixth Edition
HECO	Hawaiian Electric Company
HFD	County of Hawai‘i Fire Department

HPD	County of Hawai‘i Police Department
HPP	Hawaiian Paradise Park
HPPOA	Hawaiian Paradise Park Homeowners Association
HRS	Hawai‘i Revised Statutes
IBC	International Building Code
IWS	individual wastewater system
LOS	level of service
LUPAG	Land Use Pattern Allocation Guide
mdu	Medium Density Urban
MGD	million gallons per day
MMI	Modified Mercalli Intensity
MPH	miles per hour
MTA	County of Hawai‘i Mass Transit Agency
NAAQS	National Ambient Air Quality Standards
NEHRP	National Earthquake Hazard Reduction Program
NB	North Bound
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
ROD	Rapid ‘Ōhi‘a Death
SB	South Bound
SDC	Seismic Design Category
SF	square feet
SHPD	Hawai‘i State Historic Preservation Division
SMA	Special Management Area
TIAR	Traffic Impact Analysis Report
TMK	Tax Map Key
TWSC	two-way stop-controlled
USGS	United States Geological Survey
WB	west bound
v/c	volume to capacity ratio
$\mu g/m^3$	micrograms per cubic meter
UH	University of Hawai‘i

1.0 Project Description

1.1 Introduction

The County of Hawai‘i Department of Parks and Recreation (DPR) plans to implement a 20-acre District Park in the Hawaiian Paradise Park (HPP) community of Puna, Hawai‘i Island. The District Park would include several sporting facilities and amenities as identified in the Hawaiian Paradise Park District Park Master Plan (SSFM, 2018), see **Appendix A** attached.

This project is subject to the state environmental review process prescribed under Chapter 343 (Environmental Impact Statements), Hawai‘i Revised Statutes (HRS), as amended, also known as the Hawai‘i Environmental Policy Act, and Title 11, Chapter 200.1 (Environmental Impact Statement Rules), Hawai‘i Administrative Rules (HAR). Under these regulations, nine specific types of actions are identified that “trigger” environmental review. This project triggers the state environmental review process under these regulations because it proposes the use of state or county lands and the use of state or county funds (HRS Section 343-5(a)(1)).

1.2 Project Background

A Hawaiian Paradise Park Community Master Plan was prepared in 1997 by the Hawaiian Paradise Park Owners Association (HPPOA) and adopted by County Resolution No. 184-97, see **Appendix B**. Section IV of the Master Plan refers to developing a new 20-acre community park and recreational facility that "could include a ballfield, swimming pool, tennis courts, basketball courts, picnic areas, tot lots and related facilities."

The HPPOA Community Action Committee updated the 1997 master plan in 2015 with Data Amendments adopted by County Resolution 284-15, see **Appendix C**. As part of the update, a survey to solicit feedback on the community's needs was completed by more than 400 HPP residents which indicated that recreational facilities (i.e. parks and recreational opportunities and sports fields) was the highest priority for the community. The recreational amenities desired by the community included a park, walking and biking trails, swimming pool, gymnasium, sports fields, community hall, theater, library, after school center, senior center, dog park, skateboard park, tennis courts, and playgrounds. In 2016, the HPPOA Parks Committee conducted another survey of HPP residents to identify community park and recreational needs.

In 2016, County Resolution number 360-16 (**Appendix D**), Hawai‘i County dedicated a 20-acre parcel (Tax Map Key [TMK] (3) 1-5-039:267) to the HPPOA for the purpose of establishing a park in the HPP subdivision to support and encourage healthy lifestyles and healthy families. As a condition of the resolution, the County Department of Parks and Recreation was tasked to complete a master plan for the park.

In 2017 SSFM International, Inc. (SSFM) was contracted by DPR to develop a County Park Master Plan and preparation of a preliminary engineering report incorporating feedback and survey data collected from the community. Between November 7th and November 22nd, 2017, stakeholder meetings were held with

the HPPOA, DPR’s Maintenance and Recreation Division, the Department of Planning's Long-range Planning Division, and DPR’s Elderly Assistance Division. These meetings focused on identifying current needs, evaluating the park's alignment with the Puna Community Development Plan (CDP), and exploring potential requirements and opportunities for senior activities and programs.

Two public meetings were held in HPP for the purpose of gathering the community’s input in developing park plan alternatives and the finalization of the master plan. The first public meeting was held on Sunday, January 7, 2018, at the HPPOA Activity Center to present the vision for the park and preliminary alternative plans. Three alternative park designs were presented to the HPP community that included different driveway and parking configurations, and layouts for various park amenities and features. This created the opportunity for the community to share feedback on how the park configuration impacts the convenience and enjoyment of the park. Of primary interest to the community was parking capacity and vehicular access into and through the park. This included taking a careful look at the proximity of parking to play fields, the community center, skate park, and the playground. Secondary to parking and vehicle access was the issue with the amount of play fields and exercise stations each alternative had. The community overwhelmingly favored reducing the number of play fields in favor of allowing space for a pool, dog park, or sand volleyball court. There were also many requests to add exercise stations along the walking path and near play fields.

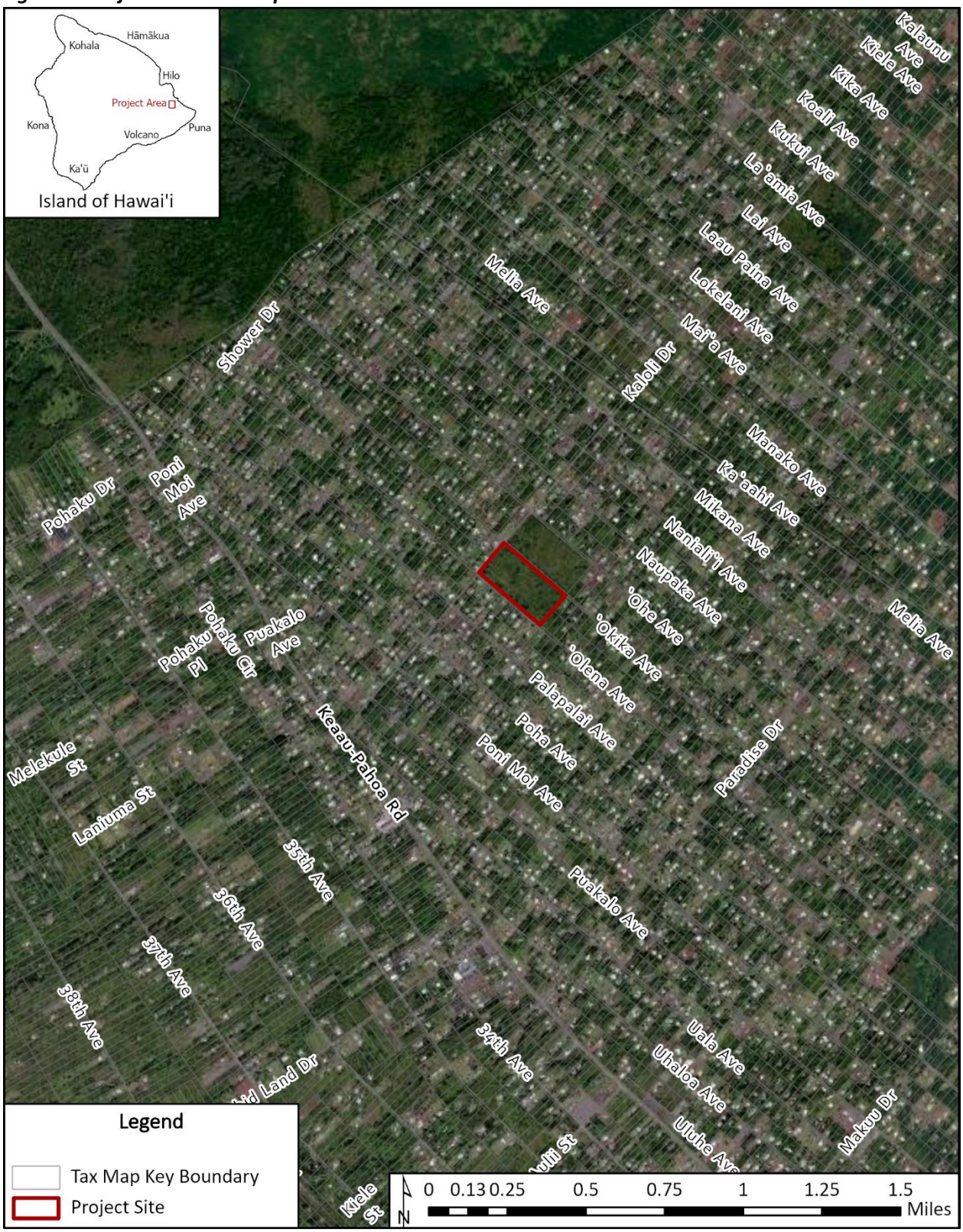
The second public meeting was held on Monday, February 19, 2018, to present the preliminary master plan and collect feedback on the conceptual design alternatives that were created based on previous input. Two preliminary masterplan alternatives were presented, the first alternative included a more simplified “base” option that included a covered playcourt, a skatepark, playground, community center, youth baseball/softball field and a football/soccer friend. The second alternative included the “base” amenities plus the addition of a pool, tennis courts, pickleball courts, a dog park, and a sand volleyball court. The second alternative was the overwhelming preference with strong community support for the inclusion of a dog park and pool. **Figure 1** is the resulting Hawaiian Paradise Park District Park Final Master Plan design that was created through the public outreach process. It was overall decided that a district park accommodating all ages and physical capabilities was necessary to provide a safe space for recreational opportunities and organized sports.

1.3 Project Location

The project area is located between 78 and 89 meters (256 to 292 feet) above sea level, approximately 6.34 kilometers (3.94 miles) inland of the coast in Kea‘au Ahupua‘a, Puna District, Island of Hawai‘i. The proposed project is located in the HPP community in the Puna District of Hawai‘i Island. The project site is a vacant 20-acre parcel at the intersections of Kaloli Drive with and between 25th Avenue (‘Okika Avenue) and 26th Avenue (‘Olena Avenue) on TMK (3) 1-5-039:267, as shown in **Figure 2**.

Figure 1. Hawaiian Paradise Park District Park Final Master Plan

Figure 2. Project Location Map



1.4 Purpose and Need

1.4.1 Purpose of the Proposed Project

The purpose of the Proposed Action is to implement the current, updated version of the Hawaiian Paradise Park District Park Master Plan that has been a community priority since the adoption of the original master plan in 1997. The project would provide needed community sporting and leisure amenities through the creation of new recreational facilities in an underserved and quickly growing community in Hawai‘i County.

1.4.2 Need for the Proposed Project

The new District Park is needed to enhance opportunities for DPR to provide recreational facilities, programs, and services to the HPP community. This park would provide for and support a diverse array of recreational activities that would service various needs of the surrounding community. The Proposed Project would serve, not only as a County parks facility but as a gathering space for community members to come together for various social events and both foster and strengthen a sense of personal connections and community pride.

One of the park’s primary functions would be to serve as a recreation area that caters to all age groups, including specialized programs for keiki (youth) and kupuna (seniors). These programs are essential for promoting physical health, mental well-being, and social interaction among these groups, who often have limited abilities to access general recreational activities.

Currently, the HPP community faces a significant lack of convenient access to recreational spaces of the types proposed in the master plan, being situated far from surrounding parks. This gap means that many residents are underserved and must travel considerable distances to access similar facilities, which can be a barrier to participation, especially for families with young children and elderly community members who may face a reduced ability to access recreational activities. In addition, the population of the Puna district is quickly growing with an expanding need for services to maintain a good quality of life for residents.

This new development is not just about adding a recreational facility; it is about creating a community asset that brings people together, enhances quality of life, and meets the specific needs of the HPP community. By providing easily accessible and versatile spaces, the community center will especially help to bridge the gap in services and facilities, ensuring that all residents have the opportunity to participate in, and benefit from, community life.

1.5 Project Schedule

Construction of the Proposed Action is expected to take approximately 18 to 24 months. It is likely that due to the estimated high costs for the project, that the Proposed Action would be broken into two or more phases, however the details of which are yet to be determined. The following provides a timeline of tasks associated with completion of the Proposed Action:

- January 2025: Completion of the HRS Chapter 343 process/Master Plan

The items below are unfunded or uncontracted at the time of this Draft EA publication. Therefore, a broad timeframe is provided to account for this uncertainty.

- Final design and permitting – 12 months
- Advertising, bidding, and award – 6 months
- Construction – 12 to 24 months

1.6 Permits and Approvals Which May Be Required for the Proposed Project

Implementation of the proposed project would require coordination with state and county agencies for permits or approvals. The permits and approvals presented in **Table 1** may be required for the proposed project. Permit requirements would be determined through continued agency coordination during the HRS Chapter 343 process.

Table 1. Permits and Approvals Which May Be Required for the Proposed Action

Permit or Approval	Description	Regulation(s)	Administrative Authority
Environmental Assessment and FONSI	Required for projects that "trigger" environmental review, including those that propose the use of state or county lands and the use of state or county funds.	• HRS Chapter 343, Environmental Impact Statements • HAR Title 11 Section 200.1, Environmental Impact Statement Rules	Office of Planning and Sustainable Development, Environmental Review Program
Community Noise Permit/ Community Noise Variance	Required for construction projects exceeding 78 decibels (dBA) or has a total cost of more than $250,000.	• HRS Chapter 342F • HAR Title 11, Chapter 46	Department of Health (DOH) – Indoor and Radiological Health Branch
National Pollutant Discharge Elimination System (NPDES) General Permit Coverage	Coverage under the NPDES General Permit required for stormwater discharge associated with construction activities over 1 acre.	• Clean Water Act, Section 401 • HAR Section 11-55	DOH – Clean Water Branch (CWB)
Individual Wastewater System, Approval to Construct and Occupy	Required for the construction and use of an individual wastewater system.	• HAR Section 11-62	DOH – Wastewater Branch

Permit or Approval	Description	Regulation(s)	Administrative Authority
County Grading Permit	Required when any one of the following items are exceeded: a. 100 cubic yards of excavation or fill; b. Vertical height of excavation or fill measured at its highest point exceeds 5 feet; or When the general and localized drainage pattern with respect to abutting properties is altered.	• Hawai'i County Code, Chapter 10 – Erosion and Sedimentation Control	County of Hawai'i Department of Public Works (DPW)
County Building Permit	Required for any project that proposes to erect, construct, enlarge, alter, repair, move, convert, or demolish any building or structure in the County.	• Hawai'i County Code, Chapter 5 – Building	DPW
County Site Plan Approval	Required prior to the construction or establishment of public uses, structures and buildings, and community buildings.	• HCC, Chapter 25 – Zoning	County of Hawai'i Planning Department

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2.0 Proposed Action and Alternatives

2.1 Proposed Action

The Proposed Action includes several amenities, as identified in the Master Plan. These amenities could include:

- A Baseball/Softball Field. Approximately 270-feet-wide to accommodate youth and adult softball. Would include bleachers near the first and third bases, a scoreboard, and nighttime lighting fixtures.
- Football/Soccer Field. Approximately 80 x 120 yards in size to accommodate high school football and soccer. This field would also include bleachers, a scoreboard, and nighttime lighting fixtures.
- Two Tennis Courts. Would include nighttime lighting fixtures.
- Three Pickleball Courts. Approximately 6,000 square feet.
- Covered Playcourt. Approximately 24,120 square feet. Would include two regulation basketball/volleyball courts, bleachers, storage room, staff recreation office, and restrooms.
- Community Pool and Pool Building. Approximately 9,600 square feet and 3,760 square feet, respectively. Would include fencing and pavement surrounding the pool and restrooms.
- Skate Park. Approximately 15,000 square feet.
- Two Covered Playground Areas. Approximately 2,600 square feet for younger kids (2-5 years), 5,600 square feet for older kids (5-12 years).
- Picnic Areas.
- Dog Park.
- DPR Maintenance Baseyard.
- Perimeter pathway. Approximately 10 feet wide, intended for leisure walking.

Major design features for the park would include:

- Vehicular access from 25th and 26th Avenues.
- Approximately 81 parking stalls in the north parking lot, 137 parking stalls in the south parking lot, making about 218 parking stalls total.
- Fencing around the perimeter of the park for safety and security. This would also include a landscape buffer.

Figure 1 is a conceptual design of the Proposed Action as created through the HPP District Park Master Plan drafting process.

2.2 No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be constructed. There would be no new recreational facilities, community resources, or leisure amenities constructed in HPP as proposed by this project. The HPP community would continue to use parks and sporting facilities located in other areas of the Puna district which require long driving distances and have limited capacity to serve a large, wide-spread, and growing population.

In addition, the proposed project site would continue to be unmanaged and unmaintained would allow existing issues to persist and potentially worsen. The parcel is currently subject to trespassing and illegal dumping activity, which could continue unmoderated. These activities could also create conditions where pollutants and toxic waste could be deposited, for example through vehicle abandonment on site, as has been previously reported to the County. This activity would also result in conditions where arson is more likely. Additionally, undesirable, invasive, or destructive plants and animal species would continue to persist on the parcel which could pose threats to native species, roads, and nearby private properties. Unchecked undesirable vegetation growth could also inhibit the growth of more desirable plants and animals, creating conditions that increase fire risk. Overall, maintaining the proposed project site could result in the mitigation of numerous potential negative impacts for the HPP community.

3.0 Affected Environment, Potential Impacts, and Avoidance and Minimization Measures

3.1 Cultural Practices and Beliefs

3.1.1 Affected Environment

A Cultural Impact Assessment (CIA) was conducted for the Proposed Action in December 2023 by ASM Affiliates, Inc. The CIA was prepared pursuant to Act 50 and in accordance with the Environmental Review Program's (formerly the Office of Environmental Quality Control) Guidelines for Assessing Cultural Impacts, adopted by the State of Hawai‘i Environmental Council on November 19, 1997. Act 50, which was proposed and passed as Hawai‘i State House of Representatives Bill No. 2895 and signed into law by the Governor on April 26, 2000, specifically acknowledges the State's responsibility to protect native Hawaiian cultural practices. Act 50 further states that environmental studies ". . . should identify and address effects on Hawai‘i's culture, and traditional and customary rights" and that "native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the 'aloha spirit' in Hawai‘i. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on governmental agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups."

The CIA report, which is included as **Appendix E**, contains background information outlining the study area's physical and cultural contexts, an inventory of previous archaeological work in the vicinity of the Proposed Action, methods and results of the consultation process, and a discussion of potential cultural impacts. The report also includes actions and strategies that may help mitigate any identified impacts.

Background

The ahupua‘a of Kea‘au is one of roughly 62 traditional ahupua‘a that make up the moku (district) of Puna situated on the eastern shores of Hawai‘i Island. Kea‘au is bound on the north by Waiākea and ‘Ōla‘a Ahupua‘a and on the south by the Kahuaele‘a, Waikahekaheiki, and Waikahekahenui Ahupua‘a.

Consultation

To identify individuals knowledgeable about traditional cultural practices and/or uses associated with the Project Site and the surrounding area, a public notice was published in the October 2023 issue of *Ka Wai Ola*, the Office of Hawaiian Affairs' monthly newsletter. No responses were received. In addition, ASM contacted 27 individuals and organizations that were identified as long-time residents of the area and were believed to have knowledge of past land use, history, and cultural information via phone and email. Each of the persons contacted was provided with a consultation packet that contained maps of the project area, a description of the proposed project, and the proposed plans. Of the 27 people contacted, six (6) agreed to be interviewed for the study.

The individuals that were interviewed for the study expressed a mixture of comments and provided insights as to the cultural landscape to be recognized in and around the project site. One interviewee

discussed the widespread occurrence of unknown/unidentified burials in the Puna district and that Hawai‘i County may not have the necessary resources to provide outreach to lineal descendants efficiently and effectively. The Archeological Assessment(AA), discussed in **Section 3.2**, further examined these concerns and indicated that the discovery of significant archeological resources (such as burials) would be unlikely, **Section 3.2.33.1.3** discusses minimization measures for such circumstances. From the interviews, it was generally noted that cultural resources tend to be in greater abundance closer to the coastline, leading a few responses to reflect less concern for related impacts.

Another interviewee shared information regarding the elaborate network of tunnels from the Kohe cave system that contains historical remnants of settlements. They expressed concern for potential access to a cave system being identified and impacted. The AA conducted for the project did not uncover any cave openings on the project site, however, as with the discussion on burials in the previous paragraph, minimization measures are addressed in **Section 3.2.3.**

It was suggested that the landscaping for the park focus on native plants and preferably plants that are edible or have other practical uses. This would support native practitioners and native ecosystems while contributing to food sovereignty for the community. Specific plants mentioned included kukui (*Aleurites moluccana*) and hala (*Pandanus tectorius*). A community greenhouse and/or community gardens were suggested as beneficial for both cultivation and educational purposes.

Some additional feedback included the implementation of a star compass, on this and other public parks, to support the practice of kilo, observation, or spatial navigation. It was additionally suggested that DPR should hire Puna businesses for the construction and maintenance of the park. One interviewee mentioned that the HPPOA has seen recent, complete turnover of their board. This raises concern for lost knowledge of the park planning efforts in regard to the association and the subdivision more generally as it pertains to community outreach during the process.

Although not specific to cultural practices and beliefs, the consulted parties also brought up traffic concerns, parking concerns, roadway improvements at the Kaloli Drive and Highway 130 intersection, and concerns about the safety and security of the community as impacted by a potential increase in crime from induced traffic and visitors to the park.

Overall, the consultation process for the CIA indicated that respondents felt the park would be a good community resource and that it was good to see parcels set aside for community use being utilized. Interviewees noted that the parcel is currently routinely used as a rubbish dump site, as the top of the hill conceals litterers, sometimes including abandoned vehicles and substances that could be hazardous to surrounding neighbors or potentially cause fires. Some of the interviewees also stated that the parcel has been routinely utilized as a homeless encampment with concerns for illegal activity, namely illicit drug use. Without improvement that would enable the parcel to serve the broader community, there was an overall sentiment that these undesirable activities would continue.

Finding, Recommendations, and Conclusion

The CIA concludes that the proposed project may impact native plant resources, particularly the culturally significant ‘ōhi‘a. In addition, the CIA concluded that the proposed project may impact the Puna Cave

System. To address potential impacts, the CIA recommends investigating the presence of Rapid 'Ōhi'a Death (ROD), incorporating ecologically appropriate native plants in landscaping plans, and conducting an Archaeological Inventory Survey before construction, if requested by SHPD. The topic of ROD is also discussed in **Section 3.3, Biological Resources**.

While there were no strong objections to the proposed project by those interviewed for this study, they did raise concerns over increased traffic to the area, the potential for illegal activities, challenges with those who are unhoused, and the need for inclusivity of Hawaiian and other non-western forms of recreation in the proposed park.

3.1.2 Potential Impacts

Construction

Proposed Action

During construction of the Proposed Action there would be an increase in noise and dust. These impacts would be temporary and minimized to the extent possible.

An AA was conducted for the project and did not identify archaeological or historic properties of any kind within the project area. An Archaeological Inventory Survey (AIS) may be required if requested by the State Historic Preservation Division (SHPD).

Currently, the project site is not known to host cultural gatherings or contain culturally-sensitive resources utilized by the community. It is therefore not anticipated that construction activities would impact cultural practices and beliefs.

The project does have has the potential to impact the remaining native plant resources including the culturally valued 'ōhi'a as well as the Puna Cave System. While none of the consultant parties in the CIA were aware of any caves or cave openings within the project area, the use of heavy machinery for grubbing and or grading activities during the park's construction has the potential to expose subterranean lava tubes that may contain cultural material and human remains.

The minimization measures in **Section 3.2.3** related to archaeological impacts are applicable in the event of the discovery of human remains or historic properties.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impacts to cultural practices and beliefs.

Operation

The Proposed Action

The Proposed Action is not anticipated to impact existing cultural gatherings or culturally-sensitive resources. It would create a gathering space and amenities that could support the celebration of culture through providing space to bring the community together, particularly should design features incorporating the propagation of native landscaping and community gardens be implemented in the final design of the project.

No-Action Alternative

Under the No-Action Alternative, the proposed HPP District Park would not be in operation. The project site would not undergo construction activities and would remain a vacant lot. The illegal activities discussed by consulted parties of the CIA would continue to occur on the property which included unpermitted occupancy of the lot and rubbish dumping. The HPP community would be deprived of an opportunity to enhance cultural practices and beliefs by having a public park facility where those values could be shared and celebrated through, through programs and activities that could be held at the park.

3.1.3 Avoidance and Minimization Measures

The following measures would be implemented to minimize potential impacts to cultural practices and beliefs:

- Applicable mitigative measures in **Section 3.2.3** related to archaeological impacts are also applicable to protecting cultural practices and beliefs.

The following measures may be implemented if feasible or determined necessary:

- An AIS may be required if requested by SHPD.

3.2 Archaeological and Historic Resources

3.2.1 Affected Environment

An AA was completed for the Proposed Action in December 2023 by ASM Affiliates, Inc. This study, which is included as **Appendix F**, was conducted in order to provide DPR with information regarding the general nature, density, and distribution of archaeological and historic resources that may be expected in the location of the Proposed Action. The study provided recommendations and guidance on future historic preservation work to support the agency in complying with the applicable state laws and any future County of Hawai'i development permitting that may be required. As the proposed project is set to be carried out by the County on County-owned lands, review is required under HRS Chapter 6E-8 by the Department of Land and Natural Resources-State Historic Preservation Division (SHPD). The AA was undertaken in accordance with HAR §13-284 and complies with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports contained in HAR §13-276. Compliance with the above standards is sufficient for meeting the historic preservation review process requirements of both the SHPD and the County of Hawai'i Planning Department.

The project area is located between 78 and 89 meters (256 to 292 feet) above sea level, approximately 6.34 kilometers (3.94 miles) inland of the coast in Kea'au Ahupua'a, Puna District, Island of Hawai'i. Terrain within the project area is characterized by gently makai (northeast) sloping undulating pāhoehoe bedrock. The pāhoehoe is classified as Puna Basalt (Sherrod et al. 2007) that originated from Kīlauea Volcano between A.D 1410-1460. Soil overlying these lava flows is classified as Keaukaha highly decomposed plant material on two to ten percent slopes. These shallow well drained soils are formed from a thin layer of organic material and contain small amounts of volcanic ash (Soil Survey Staff 2022).

In Puna, a few small communities were initially established along sheltered bays with access to fresh water and rich marine resources. The Precontact population of the moku resided in small settlements clustered around sheltered bays along the coastline where they subsisted on marine resources supplemented by agricultural products. According to McEldowney (1979), there were six villages present along the coast between Hilo and Cape Kumkahi (Kea‘au or Hā‘ena, Maku‘u, Waiakahiula, Honolulu, Kahuwai, and Kula or Koa‘e). The current project area is located mauka of the coast, between the villages of Kea‘au (or Hā‘ena) and Maku‘u.

As a result of the *Māhele*, Kea‘au Ahupua‘a in its entirety was awarded as *Konohiki* Land to William C. Lunalilo as *‘āpana* (lot) 16 of Land Commission Awards (LCAw). 8559B. The Royal Patent (no. 7223) award, which conveyed an absolute fee simple title to Kea‘au Ahupua‘a was not issued until 1879 by King Kalākaua, some five years after Lunalilo’s death. The roughly 65,000-acre Kea‘au Ahupua‘a was put up for sale in an 1881 public auction. Three men, Willie (William) Shipman, Captain J. Elderts, and Samuel M. Damon saw new economic and ranching possibilities for Kea‘au. With much determination, the three men formed a consortium and individually financed one-third equal share and thereby made a $20,000 offer for the parcel. On January 9, 1882 they became the owners of the entire Kea‘au Ahupua‘a, with an agreement that gave each of the signatories first right of refusal should one of them decide to sell their portion.

While various agriculture-based industries were attempted in Puna during the late 19th century, by the early 20th century ranching and sugar emerged as the predominant sectors which were initially propelled by the sale of the ahupua‘a to William Herbert (W.H.) Shipman, J. Eldarts, and Samuel Damon by the King Lunalilo Estate in 1882. Within two years, Shipman had bought out his fellow business partners, becoming the sole owner of the entire Kea‘au Ahupua‘a.

During the *Māhele*, native tenants of the lands that were divided up among the Crown, *Konohiki*, and Government were able to make claim to, and acquire title to, *kuleana* parcels that they actively lived on or farmed. The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw.). Only two kuleana were awarded within Kea‘au Ahupua‘a, neither of which are in close proximity to the current project area.

During the latter part of the 19th century and into the 20th century, land use within the District of Puna began to change. Large tracts of land in lower Puna were used for cattle grazing and sugarcane cultivation. With Shipman’s purchase of the Kea‘au Ahupua‘a, the project area was utilized for cattle ranching and became part of the Kea‘au ranch until being developed into the HPP subdivision during the mid-20th century. While the project area never came under sugarcane cultivation, sugarcane cultivation and operations were centered mostly to the area north and northwest of the project area in the vicinity of present-day Kea‘au Town.

In addition to the AA conducted for the project, archaeological studies have taken place within numerous TMK parcels throughout HPP following inception of the subdivision. Overall, the probability of encountering archaeological resources in this area is very low as no historic properties have been identified on nearby TMK parcels. Due to activities associated with the transition from forest to sugarcane

cultivation and pastures, any archaeological features that might have escaped this disturbance could include agricultural features typical of this part of Puna (e.g., modified depressions, modified outcrops, alignments, and/or mounds), and possibly, but not likely, scattered habitation features (e.g., platforms, terraces, pavements, walls, and/or enclosures), though they would not be expected to maintain much integrity. Lava tubes, both culturally sterile and those containing cultural material, have been recorded in the vicinity of the project area. There is a possibility of skylights from unexplored branches of lava tubes within the project area.

3.2.2 Potential Impacts

Construction

Proposed Action

The presence of archaeological features on the proposed project site are not anticipated due to the lack of archaeological resources identified by previously conducted AIS in the surrounding area and the AA conducted for the project. The recommendation from the AA is "no historic properties affected" and that no further work needs to be done prior to permit issuance or during any subsequent development activities. Therefore, construction of the Proposed Action is not anticipated to have an effect on historic properties.

There remains a possibility that lava tube openings could be discovered during construction. **Section 3.2.3** details minimization measures that may be required in the event that archaeological human remains, burials, or historic resources are uncovered during the construction process, however unlikely.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impacts to archaeological or historic resources.

Operation

Proposed Action

Operation of the Proposed Action would have no effect on historic properties as there would be no additional ground-disturbing activities.

No-Action Alternative

Under the No-Action Alternative, the proposed HPP District Park would not be constructed. The project site would remain a vacant lot for the foreseeable future. The illegal activities would continue to occur on the property which included unpermitted occupancy of the lot and rubbish dumping. By not occupying the lot, there would be an increased opportunity for lava tube openings to be found as the result of illegal activity occurring at the site with the potential for desecration and looting of any corresponding cultural deposits.

3.2.3 Avoidance and Minimization Measures

The following measures would be implemented to minimize potential impacts to archaeological and historic resources:

- An AIS may be required if requested by SHPD.
- If human remains or burials are identified, all earth-moving activities in the area would stop, the area would be cordoned off, and the SHPD and Hawai‘i County Police Department would be notified pursuant to HAR Section 13-300-40.
- If any potential historic properties are identified during construction activities, all activities in the area would cease and the SHPD would be notified pursuant to HAR Section 13-280-3.

3.3 Biological Resources

3.3.1 Affected Environment

A biological survey was conducted for the project site in November 2023 by Geometrician Associates, LLC and may be found in **Appendix G**. The objectives of the botanical survey component of the survey were to: 1) describe the vegetation; 2) list all species encountered; and 3) identify the locations of any special status species. Plant species were identified in the field and, as necessary, collected and keyed out in the laboratory. Special attention was given to the possible presence of any federally listed threatened or endangered plant species, although the habitat did not indicate a high potential for their presence. The faunal portion of the survey consisted of visual/auditory faunal surveys both during and apart from the botanical survey covering birds and introduced mammals, reptiles, or amphibians. Also considered during the survey was the general value of the habitat for native birds and the Hawaiian hoary bat. Not included in the survey were invertebrates, as the properties did not have potential to contain special status invertebrate species. Similarly, because of the lack of lakes, ponds, or watercourses aside from an occasionally flowing man-made drainage ditch within the existing park, no aquatic species survey was conducted.

Vegetation Communities and Habitat

The project site for the Proposed Action is located on the flank of Kīlauea volcano. The geologic makeup and soil composition of the mountain slope (described in more detail in **Section 3.4**) supports the growth of native forests when it is undisturbed. Much of the area surrounding the project site has experienced heavy degradation as a result of residential development and agricultural practices. Historic imagery of the project site show disturbance from low-density grazing in the mid-20th century from ranching operations through the area. The project site slowly reforested when these lands were converted to agricultural/residential uses.

Vegetation of the project site is comprised of an open ‘ōhi‘a forest with an understory of uluhe ferns, *Melastoma*, and a variety of non-native herbs and grasses including *Schizachrium condensatum, Sporobolus indicus, and Eragrostis tenella*. A few non-native, emergent trees were also found scattered across the site such as albizia, Chinese banyan, and gunpowder tree. The vegetation in the shrub and herb

layers was predominantly non-native, but some native ferns and fern allies were present in low abundance, including moa (*Psilotum nudum*), wawae‘iole (*Lycopodiella cernua),* and pala‘a (*Sphenomeris chinensis*).

Of the 65 species identified during the survey, nine (9) are native, with eight (8) being indigenous (native to Hawai‘i and elsewhere) and one (1) endemic (native only to Hawai‘i). All natives are very common on the Big Island and elsewhere in Hawai‘i. No listed, candidate, or proposed endangered plant species as listed by the U.S. Fish and Wildlife Service (USFWS) were identified. No existing or proposed federally designated critical habitat for plants (or animals) is present on or near the property. In terms of conservation value, no botanical resources requiring special protection are present, although it is recognized that the ‘ōhi‘a forest, despite its moderate to heavy degradation, has intrinsic conservation value.

Fauna

With the exception of a single observation of a Hawaiian hawk or ‘i‘o (*Buteo solitarius*), the observed bird fauna was entirely non-native and included a number of Japanese white-eyes (*Zosterops japonicus*) as well as common mynas (*Acridotheres tristis*), northern cardinals (*Cardinalis cardinalis*), spotted doves (*Spilopelia chinensis*), house finches (*Haemorhous mexicanus*), yellow-billed cardinals (*Paroaria capitata*), yellow-fronted canaries (*Serinus mozambicus*), saffron finches (*Sicalis flaveola*), zebra doves (*Geopilia striata*), and chickens (*Gallus gallus*).

The single Hawaiian hawk that was observed was perched in a moderately tall ‘ōhi‘a tree. This formerly federally-listed endangered bird (still listed by the State of Hawai‘i) is very commonly seen in forests, agricultural areas, and even towns throughout East Hawai‘i. Hawaiian hawks generally prefer ‘ōhi‘a forest habitat but are known to breed successfully in both native and non-native forests. They occur throughout the island of Hawai‘i from sea level to 8,530 feet in elevation. Hawks often forage in forests near agricultural tracts and nest in tall trees of a variety of species. Most nesting occurs in tall native ‘ōhi‘a trees, although hawks may also nest in non-native trees, including eucalyptus, ironwood, mango, coconut palm and macadamia.

The area is generally poor habitat for native forest birds due to the low elevation, mostly non-native vegetation, and intrusive, ongoing human activities. The native Hawai’i ‘amakihi (*Chlorodrepanis virens virens*) has been detected in nearby areas within HPP and is likely to be occasionally present.

Because of the non-coastal location, only one species of shorebird is likely to be seen. The very common native resident migratory bird Pacific golden-plover or kolea (*Pluvea fulvialis*) utilizes inland habitats, especially patches of short grass, during its winter residency in Hawai‘i. The kolea is not a listed threatened or endangered species but is protected under the Migratory Bird Treaty Act.

The area surrounding the project site is not suitable habitat for waterbirds due to the lack of streams or ponds. Therefore, the only waterbird likely to occasionally be present is the threatened Hawaiian goose or nēnē (Branta sandwicensis). Nēnē have become very common on many Hawaiian islands and can be

found at elevations ranging from sea level to sub-alpine areas above 7,000 feet. While grassy patches on the disturbed portions of the properties may occasionally host nēnē, there were no signs of them observed.

Although they would rarely if ever be visible, several listed seabirds may overfly HPP between the months of May and November, including the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*). These seabirds hunt over the ocean during the day and fly to higher elevations at night to nest. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals including cats and mongooses. Although each of these seabirds may fly over HPP on their way to and from mountain nesting areas and the open ocean, no suitable nesting habitat for any of them is present on the project site.

The Hawaiian hoary bat or ‘ōpe‘ape‘a (*Lasiurus cinereus semotus*) is found throughout Puna and most areas on the island of Hawai‘i. Bats may forage for flying insects on the properties on a seasonal basis and may also roost in trees and large shrubs. Bats are often visible while they are feeding on flying insects near dusk and dawn at various locations around the island of Hawai‘i. Although the scope of the biological survey did not include the sophisticated equipment necessary to identify Hawaiian hoary bats, the absence of bat detections does not indicate an absence of bats. These species may visit or transit through the project site and surrounding area and it is therefore assumed that Hawaiian hoary bats are present at least some of the time.

Aside from bats, the other mammals in the project area are all introduced species, including feral cats (*Felis catus*), feral pigs (*Sus scrofa*), mongoose (*Herpestes* spp.), and various species of rats (*Rattus* spp.) and mice (*Mus* spp.). Surveyors did not observe any mammals during the survey, but pig trails were common throughout the project area. Coqui frogs (*Eleutherodactylus coqui*) were clearly heard during the biological survey despite it being the middle of the day. Several other species of non-native reptiles and amphibians may also be present.

Invasive Species

Soil and plant material may contain invasive fungal pathogens (e.g., ROD), vertebrate and invertebrate pests (e.g., Little Fire Ants, Coconut Rhinoceros Beetles), or invasive plant parts that could harm our native species and ecosystems.

ROD is caused by the *Ceratocystis* spp. and has been found on the islands of Hawai‘i, Kaua‘i, Maui, and O‘ahu. The Ceratocystis fungus enters the ‘ōhi‘a (*Metrosideros polymorpha*) tree through a wound (e.g., broken limb, twig, scuffed exposed root) and grows in the sapwood of infected ‘ōhi‘a trees and ultimately kills the tree. Humans are thought to be a main vector through the movement of wood or contaminated tools, gear, and vehicles from one location to another. Other potential vectors include feral ungulates and beetles.

The little fire ant (*Wasmannia auropunctata*) is an invasive species known to occur throughout Hawai'i Island. The little fire ant does not build mounded dirt nests; rather, it nests in a variety of habitats including in trees, around potted plants, irrigation lines, and in electrical boxes.

3.3.2 Potential Impacts

Construction

Proposed Action

No rare, threatened, or endangered plant or animal species were present on the project site for the Proposed Action. Lesser disturbed areas did contain native shrubs, ferns, and trees which are components for the habitats of many native animal species as well.

An issue for construction in properties with 'ōhi'a trees includes the propagation of two species of fungus that produce a disease called ROD. Projects that harm or relocate 'ōhi'a trees can spread the disease, and certain mitigation measures are recommended.

Grading, tree removal, or other construction activities could disturb nesting activities of the Hawaiian hawk if nests are near enough to the construction area. Avoidance and minimization measures would be implemented to minimize potential impacts to the Hawaiian hawk (see **Section 3.3.3**).

Construction of the Proposed Action is not expected to have adverse impacts to the Pacific golden-plover since there is sufficient habitat in the surrounding area that the species could utilize.

Construction of the Proposed Action is not expected to have adverse impacts to Hawaiian waterbirds since there is not appropriate habitat within the construction area. Construction of the Proposed Action could have short-term, indirect impacts (e.g., noise, dust control) to Hawaiian waterbirds if they are utilizing areas adjacent to the project area. Avoidance and minimization impacts would be implemented to minimize potential impacts to Hawaiian waterbirds (see **Section 3.3.3**).

Construction of the Proposed Action would occur during daylight hours; therefore, there would be no impacts to listed seabirds. However, avoidance and minimization measures would be implemented to minimize potential impacts to seabirds should there be nighttime construction activities (see **Section 3.3.3**).

Construction of the Proposed Action would involve removing trees greater than 15-feet-tall. There would be no tree trimming or clearing during the bat breeding season (June 1 through September 15). During construction of the Proposed Action, the Hawaiian hoary bat may be temporarily displaced from the project area. The temporary displacement of these individuals at the project site is not expected to affect individual survival or overall species populations. The measures in **Section 3.3.3** would be implemented to minimize potential impacts to the Hawaiian hoary bat.

Construction of the Proposed Action would involve the movement of soil and plant materials to and from the site. Construction activities could spread invasive species to new areas through the movement of vehicles and materials. Avoidance and minimization measures would be implemented to minimize potential impacts to native species from the inadvertent spread of invasive species off-site.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impacts related to the Proposed Action on flora or fauna. Non-native and invasive species that currently exist on the project site would be allowed to continue to grow unchecking, creating an environment that is not favorable to the growth of native flora which in turn create habitat for native fauna species.

Operation

Proposed Action

Operation of the Proposed Action would include outdoor lighting which may impact seabirds. These impacts would be minimized as discussed in **Section 3.3.3**. No other impacts to flora or fauna due to operation of the Proposed Action.

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be constructed; therefore, there would be no impacts to biological resources.

3.3.3 Avoidance and Minimization Measures

The following measures would be implemented to minimize potential impacts associated with flora species including reducing the spread of ROD:

- Native plants would be used much as it is practicable in the park's landscaping design. Where possible, existing native plants will be retained.
- The contractor would retain the services of a qualified certified arborist with experience in tree protection and preservation during construction. The arborist would be present during all excavation activities adjacent to trees that would remain in place.
- Investigate the extant stands of 'ōhi'a within the project area to determine whether ROD is present. If ROD is present, then cautionary measures including those that have been put forth by the DLNR, the UH CTAHR, the DOA, and other agencies should be undertaken to reduce the spread of this fungus.

The following measures would be implemented to minimize potential impacts to the Hawaiian hawk:

- A pre-construction survey for hawk nests would be completed if construction is initiated during the breeding season (March 1 through September 30). If hawk nests are found to be present on or near the project site, a buffer zone of 100 meters (330 feet) will be established around it where no construction shall occur until the chick or chicks have fledged, or the nest is abandoned.

The following measures would be implemented to minimize potential impacts to Hawaiian waterbirds:

- If any Hawaiian waterbirds are present within or adjacent to the project area during construction, then all activities within 100 feet (30 meters) would cease, and the bird or birds would not be approached. Work may continue after the bird or birds leave the area of their own accord.
- If a nest is discovered at any point, the Hawaii Island Branch Division of Forestry and Wildlife Office would be contacted.

The following measures would be implemented to minimize potential impacts to Hawaiian seabirds:

- Construction activity would be restricted to daylight hours as much as practicable during the seabird peak fledgling fallout period (September 15 to December 15) to avoid the use of nighttime lighting that could attract seabirds.
- All outdoor lights would be shielded to prevent upward radiation to reduce the potential for seabird attraction and shall not be directed to travel across property boundaries toward the shoreline and ocean waters.
- Outside lights not needed for security or safety would be turned off from dusk through dawn during the fledgling fallout period.

The following measures would be implemented to minimize potential impacts to the Hawaiian hoary bat:

- Any fences that are erected during construction of the Proposed Action would have barbless topstrand wire to prevent Hawaiian hoary bats from becoming entangled on barbed wire.
- Trees taller than 15 feet would not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15).

3.4 Geology and Soils

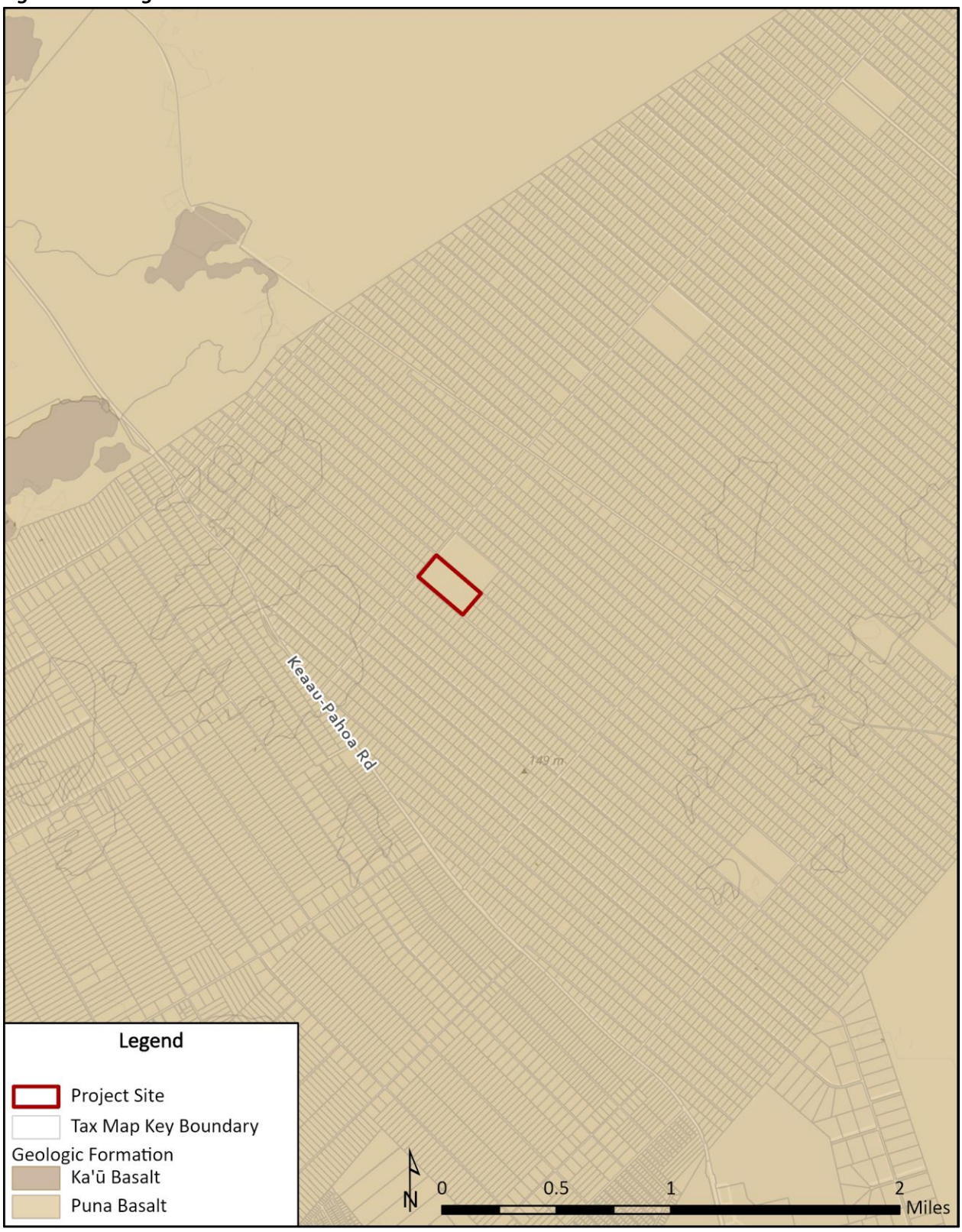
3.4.1 Affected Environment

The Island of Hawai'i is the largest island in the Hawaiian Archipelago and covers an area of approximately 4,000 square miles. The island was formed by the activity of five shield volcanoes: Kohala (long extinct), Mauna Kea (activity during the recent geologic time), Hualālai (last erupted 1801 to 1803), and Mauna Loa and Kīlauea (both still active).

The Project Site is located on eastern flank of the Kīlauea shield volcano. As shown in **Figure 3**, the Project Site is underlain by the Puna basalt series of Kīlauea, which were deposited during the Holocene and Pleistocene Epoch. The lava formation encountered at the site appears to consist of both a'ā and pahoehoe type flows of the Puna Basalt Series, which spread and ponded as they approached the ocean. A'ā lava is typically characterized by a porous, rough, and irregular flow surface resembling a jagged accumulation of rock fragments, including cobbles and boulders. Pāhoehoe is characterized by a smooth, rope-like, or billowy surface and an internal structure of vesicular (porous) rock. The project site is generally flat with existing ground elevations ranging from approximately 256 to 292 feet above mean sea level with an average slope of about 2.4%.

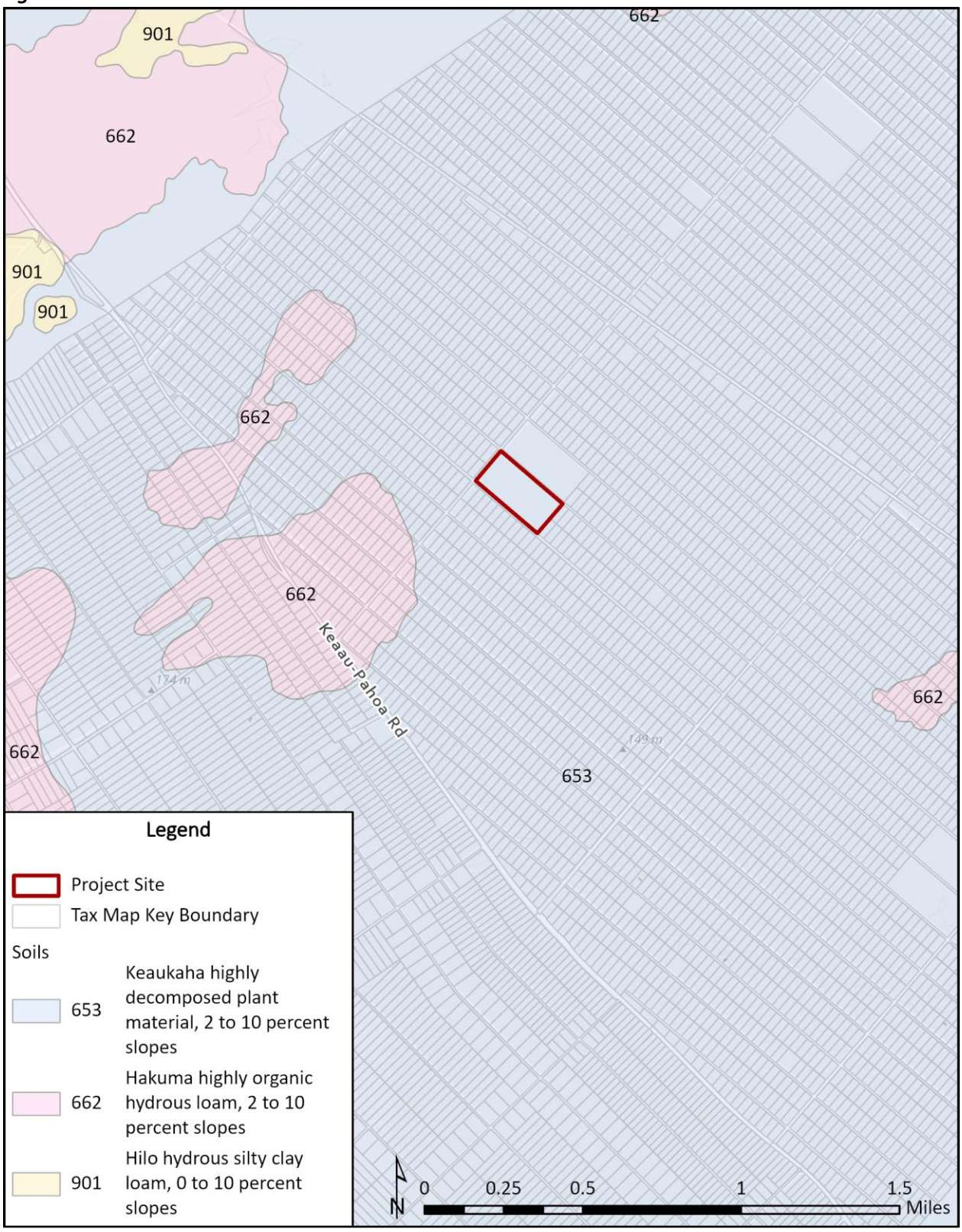
As shown in **Figure 4**, soils at the Project Site consists of Keaukaha Highly Decomposed Plant Material, 2 to 10 percent slopes. This particular soil category comprises shallow and extremely shallow soils that are well drained. These soils have developed on top of a thin layer of organic material and a small quantity of volcanic ash, which overlays smooth, undulating pāhoehoe lava (SSURGO, 2016).

Figure 3. Geologic Units



Source: Geological Units for the State of Hawai‘i, USGS (2007)

Figure 4. Soils



Source: U.S. Department of Agriculture, Natural Resources Conservation Service (2016)

3.4.2 Potential Impacts

Construction

Proposed Action

Construction of the Proposed Action would not substantially alter the overall existing geology and topography. Ground-disturbing activities associated with construction of the Proposed Action have the potential to cause minor soil loss and erosion. All excavation and grading activities would be limited to the project area to minimize erosion potential. Measures to minimize impacts would be implemented, as discussed in **Section 3.4.3**.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no construction-related impacts to geology and soil resources.

Operation

Proposed Action

Operation of the Proposed Action is not anticipated to significantly impact existing geology and topography. There may be impacts to soils and grading due to water runoff from impervious surfaces on the site, such as the parking lot, driveways, building footprints, and various sporting facilities. Biofiltration swales and basins, a retaining wall, and landscape drainage buffers are incorporated into the conceptual design plan to mitigate the potential of water runoff from impacting nearby roadways and properties.

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be in operation; therefore, there would be no impacts to surrounding geology, topography, or soil resources.

3.4.3 Avoidance and Minimization Measures

Any grading would be in conformance with the Hawai'i County Grading Ordinance. In addition, DPR would obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for stormwater discharge associated with construction activities. As part of the permit process, DPR would prepare a site-specific Best Management Practices (BMP) Plan that would include an erosion and sediment control plan to minimize erosion of soil and discharge of other pollutants off site, and descriptions of measures that would minimize the discharge of pollutants via stormwater after construction is complete.

BMPs would include some or more of the following measures:

- Watering or applying dust suppressants at active work areas and project access roads, as needed
- Installing dust screens or wind barriers around the construction site
- Installation of a filter sock, silt fence, or other perimeter controls adjacent and down slope from disturbed areas
- Cleaning nearby pavements and paved roads after construction
- Covering open trucks carrying construction materials and debris
- Limiting areas to be disturbed at any given time

BMPs would be implemented prior to ground-disturbing activities and would be inspected and maintained throughout the construction period.

The following measures would be implemented to minimize impacts associated with contaminated soils:

- If discovered, site workers would be informed of the presence of contaminated soil.
    - All work involving contaminated soil would be conducted in a controlled manner protective of the workers, site users, the public, and the environment.
    - All workers would be provided necessary training and hazard communication.
- Any excavated contaminated soils in excess of what can be safely encapsulated on site would be disposed of at an approved facility.

3.5 Water Resources

3.5.1 Affected Environment

Groundwater

As shown in **Figure 5**, the Project Site is located within the Pāhoa aquifer system of the Kīlauea sector (Aquifer Code 80801). The Kīlauea sector has a sustainable yield of 621 million gallons per day (MGD); the Pāhoa aquifer has a sustainable yield of 432 MGD. Withdrawal from the Pāhoa aquifer system is estimated to be .86 MGD or 0.2% of the current sustainable yield (State of Hawai'i Commission on Water Resource Management, Water Resource Protection Plan, 2019).

Water service to the Project Site is provided by the County of Hawai'i Department of Water Supply (DWS). **Section 3.11** outlines water utility services and needs.

Surface Waters

There are no standing water bodies, streams, or other surface water features in the immediate vicinity of the Project Site.

Wetlands

There are no wetland habitats in the immediate vicinity of the Project Site as recorded by the National Wetland Inventory.

3.5.2 Potential Impacts

Construction

Proposed Action

Construction of the Proposed Action would consist of grubbing and grading of the subject parcel. No significant impact to groundwater underlying the Project Site would be anticipated during construction. Construction associated with the Proposed Action is unlikely to introduce or release any substance into the soil that could adversely affect groundwater quality.

An individual wastewater system (IWS) would be installed for the project. A permit from the DOH, Wastewater Division, would be required. The IWS is discussed in greater detail in **Section 3.11.**

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impacts to water resources.

Operation

Proposed Action

No significant impact to groundwater underlying the Project Site would be anticipated during the operation of the Proposed Action.

An individual wastewater system (IWS) would be installed for the project. A permit from the DOH, Wastewater Division, would be required. The IWS is discussed in greater detail in **Section 3.11.**

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be in operation; therefore, there would be no impact to the existing water resource quality.

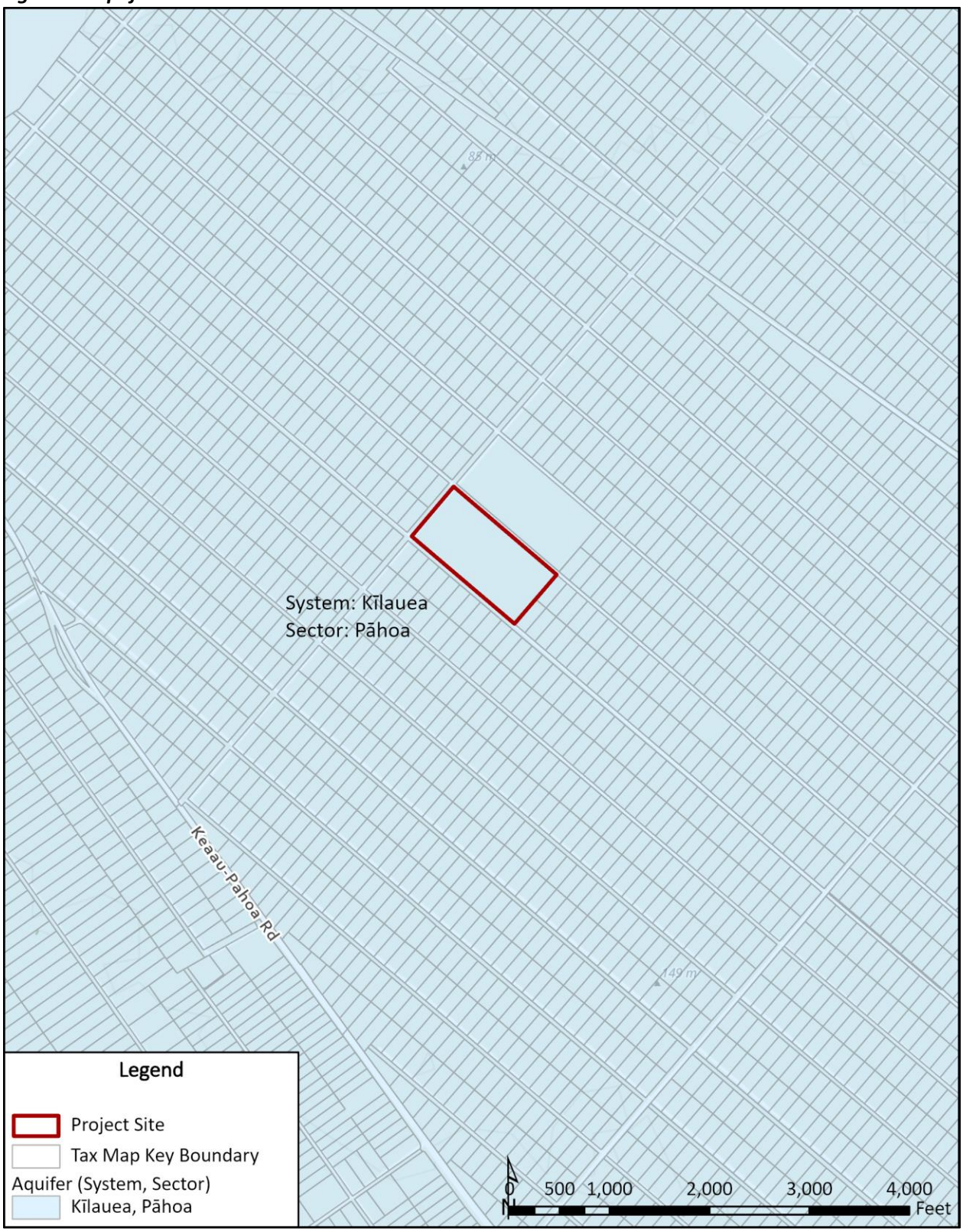
3.5.3 Avoidance and Minimization Measures

DPR would obtain coverage under the NPDES General Permit for stormwater discharge associated with construction activities. As part of the permit process, DPR would prepare a site-specific BMP Plan that would include an erosion and sediment control plan to minimize erosion of soil and discharge of other pollutants into State waters, and descriptions of measures that would minimize the discharge of pollutants via stormwater after construction is complete.

BMPs would include some or more of the following measures:

- Watering or applying dust suppressants at active work areas and project access roads, as needed
- Installing dust screens or wind barriers around the construction site
- Installation of a filter sock, silt fence, or other perimeter controls adjacent and down slope from disturbed areas
- Cleaning nearby pavements and paved roads after construction
- Covering open trucks carrying construction materials and debris
- Limiting areas to be disturbed at any given time.

Figure 5. Aquifers



Source: DLNR, Commission on Water Resource Management (2022).

3.6 Air Quality

3.6.1 Affected Environment

The Clean Air Act of 1972 and its 1990 Amendments (CAA) and subsequent legislation regulate air emissions from area, stationary, and mobile sources. Both the U.S. Environmental Protection Agency (USEPA) and the State of Hawai‘i have instituted Ambient Air Quality Standards (AAQS) to maintain air quality in the interest of public health and secondary public welfare.

At the present time, seven parameters are regulated: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. The Hawai‘i AAQS are in some cases considerably more stringent than the comparable National Ambient Air Quality Standards (NAAQS). **Table 2** illustrates the NAAQS and State AAQS and the units of measure (micrograms per cubic meter [$\mu g/m^3$] and parts per million [ppm]).

In addition to the NAAQS and the State AAQS, the State of Hawai‘i Department of Health (DOH) regulates fugitive dust. HAR Section 11-60.1-33, Fugitive Dust, states that no person shall cause or permit visible fugitive dust to become airborne without taking reasonable precautions, and no person shall cause or permit the discharge of visible fugitive dust beyond the property lot line on which the fugitive dust originates (DOH, 2014). This rule applies to construction projects and would, therefore, be applicable to the Proposed Action.

Prevailing winds throughout the year in Hawai‘i are the northeasterly trade winds. These trade winds generally help maintain good air quality conditions. The DOH operates a network of air quality monitoring stations at various locations around the state. The closest DOH air quality monitoring station is located in the town of Mountain View to the west. Air quality data from the Mountain View monitor consistently trends well below State and Federal air quality standards.

Locally generated contributors to air pollution in the vicinity of the project site include vehicle exhaust, chemical fumes from construction and maintenance activities, and fugitive dust from various sources.

Table 2. State of Hawai‘i and National Ambient Air Quality Standards

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawai‘i
Particulate Matter <10 microns (PM_{10})	$\mu g/m^3$	Annual 24 Hours	- 150[a]	- 150[a]	50 150[b]
Particulate Matter <2.5 microns ($PM_{2.5}$)	$\mu g/m^3$	Annual 24 Hours	12[c] 35[d]	15[c] 35[d]	- -

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawai'i
Sulfur Dioxide (SO_2)	ppm	Annual 24 Hours 3 Hours 1 Hour	- - - 0.075[e]	- - 0.5[b] -	0.03 0.14[b] 0.5[b] -
Nitrogen Dioxide (NO_2)	ppm	Annual 1 Hour	0.053 0.100[f]	0.053 -	0.04 -
Carbon Monoxide (CO)	ppm	8 Hours 1 Hour	9[b] 35[b]	- -	4.4[b] 9[b]
Ozone (O_3)	ppm	8 Hours	0.070[g]	0.070[g]	0.08[g]
Lead	$\mu g/m^3$	3 Months Quarter	0.15[h] 1.5[i]	0.15[h] 1.5[i]	- 1.5[i]
Hydrogen Sulfide	ppb	1 Hour	-	-	25[b]

Notes: [a]Not to be exceeded more than once per year on average over three years.
[b]Not to be exceeded more than once per year.
[c]Three-year average of the weighted annual arithmetic mean.
[d]98th percentile value averaged over three years.
[e]Three-year average of fourth-highest daily 1-hour maximum.
[f]98th percentile value of the daily 1-hour maximum averaged over three years.
[g]Three-year average of annual fourth-highest daily 8-hour maximum.
[h]Rolling 3-month average.
[i]Quarterly average.
Source: DOH, 2015

3.6.2 Potential Impacts

Construction

Proposed Action

Construction of the Proposed Action would have short-term and temporary impacts to air quality from the generation of dust or particulate matter and exhaust fumes from vehicular travel to and from the project site and from equipment operations during construction activities. Construction activities would include grading and vehicle and equipment engine operations. Because the level of criteria pollutants in Hawai'i are consistently below Federal and State AAQS, and because air pollutants are rapidly dispersed by strong winds, increasing levels of criteria pollutants at the project site from construction activities are not expected to exceed the Federal or State AAQS.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impact to the existing air quality.

Operation

Proposed Action

The Proposed Action would result in a facility that would result in power consumption and would therefore lead to an increase in carbon emissions. Maintenance activities, such as mowing lawns and trimming landscaping foliage, and general building repair would result in the use of equipment and machinery that could contribute to fugitive dust and impact air quality.

As shown in **Section 3.9**, the Proposed Action would cause a slight increase of traffic in the area, which would increase emissions from people travelling to and from the park. However, this increase in traffic would not be substantial and would not have a significant impact on greenhouse gas (GHG) emissions. It is also anticipated that vehicle miles traveled would be reduced from HPP residents not having to travel outside of the subdivision for their recreational needs.

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be in operation. HPP residents would have to travel further to access recreational facilities and services which would increase traffic resulting in increased vehicle emissions on the road.

3.6.3 Avoidance and Minimization Measures

All construction activities would comply with the provisions of HAR Chapter 11-60.1, Air Pollution Control, and HAR Chapter 11.60.1-33, Fugitive Dust. A dust control plan would be developed and implemented to minimize fugitive dust during construction. Measures to control fugitive dust during construction may include, but not be limited to, the following:

- Watering of active work areas and project access roads, as needed.
- Screening piles of materials from wind, if appropriate.
- Covering open trucks carrying construction materials.
- Limiting areas to be disturbed at any given time.
- Mulching or chemically stabilizing inactive areas that have been disturbed.
- Minimizing airborne, visible fugitive dust from shoulders and access roads.

Additionally, contractors would be required to maintain equipment with emissions controls.

3.7 Climate and Climate Change

3.7.1 Affected Environment

Climate change is a long-term shift in patterns of temperature, precipitation, humidity, wind, and seasons. Scientific data show that earth's climate has been warming. This warming is mostly attributable to rising levels of carbon dioxide and other GHGs generated by human activity. These changes are already impacting Hawai'i through rising sea levels, increasing ocean acidity, changing rainfall patterns, decreasing stream flows, and changing wind and wave patterns. While the earth's climate experiences natural change and variability over geologic time, the changes that have occurred over the last century due to human

input of GHG into the atmosphere are unprecedented (Hawai'i Climate Change Mitigation and Adaptation Commission (HCCMAC), 2017).

Sea levels are rising at increasing rates due to global warming of the atmosphere and oceans and melting of glaciers and ice sheets (HCCMAC, 2017). These rising seas and the projection for more increased tropical storms in the Pacific Ocean would increase Hawaii's vulnerability from coastal inundation and erosion. The Proposed Action is far from the coastline and therefore not subject to the risk of sea-level rise.

3.7.2 Potential Impacts

Construction

Proposed Action

Construction of the Proposed Action would result in emissions of GHGs from operation of construction equipment, workers travel, and delivery of materials and equipment. These emissions would be short-term and temporary and would not be substantial; therefore, construction of the Proposed Action would not have significant impacts that would exacerbate climate change.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no construction impacts related to climate change.

Operation

Proposed Action

It is anticipated that the park would require lighting, restrooms and other water features, and various other electronic equipment, all of which require the use of electricity. Maintenance activities, such as mowing lawns and trimming landscaping foliage, and general building repair would result in the use of equipment and machinery to perform the repairs and transport needed materials.

Grubbing of the project site would result in fewer trees and other vegetation on the parcel which naturally sequester carbon.

As shown in **Section 3.9**, the Proposed Action would cause a slight increase traffic in the area, which would increase emissions from people travelling to and from the park. However, this increase in traffic would not be substantial and would not have a significant impact on GHG emissions which would exacerbate climate change. It is also logical to consider that the demand for and access to programs, services, and amenities would increase regardless of this project and would be developed elsewhere potentially causing the same or more GHG emissions depending on length of travel required. The Proposed Project would reduce the driving time for HPP residents to access recreational resources.

It is anticipated that the park would require lighting, restrooms and other water features, and various other electronic equipment, all of which require the use of electricity. Maintenance activities, such as mowing lawns and trimming landscaping foliage, and general building repair would result in the use of equipment and machinery to perform the repairs and transport needed materials.

Grubbing of the project site would result in fewer trees and other vegetation on the parcel which naturally sequester carbon.

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be in operation; therefore, there would be no additional climate change impacts. HPP residents would seek recreational amenities and programs at more distant locations, increase the driving distance and highway traffic, and increasing GHG emissions associated with vehicular travel.

3.7.3 Avoidance and Minimization Measures

No avoidance and minimization measures are proposed for potential climate change impacts, and none are expected to be required.

3.8 Noise

3.8.1 Affected Environment

Noise is defined as "any sound that may produce adverse physiological or psychological effects or interfere with individual or group activities, including but not limited to communication, work, rest, recreation, or sleep" (HAR Title 11, Chapter 46). A number of factors affect sound as it is perceived by the human ear. These include the actual level of the sound (i.e., noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels.

The State of Hawai'i Community Noise Control Rules (HAR Title 11, Chapter 46) defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, and generators. The accepted unit of measure for noise levels is the decibel (dB). The Community Noise Control Rules do not address most moving sources, such as vehicular traffic noise, air traffic noise, or rail traffic noise. However, the Community Noise Control Rules do regulate noise related to construction activities, which may not be stationary.

The State of Hawai'i regulates noise exposure in the following statutes and rules:

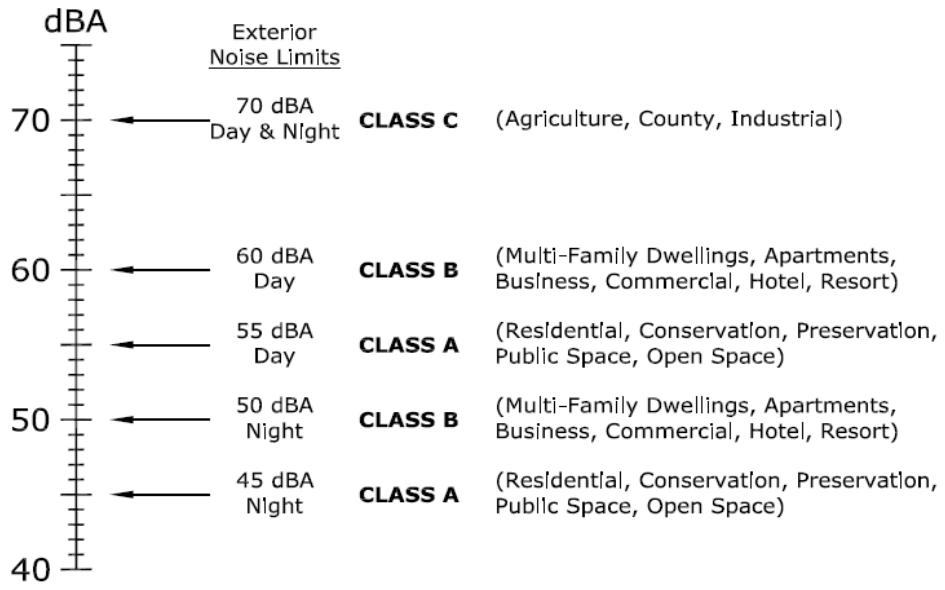
- HRS Chapter 342F – Noise Pollution
- HAR, Title 11, Chapter 46 – Community Noise Control

The maximum permissible noise levels are enforced by the DOH for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in

Figure 6. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is considered by the DOH.

Figure 6. Hawai'i Maximum Permissible Sound Levels for Various Zoning Districts

Zoning District	Day Hours (7 AM to 10 PM)	Night Hours (10 PM to 7 AM)
CLASS A Residential, Conservation, Preservation, Public Space, Open Space	55 dBA (Exterior)	45 dBA (Exterior)
CLASS B Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort	60 dBA (Exterior)	50 dBA (Exterior)
CLASS C Agriculture, Country, Industrial	70 dBA (Exterior)	70 dBA (Exterior)



3.8.2 Potential Impacts

Construction

Proposed Action

During construction, noise would be generated from equipment being used to construct the HPP District Park which would include grubbing/grading, building construction, construction of parking areas, and landscaping activity. Construction equipment may include excavators, trucks, and other heavy equipment. Typical noise emission levels for construction equipment are provided in **Table 3.**

Table 3. Typical Noise Emission Levels for Construction Equipment

Equipment Type	Equipment Type
Air Compressor	81
Backhoe	80
Bulldozer	82
Chain Saw	85
Concrete/Grout Pumps	82
Crawler Service Crane (100-ton)	83
Dump Truck	88
Excavator	85
Front End Loader	80
Generator	81
Jackhammer (compressed air)	85
Lift Booms	85
Pick-Up Truck	55
Power-Actuated Hammer	88
Water Pump	76
Water Truck	55

Source: Federal Highway Administration, 2006

The Project Site is surrounded by land which is zoned agricultural but used primarily for single family residences. Accordingly, the Project Site would be considered a Class A zoning district per the HAR, Title 11, Chapter 46 – Community Noise Control guidelines. This would result in a maximum permissible impulse sound level of 55 dBA during the day and 45 dBA at night, without a noise variance. Construction would generally only occur Monday through Friday between the hours of 7:00 AM and 3:30 PM, excluding State and Federal holidays. Noise generated during construction could impact the enjoyment of visitors to the nearby businesses and residences. However, these impacts would be short-term and temporary. In addition, the measures provided in **Section 3.8.3** would be implemented to minimize potential noise impacts.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no impact to the existing noise environment.

Operation

Proposed Action

Hours of operation for the HPP District Park are primarily expected to be from 7:00am to 8:00pm. Permits may be issued for facility use until 11pm, which would primarily be for indoor activities at the covered court or community center. There would be an anticipated increase in noise levels during the operation of the park, especially during large sporting events or community activities. It is therefore anticipated that noise mitigation efforts would be required for duration of large gatherings and events to mitigate noise pollution to surrounding residences, this is discussed in **Section 3.8.3**.

It is also anticipated that the Proposed Action would have beneficial impacts to traffic elsewhere in the district as HPP residents would not have to travel to and from nearby public parks to seek recreational opportunities.

No-Action Alternative

Under the No-Action Alternative, no changes to existing conditions would occur; therefore, there would be no additional impacts to the existing noise environment.

3.8.3 Avoidance and Minimization Measures

Noise generated from short-term construction activities and the use of machinery would be minimized by requiring contractors to adhere to state and county noise regulations, including HRS Chapter 342F, Noise Pollution, and HAR Chapter 11-46, Community Noise Control. In the event that work occurs after normal working hours (i.e., at night or on weekends), or if permissible noise levels are exceeded, appropriate permitting and monitoring, as well as development of administrative and engineering controls, would be employed.

In cases where construction noise exceeds or is expected to exceed the State's "maximum permissible" property line noise levels, a permit must be obtained from DOH to allow the operation of vehicles, cranes, construction equipment, power tools, etc., which emit noise levels in excess of the "maximum permissible" levels. In order for DOH to issue the construction permit, the contractor must submit a permit application explaining the construction activities. DOH may also require the contractor to conduct noise monitoring or community meetings inviting the neighboring residents and business owners to discuss construction noise. The contractor should use reasonable and standard practices to mitigate noise, such as using mufflers on diesel and gasoline engines, using properly tuned and balanced machines, etc. However, the DOH may require additional noise mitigation, such as temporary noise barriers, or time of day usage limits for certain kinds of construction activities.

Specific permit restrictions for construction activities are:

- "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels . . . before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday."
- "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels . . . before 9:00 a.m. and after 6:00 p.m. on Saturday."
- "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

The use of hoe rams and jack hammers 25 pounds or larger, high-pressure sprayers, chain saws, and pile drivers are restricted to 9:00 a.m. to 5:30 p.m., Monday through Friday. In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds, must be equipped with mufflers.

The DOH noise permit does not limit the noise level generated at the construction site, but rather the times at which noisy construction can take place. Therefore, noise mitigation for construction activities should be addressed using project management, such that the time restrictions within the DOH permit are followed.

Measures could be considered in the design of the Proposed Action that would mitigate noise pollution during normal park usage and operations, including occasional sporting events. Designing indoor facilities with acoustic sound features would limit the noise levels that emanate outside. These can include acoustic flooring solutions along with wall panels on the ceiling and walls. Minimization measures for outdoor areas could include acoustic sound barriers along fence-lines surrounding outdoor playing fields or sound panels in strategic places between noise generators and receptors. In addition, the park's overall layout and the siting of the individual facilities takes into account the proximity of noise generating spaces in the park and surrounding residences. The location of sporting fields that could host noisy games, such as the outdoor baseball and grass fields are designed to be as far from surrounding residences as possible. They also take into account natural topography of the parcel to create noise buffers where possible.

3.9 Roadways and Traffic

3.9.1 Affected Environment

A traffic impact analysis report (TIAR) was completed for the Proposed Action in December 2023 by SSFM International (see **Appendix H**). The TIAR analyzed anticipated traffic with project conditions and without to cover a variety of possible circumstances, design options, and configurations. Five intersections were analyzed in the surrounding area as well as existing multimodal facilities including sidewalks and bus stops.

Roadways

There are Four roadways in the vicinity of the Proposed Action:

Kea‘au-Pāhoa Road: Kea‘au-Pāhoa Road (also referred to as Hawai‘i Route 130, Pāhoa-Kalapana Road and Kaimū Chain of Craters Road) is a State of Hawai‘i (State)-owned roadway extending 21.60-miles between Volcano Road (Hawai‘i Route 11) in the northwest to the northeast boundary of Hawai‘i Volcano National Park near Queen's Bath in the southeast. In the surrounding project area, Kea‘au-Pāhoa Road has an Federal Highway Administration (FHWA) functional classification of a small urban minor arterial. The corridor provides the sole connection for communities such as HPP to/from Hilo. The corridor is a two-way roadway, with four travel lanes from Kea‘au-Pāhoa Bypass Road to Shower Drive. Kea‘au-Pāhoa Road drops a westbound lane at Shower Drive and drops an eastbound lane east of Puakalo Street.

The Hawai‘i Department of Transportation (HDOT) operates a northbound contraflow from 5:30 AM – 8:30 AM Mondays to Fridays, except for holidays extending from Kaloli Drive to Shower Drive/Pahaku Drive. During the AM contraflow, one of the southbound lanes is converted to a northbound lane. The only left turns allowed within the contraflow limits are at Kea‘au-Pāhoa Road and Shower Drive/Pōhaku Drive intersection. Striped and paved shoulders are present along the corridor. A varying width striped median is present in portions of the corridor. Dedicated left-turn lanes are provided along the corridor at major intersections.

Sidewalks, bike facilities, or curb and gutter do not exist. The corridor provides some direct connections to residential lots, agricultural land, and undeveloped land. The posted speed limit varies, but within the project study area is 45 miles per hour (MPH).

Kaloli Drive: Kaloli Drive extends 4.20-miles between Kea‘au-Pāhoa Road and Beach Road. All roads in HPP, including Kaloli Drive, are privately owned and maintained by HPP. Posted “PRIVATELY MAINTAINED ROADS DRIVE AT YOUR OWN RISK” signs are posted by HPPOA along Kaloli Drive. Kaloli Drive is a two-way roadway with two travel lanes. No sidewalks, bike facilities, shoulders, or curb and gutter are present along the corridor. Dedicated left-turn lanes are generally not provided along the corridor. The corridor provides direct connections to large single-family lots, as well as agricultural lands, with other portions fronting the corridor being undeveloped. The posted speed limit within the project study area is 35 MPH. “BLIND HILL AHEAD” signs are scattered along Kaloli Drive due to the rolling terrain of Kaloli Drive. Streetlights are not provided on Kaloli Drive.

25th Avenue (‘Okika Avenue): 25th Avenue extends 3.60-miles between Shower Drive and Maku‘u Drive. All roads in HPP, including 25th Avenue, are privately owned and maintained by HPP. Street name signs include “25” and “‘Okika” signs. 25th Avenue does not have a FHWA functional classification per the Fed-Aid Update, meaning it is defined as a local roadway. 25th Avenue is a two-way roadway, with two travel lanes. Sidewalks, bike facilities, shoulders, or curb and gutter do not exist along the corridor. The corridor provides direct connections to large single-family lots, as well as agricultural lands, with other portions fronting the corridor being undeveloped. 25 MPH posted speed limit signs are provided along 25th Avenue. There are no existing streetlights on 25th Avenue.

26th Avenue (‘Ōlena Avenue): 26th Avenue extends 3.60-miles between Shower Drive and Maku‘u Drive. All roads in HPP, including 26th Avenue, are privately owned and maintained by HPP. Street name signs at intersections include “26” and “‘Ōlena” signs. 26th Avenue does not have a FHWA functional classification per the Fed-Aid Update, meaning it is defined as a local roadway. 26th Avenue is a two-way roadway, with two travel lanes. Sidewalks, bike facilities, shoulders, or curb and gutter do not exist along the corridor. The corridor provides direct connections to large single-family lots, as well as agricultural lands, with other portions fronting the corridor being undeveloped. 25 and 15 MPH posted speed limit signs are provided along 26th Avenue west and east of Kaloli Drive, respectively. There are no existing streetlights on 26th Avenue.

Study Intersections

There were three existing intersections and two proposed intersections studied in the TIAR:

Kaloli Drive and Kea‘au-Pāhoa Road: Kaloli Drive at Kea‘au-Pāhoa Road is three-way intersection that is stop-controlled for the Kaloli Drive approach. There are no marked crosswalks or sidewalks at the intersection. A dedicated eastbound left turn lane is provided from Kea‘au-Pāhoa Road onto Kaloli Drive. A dedicated refuge lane is provided for southbound left turns from Kaloli Drive onto Kea‘au-Pāhoa Road. The Kaloli Drive approach is a single lane, but right turn vehicles at the intersection maneuver around left turning vehicles queued at the stop sign. This approach will be analyzed with a separate left turn and right turn lane to reflect the existing field condition.

Vehicles from Kaloli Drive onto Kea'au-Pāhoa Road may have sight distance issues due to the existing vegetation growing on the northwest corner that obstructs the view of southbound vehicles. Vehicles making left turns and right turns from Kaloli Drive were observed rolling past the stop bar frequently.

31st Avenue ('Uala Avenue) intersects Kaloli Drive about 70 feet east of Kea'au-Pāhoa Road. If there are more than three vehicles queued at the Kaloli Drive and Kea'au-Pāhoa Road intersection, left turn vehicles from 31st Avenue may have trouble turning onto Kaloli Drive. This situation was not observed during the site visit.

Kaloli Drive and 26th Avenue: Kaloli Drive and 26th Avenue is a two-way, stop-controlled (TWSC) intersection with stop control on 26th Avenue. There are no marked crosswalks or sidewalks at the intersection. Damage in the grassy shoulder area suggests vehicles parking in the shoulder along Kaloli Drive.

Kaloli Drive and 25th Avenue: Kaloli Drive and 25th Avenue is a TWSC intersection with stop control on 25th Avenue. There are no marked crosswalks, sidewalks, bike facilities, or transit facilities at the intersection. Damage in the grassy shoulder area suggests vehicles parking in the shoulder along Kaloli Drive.

26th Avenue and (future) HPP District Park South Driveway: The future HPP District Park South Driveway will be located about 700 feet southeast of Kaloli Avenue at 26th Avenue. The driveway will provide inbound access into the park.

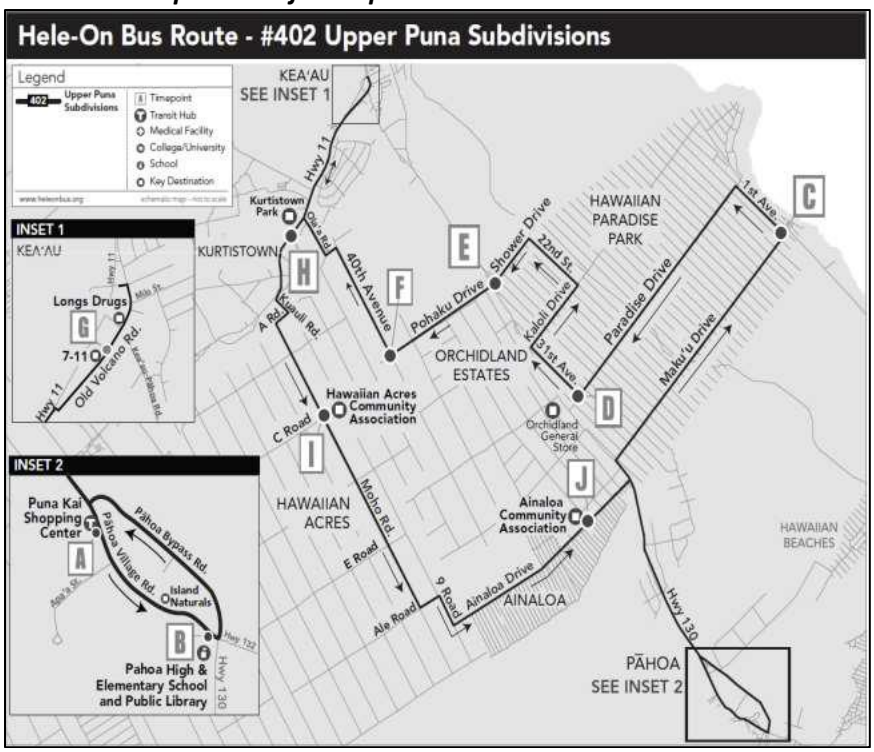
25th Avenue and (future) HPP District Park North Driveway: The future HPP District Park North Driveway will be located about 600 feet southeast of Kaloli Avenue at 25th Avenue. The driveway will be an exit only from HPP Park onto 25th Avenue. The future exit will be stop-controlled at the HPP Park exit.

Transit Facilities

Throughout the majority of HPP, sidewalks and bike facilities are not provided, including the blocks surrounding the project area.

The County of Hawai'i operates the Hele-On Bus throughout the island, of which one route operates within HPP – Route 402 (Hawaiian Paradise Park/Orchidland/Hawaiian Acres/Ainaloa) see **Figure 7**. The route runs towards Kea'au, terminating in Kea'au-town, at which point riders can connect to numerous other Hele-On Bus routes that connect elsewhere throughout the island, including Hilo. Various County of Hawai'i Bus stops are located within HPP, including three along Kaloli Drive; however, these stops are not signed and do not provide any rider facilities. Route 402 operates every other hour, with the first bus arriving at stops along Kaloli Drive just after 6:00 AM, and the last bus arriving just after 8:00 PM, Monday through Saturday. Riders can flag the bus along its route at safe intersections where the bus can safely pull over. Effective February 27th, 2022, County of Hawai'i Bus fares are free through December 31st, 2025.

Figure 7. Route 402 Route Map and Major Stop Locations



Vehicle Volumes

Historic HDOT Annual Average Daily Traffic (AADT) counts on Kea'au-Pāhoa Road between Shower Drive and Pōhaku Place were available from 2013 to 2021, except for 2017. The 2020 and 2021 AADT were lower than the 2013 AADT, likely due to the impact of the COVID-19 pandemic restrictions and were not used in the analysis. The historic HDOT AADT counts are shown in **Table 4**.

Table 4. Kea'au-Pāhoa Road 24-Hour Historical Volumes

Year	AADT
2013	23,300
2014	24,400
2015	20,000
2016	23,300
2017	--
2018	22,000
2019	26,700
2020	21,500
2021	23,100

Existing Level of Service

Level of service (LOS) is a rating system used in traffic engineering to measure the effectiveness of roadway operating conditions (see **Table 5**). There are six LOS ratings from A to F. LOS A is defined as being the least interrupted flow conditions with little or no delays; LOS F is defined as conditions where

extreme delays exist. Guidelines state that LOS D or better is appropriate for the study intersections and movements.

As stated in the Highway Capacity Manual, Sixth 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, shown in **Table 5**. 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 and 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. As stated in the HCM6 (TRB, 2016), roundabouts share the same control delay thresholds as AWSC and TWSC intersections.

Table 5. LOS Criteria for Unsignalized Intersections

Average Control Delay (sec/veh)	LOS by v/c Ratio	
	≤1.0	>1.0
≤10.0	A	F
>10.0 and ≤15.0	B	F
>15.0 and ≤25.0	C	F
>25.0 and ≤35.0	D	F
>35 and ≤50	E	F
>50	F	F

Source: HCM6 (TRB, 2016)

The LOS analysis for signalized intersections is determined by average total vehicle delay based on the methodologies of the HCM6 (TRB, 2016), shown in **Table 6**. High numbers of vehicles passing through the intersection, long cycle lengths, inappropriate signal phasing, or poor signal progression can result in long delays, and consequently poor LOS.

Table 6. LOS Criteria for Signalized Intersections

Average Control Delay (sec/veh)	LOS by v/c Ratio	
	≤1.0	>1.0
≤10.0	A	F
>10.0 and ≤20.0	B	F
>20.0 and ≤35.0	C	F
>35.0 and ≤55.0	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, which 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. 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 (LOS F).

Existing LOS and delay (in seconds per vehicle) were determined for the AM and PM peak hours using Synchro 11.0 and SimTraffic traffic analysis software. **Table 7** shows the existing vehicular delay and LOS at each intersection, with the shaded rows indicating the overall intersection delay (applicable at signalized intersections only). Movements that operated at LOS E/F or v/c ≥ 1.0 are highlighted in red.

Table 7. Existing (2023) LOS

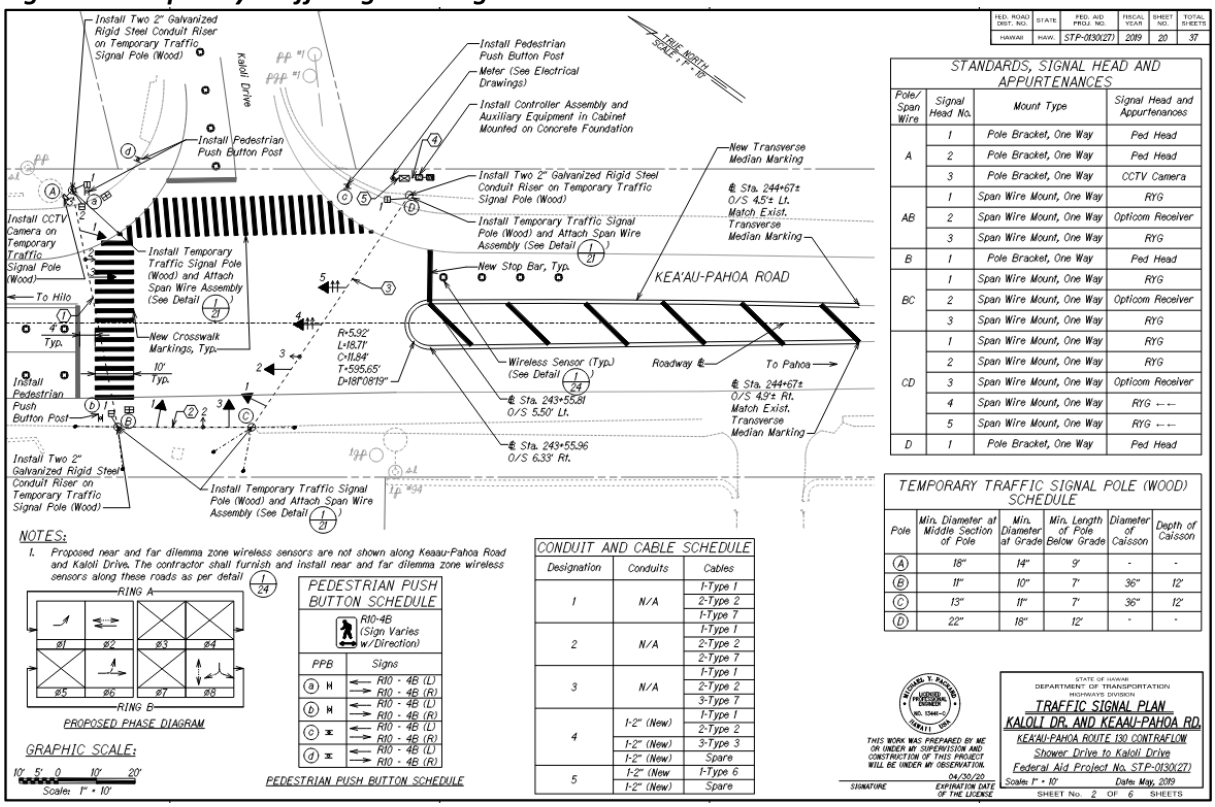
Intersection	AM LOS	AM Delay (sec/veh)	AM v/c	PM LOS	PM Delay (sec/veh)	PM v/c
Kea'au-Pāhoa Rd &Kaloli Dr	**-**	**48.8**	**-**	**-**	**2.8**	**-**
Kea'au-Pāhoa Rd EB Left	B	10.6	0.25	12.0	0.55	B
Kea'au-Pāhoa Rd EB Through	Free Movement			Free Movement		
Kea'au-Pāhoa Rd West WB Through-right	Free Movement			Free Movement		
Kaloli Dr South-Bound SB Left	C	22.6	0.16	D	34.6	0.16
Kaloli Dr SB Right	F	187.3	1.32	B	13.8	0.26
Kaloli Dr & 26th Ave	**-**	**1.4**	**-**	**-**	**0.**	**-**
26th Ave EB Left-Through-Right	B	10.6	0.03	B	11.9	0.03
26th Ave WB Left-Through-Right	B	13.0	0.07	B	13.9	0.04
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.6	0.01
Kaloli Dr SB Left-Through-Right	A	7.5	0.00	A	8.1	0.00
Kaloli Dr & 25th Ave	**-**	**0.9**	**-**	**-**	**2.6**	**-**
25th Ave EB Left-Through-Right	B	10.6	0.03	C	17.1	0.09
25th Ave WB Left-Through-Right	B	12.0	0.03	C	12.6	0.00
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.7	0.01
Kaloli Dr SB Left-Through-Right	A	0.0	0.00	A	8.2	0.00

**North-Bound (NB), South-Bound (SB), East-Bound (EB), West-Bound (WB)*

Signalization of Kea'au-Pāhoa Road

Research was completed on October 31, 2023, at the Statewide Transportation Improvements Program (STIP) fiscal year (FY) 2022-2025 website. The STIP is a four-year forecast that identifies state and county transportation projects to be funded with Federal Highway and Federal Transit funds. The latest Revision #15 Amendment was approved and effective starting on September 12, 2023. The Kea'au-Pāhoa Road (Route 130) Improvements project from Kea'au Bypass to Pāhoa-Kapoho Road Project (Modernization Project Number HS 17) Phase 2 proposes to widen Kea'au-Pāhoa Road from Shower Drive to Kaloli Drive and signalize Kea'au-Pāhoa Road at Kaloli Drive. This project is scheduled for construction in 2026. **Figure 8** is a temporary traffic signal design from May 2019 at Kea'au-Pāhoa Road at Kaloli Drive.

Figure 8. Temporary Traffic Signal Design at Kea'au-Pāhoa Road and Kaloli Drive



Projected Traffic Volumes

Traffic analysis was completed for the Future (2028) Without Project and With Project conditions. Future (2028) traffic volumes were calculated with and without the signalized intersection improvements for Kea'au-Pāhoa Road as planned by the Statewide Transportation Improvements Program. In addition, the projections also considered the anticipated impact from the Kea'au Village Master Plan Phase 1 project. A 1.82% annual growth rate was applied to Kea'au-Pāhoa Road based on historic HDOT AADT from 2013-2019 on Kea'au-Pāhoa Road between Shower Drive and Pōhaku Place.

The study noted the opportunity to adjust the signal timing of this intersection with a four second delay to improve the LOS of the right turn from Kaloli Drive onto Kea'au-Pāhoa Road. Without these improvements the traffic volume did not maintain adequate LOS for both the Proposed Action and No-Action Alternative. However, with the additional consideration of the planned Kea'au-Pāhoa Road signalized intersection and the adjustments to signal timing, LOS remained within acceptable standards.

Consultation for the Draft Environmental Assessment for the Proposed Action revealed some community concern for traffic and pedestrian safety in the immediate area of the project site. This included concerns about parking on the shoulder of Kaloli Drive, drivers obeying stop signs, and foot traffic from nearby residents traversing to the park. HPP currently lacks sidewalks, crosswalks and other pedestrian safety infrastructure which can pose safety risks. This is particularly true for pedestrians and fast moving traffic along Kaloli Drive. Although street improvements fall outside the scope of this project, coordinative

measures with the HPPOA may help to ensure that appropriate measures are taken to ensure community safety.

3.9.2 Potential Impacts

Construction

Proposed Action

The Proposed Action would have minor, short-term direct and indirect impacts on traffic from project-related vehicles, equipment, materials delivery, and personnel access to the project site. It is expected that if personnel and project equipment and materials would be traveling to the site from Hilo; they would travel in the opposite direction of the AM/PM peak hours.

No-Action Alternative

Under the No-Action Alternative there would be no construction related impacts to traffic within the vicinity of the project area. Traffic projections from the TIAR indicate that background growth will continue to occur which would exasperate existing traffic conditions overtime if no minimization measures are taken.

Operation

Proposed Action

The TIAR projected that the project conditions would result in the Kaloli Drive South Bound, right turn traffic to exceed a v/c ratio of 1.00 and LOS F in peak hours resulting in projected delays of 111.6 seconds. This is a moderate increase in delay from projected traffic flows without project conditions by 2028, which are projected to also exceed a v/c ratio of 1.00 and LOS F in peak hours regardless of implementation of the Proposed Action. Potential mitigative treatments should be considered by the State of Hawai'i Department of Transportation to alleviate these impacts through intersection improvements on the Kea'au-Pāhoa Road. **Table 8** displays the traffic flow with the Proposed Action.

Table 8. Future (2028) With Proposed Action

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**D**	**42.8**	**-**	**B**	**12.0**	**-**
Kea'au-Pāhoa Rd EB Left (protected and permitted)	C	24.9	0.83	B	11.1	0.68
Kea'au-Pāhoa Rd EB Through	A	8.9	0.63	B	11.2	0.90
Kea'au-Pāhoa Rd West WB Through-right	C	32.8	0.93	B	11.2	0.70
Kaloli Dr South-Bound SB Left	C	24.5	0.09	C	25.2	0.10
Kaloli Dr SB Right (permitted and overlap)	F	111.6	1.14	C	21.9	0.45
Kaloli Dr & 26th Ave	**-**	**1.5**	**-**	**-**	**1.0**	**-**
26th Ave EB Left-Through-Right	B	11.5	0.04	B	13.3	0.06
26th Ave WB Left-Through-Right	B	13.8	0.07	B	15.0	0.05
Kaloli Dr NB Left-Through-Right	A	8.0	0.02	A	7.7	0.01
Kaloli Dr SB Left-Through-Right	A	7.6	0.01	A	8.2	0.01
Kaloli Dr & 25th Ave	**-**	**1.0**	**-**	**-**	**3.0**	**-**
25th Ave EB Left-Through-Right	B	10.8	0.03	C	19.0	0.11

25th Ave WB Left-Through-Right	B	12.6	0.04	B	13.7	0.27
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.8	0.01
Kaloli Dr SB Left-Through-Right	A	0.0	0.00	A	8.3	0.01
26th Ave & HPP District Park South Driveway	-	1.3	-	-	1.3	-
26th Ave EB Left-Through	A	7.4	0.01	A	7.4	0.01
26th Ave WB Through-Right	Free movement			Free movement		
HPP District Park North Driveway & 25th Ave	-	3.4	-	-	4.0	-
HPP District Park North Driveway NB Left-Right	A	8.5	0.01	A	9.0	0.10

There is an opportunity to adjust the signal timing to provide more green time for the southbound approach by taking green time from the eastbound and westbound approaches. The expected result is to improve the southbound movement, while adding some delay to the eastbound and westbound approaches during peak AM hours, but still maintaining an acceptable LOS for all movements. **Table 9** shows the future projected LOS with the Proposed Action with a 4 second signal delay timing adjustment that permits more time for the southbound right turn on Kea'au-Pāhoa Road from Kaloli Drive.

Table 9. Future (2028) with Proposed Action and Signal Timing Adjustment

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**D**	**42.8**	**-**	**B**	**12.0**	**-**
Kea'au-Pāhoa Rd EB Left (protected and permitted)	C	24.9	0.83	B	11.1	0.68
Kea'au-Pāhoa Rd EB Through	A	8.9	0.63	B	11.2	0.90
Kea'au-Pāhoa Rd West WB Through-right	C	32.8	0.93	B	11.2	0.70
Kaloli Dr South-Bound SB Left	C	24.5	0.09	C	25.2	0.10
Kaloli Dr SB Right (permitted and overlap)	F	111.6	1.14	C	21.9	0.45
Kea'au-Pāhoa Rd & Kaloli Dr (+4 second SB approach in AM peak)	**C**	**33.2**	**-**	**B**	**12.0**	**-**
Kea'au-Pāhoa Rd EB Left (protected and permitted)	C	29.9	0.85	B	11.1	0.68
Kea'au-Pāhoa Rd EB Through	B	10.7	0.65	B	11.2	0.90
Kea'au-Pāhoa Rd West WB Through-right	D	42.8	0.96	B	11.2	0.70
Kaloli Dr South-Bound SB Left	C	22.2	0.08	C	25.2	0.10
Kaloli Dr SB Right (permitted and overlap)	D	51.1	0.96	C	21.9	0.45

It is also anticipated that the Proposed Action would have beneficial impacts to traffic elsewhere in the district as HPP residents would not have to travel to and from nearby public parks to seek recreational opportunities. The County of Hawai'i Mass Transit Agency currently operates a bus route along Kaloli Drive, it would also be beneficial to provide a bus stop within or along the perimeter of the proposed HPP District Park both for transit commuters and students. This would improve access to the services and amenities located within the park as well as provide more safe transit options for the community.

No-Action Alternative

Under the No-Action Alternative there would be no park operating at the project site and therefore no induced traffic or pedestrian activity in the area related to park usage. **Table 10** displays the future projected traffic flow with the No-Action Alternative, or without build out of the Proposed Action. This

assumes the completion of a signalized intersection at Kea 'au-Pāhoa Road and Kaloli Drive per State Department of Transportation plans.

Table 10. Future (2028) With No-Action Alternative

Intersection	AM LOS	AM Delay (sec/veh)	AM v/c	PM LOS	PM Delay (sec/veh)	PM v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**C**	**33.5**	**-**	**B**	**11.9**	**-**
Kea'au-Pāhoa Rd EB Left (protected and permitted)	C	20.4	0.77	B	10.7	0.66
Kea'au-Pāhoa Rd EB Through	A	8.3	0.60	B	11.1	0.90
Kea'au-Pāhoa Rd West WB Through-right	C	28.3	0.91	B	10.9	0.69
Kaloli Dr South-Bound SB Left	C	21.9	0.09	C	25.2	0.10
Kaloli Dr SB Right (permitted and overlap)	F	79.8	1.06	C	22.0	0.45
Kaloli Dr & 26th Ave	**-**	**1.4**	**-**	**-**	**0.9**	**-**
26th Ave EB Left-Through-Right	B	10.8	0.03	B	12.2	0.04
26th Ave WB Left-Through-Right	B	13.5	0.07	B	14.7	0.04
Kaloli Dr NB Left-Through-Right	A	8.0	0.02	A	7.7	0.01
Kaloli Dr SB Left-Through-Right	A	7.5	0.01	A	8.2	0.01
Kaloli Dr & 25th Ave	**-**	**0.9**	**-**	**-**	**2.6**	**-**
25th Ave EB Left-Through-Right	B	10.8	0.03	C	18.2	0.10
25th Ave WB Left-Through-Right	B	12.4	0.03	B	13.1	0.22
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.8	0.01
Kaloli Dr SB Left-Through-Right	A	0.0	0.00	A	8.3	0.00

3.9.3 Avoidance and Minimization Measures

Minimization measures were recommended in the TIAR for both the Proposed Action and the No-Action Alternative meaning that future traffic in the area of the project is projected to increase over time and lead to reduced LOS due to background population growth. It recommended that the Kea'au-Pāhoa Road intersection be signalized per the STIP, with traffic signal phasing to include protected and permitted eastbound left turns and permitted and overlap southbound right turns. An overlap phase would require a dedicated right turn lane and a dedicated left turn lane for the protected left turn on the cross street. In addition, the TIAR recommended that the Kaloli Drive approach be restriped to have dedicated left turn and right turn lanes. It was observed that the left turn vehicles do not impede right turning vehicles at the Kaloli Drive approach. Signal timing can be adjusted as necessary to improve the southbound approach while still maintaining an acceptable LOS for all movements.

3.10 Socioeconomics

3.10.1 Affected Environment

The Proposed Action is located within the Puna District of the island of Hawai'i. As of the 2020 Decennial Census, the Puna district consists of ten census tracts that form the Kea'au-Mountain View and Pāhoa-Kalapana Census County Divisions (CCD). Over the past few decades, the Puna District has experienced rapid population growth compared to other districts in Hawai'i County as shown in **Table 11**. The Kea'au-Mountain View and Pāhoa-Kalapana CCDs had 51,704 residents combined in 2020, which made up

approximately 26% of the total population of Hawai‘i County. The Project Site is located within the Kea‘au-Mountain View CCD which has been experiencing the largest rate of growth of all CCDs in Hawai‘i County for the past two decades.

Table 11. Population Numbers

Census County Division (CCD)	2000	2010	Percent Change 2000-2010	2020	Percent Change 2010-2020
Kea‘au-Mountain View	***22,738***	***34,266***	***50.70%***	***41,210***	***20.26%***
Pāhoa-Kalapana	8,597	11,060	28.65%	10,494	-5.12%
Hilo	42,425	45,714	7.75%	46,118	0.88%
Papaikou-Wailea	4,961	5,213	5.08%	5,433	4.22%
North Hilo	1,720	2,041	18.66%	2,114	3.58%
Pa‘auhau-Pa‘auilo	2,213	2,588	16.95%	2,678	3.48%
Honoka‘a-Kukuihaele	3,895	3,925	0.77%	4,212	7.31%
North Kohala	6,038	6,322	4.70%	6,979	10.39%
South Kohala	13,131	17,627	34.24%	19,310	9.55%
North Kona	28,543	37,875	32.69%	43,313	14.36%
South Kona	8,589	9,997	16.39%	9,789	-2.08%
Ka‘ū	5,827	8,451	45.03%	8,979	6.25%
Hawai‘i County	148,677	185,079	24.48%	200,629	8.40%
Hawai‘i State	1,211,537	1,360,301	12.28%	1,455,271	6.98%

Source: US Census (2000, 2010, 2020)

Socioeconomic data indicates that the Puna district experiences significant relative poverty levels as compared to other Hawai‘i County and State districts. According to the 2021 American Community Survey (ACS), the Kea’au-Mountain View had the 4th highest percentage of households under the federal poverty line in Hawai‘i County. The percentage of households in poverty within the Puna district is among the highest in the entire state of Hawai‘i. In particular, out of the 42 CCDs in the State of Hawai‘i, the Pāhoa-Kalapana CCD had the highest percentage of households in poverty in 2021 and the Kea’au-Mountainview CCD had the 9th highest.

The Hawai‘i Island United Way maintains a socioeconomic index called ALICE (Asset Limited, Constrained, Employed), specifically created to capture household financial hardship that may not be apparent when considering poverty rates alone. ALICE factors the location-specific cost of living and calculates the minimum household income necessary to cover basic survival expenses. Households that are below the ALICE threshold consistently struggle to make ends meet and potentially forego basic needs in the event of an unanticipated expense. As shown in **Table 12**, ALICE estimates indicate that 54% in the Kea‘au-Mountain View CCD do not meet the survival budget threshold. This percentage is higher than Hawai‘i County and State averages.

Table 12. Household Poverty

Census County Division (CCD)	% Households Below Poverty Line	% Households Below ALICE*	Median Household Income
Kea‘au-Mountain View	***15.3***	***54***	***$60,875***
Pāhoa-Kalapana	23.7	67	$39,663
Hilo	15.8	46	$69,613
Papaikou-Wailea	13.4	46	$70,769
North Hilo	18.7	61	$51,488
Pa‘auhau-Pa‘auilo	14.9	53	$61,050
Honoka‘a-Kukuihaele	5.4	52	$61,275
North Kohala	9.2	38	$85,313
South Kohala	9.0	36	$87,639
North Kona	10.1	41	$80,125
South Kona	11.7	44	$69,078
Ka‘ū	23.0	69	$38,505
Hawai‘i County	**13.8**	**31**	**$68,399**
Hawai‘i State	**9.5**	**30**	**$88,005**

Source: ACS 2021 5-year estimates, 2021 inflation-adjusted dollars
**Source: Hawai‘i Island United Way ALICE (2021)*

In the Kea‘au-Mountain View CCD, White and Asian population percentages align closely with the average for Hawai‘i County, with a higher concentration of Native Hawaiian or Other Pacific Islander residents, as shown in **Table 13**. These three racial groups (White, Asian, and Native Hawaiian or Other Pacific Islander) combined with those identifying as two or more races represented a broad majority of the population in the Kea‘au-Mountain View CCD. Black/African American, Native American/Alaska Native, and Some Other Race categories represented between 1% and 3% of the population.

Table 13. Racial Demographics

	White	Asian	Native Hawaiian or Other Pacific Islander	Two or More Races
Kea‘au-Mountain View CCD	***31.28%***	***18.13%***	***15.11%***	***32.00%***
County	32.58%	22.08%	12.02%	29.81%
State	23.69%	37.47%	10.56%	24.42%

Source: ACS 2021 5-year estimates

3.10.2 Potential Impacts

Construction

Proposed Action

Construction of the Proposed Action would not increase the population of the area, nor would it have a substantial adverse effect on the economic or social welfare of the community or State. Construction would result in temporary, positive economic activity in the form of construction jobs and material procurements.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no construction-related socioeconomic impacts.

Operation

Proposed Action

The establishment of the HPP District Park would provide sporting and recreational facilities aimed at enriching the lives of residents in the surrounding area. The implementation of the park would satisfy a longstanding community demand and significantly enhance the quality of life for surrounding residents.

Public outreach efforts that were conducted during the creation of the HPP District Park Master Plan confirmed the demand for having convenient access to recreational amenities. The features in the park design were intentionally proposed to satisfy needs that were heard in the public engagement events. Some features, such as the pickleball courts are proposed to provide an outlet for park users of varying degrees of mobility. The park would offer a safe space for keiki (children) to play, socialize, and engage in sporting activities. For older kids and teens, the park would offer a space for teams to practice and participate in sporting events or celebratory events. Kupuna (seniors), among other park users, could enjoy the walking path that would encircle the outside perimeter of the park or the swimming pools. Sporting events could be hosted that would allow that would range from sporting activities for keiki (children), competition fields for teens and adult sporting clubs, to walking paths and swimming for kupuna (seniors).

The HPP District Park would be a substantial contribution to the community's vision for a vibrant and inclusive community gathering space. Research has also shown that households within a close proximity to good quality park facilities have better mental and physical health outcomes. Similarly, people of lower socioeconomic status typically have less access to parks and recreational facilities (Rigolon, 2016). The HPP District Park would be an action to reduce inequities in Hawai'i County and is anticipated to have overall positive, long-term impacts on the surrounding community.

It is important to consider the potential impact the Proposed Action could have on properties within HPP subdivision, especially for properties close to the proposed project site. Although developing a park at this location is identified as a preferred future development in the Puna Community Development Plan and other previous planning efforts, the increased certainty of its implementation could drive up property values. This has the potential effect to fuel real estate speculation in the area due to this new amenity. This dynamic could alter the fabric of the surrounding community, as the likelihood of property turnover increases. Increased home values could raise property taxes and rent, potentially resulting in gentrification and displacement, particularly for homeowners with slim financial margins or who rent property close to the project site. Of course, a raise in property values also has the potential to benefit homeowners, although it is important to weigh such benefits through an equity lens. It is important, therefore, to engage with surrounding residents throughout the process with open dialogue to mitigate such possibilities. Minimization measures regarding this issue are discussed in **Section 3.10.3.**

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be in operation; therefore, the benefits associated with the Proposed Action would not occur. The population would continue to grow in HPP as the Puna district is the fastest growing district in the County. HPP residents would have less options for recreational activities and other recreational facilities in the district would have to accommodate the needs of this subdivision which could make these facilities more crowded. Quality of life could be diminished for Puna residents that use such facilities and for HPP residents who would not have their own County operated park. The needs of HPP residents who lack transportation opportunities to reach recreational facilities in Kea'au or Pāhoa would not be met, resulting in a lack of access to an important resource for health and overall recreational needs.

3.10.3 Avoidance and Minimization Measures

The planning process of the HPP District Park would include continued open and transparent dialogue with possible affected property owners to identify and develop strategies to minimize adverse impacts. Such collaborative efforts would aim to better understand and respect existing neighborhood dynamics and sense of place to promote balance between new amenities and the surrounding residential area.

3.11 Public Facilities and Services

3.11.1 Affected Environment

Utilities

There is no domestic water service serving the project site. An extension of the municipal water supply system from the intersection of Kea'au-Pahoa Road and Kaloli Drive to the park site is recommended. The existing water system has available capacity to meet the potable water demands and the fire flow protection requirements for the Proposed Action. A municipal water supply extension would provide a safe and reliable water source, adequate fire protection for the proposed site and improving fire protection for the local community.

There is no County sewer system in the vicinity of the Project Site. Design and construction of the Proposed Action would include an approved Individual Wastewater System (IWS) consisting of a septic tank and leach field system. A permit from the DOH, Wastewater Division, would be required.

Hawai'i Electric Light Company (HECO) is the sole electric utility on the island. Hawaiian Telecom (HTCO) and Charter Communications both offer broadband, cable television and telephone signals. HECO's, HTCO's, and Charter Communication's existing facilities serv-ing the HPP subdivision consist of aerial cables attached to joint overhead pole lines along most of the privately owned roadways. Based on current technologies, both HTCO and Charter Communications would likely provide service to this project via fiber optic cable.

Further inquiry with HECO will be required to determine if their existing overhead distribution system has sufficient capacity to serve the proposed park. The worst-case scenario is that HECO would need to upgrade its existing Ha-waiian Paradise Park substation transformer and re-conductor portions of their

overhead distribution system in order to support the new park. If the worst-case scenario requires implementation, discussions between the County and HECO would need to occur. On-site electric and telecommunications systems would be developed during design.

Police

The Hawai'i Police Department (HPD) is the Island of Hawai'i's primary law enforcement agency. The department provides 24-hour service in all districts. The department is divided into two "Areas": Area I – East Hawai'i and Area II – West Hawai'i. The project site is located in Area I, which includes the Hāmākua, North Hilo, South Hilo, and Puna districts. The Puna Patrol Division is the second largest patrol division in Area I followed by the South Hilo Patrol Division. The 683-square-mile area is covered by 24-hour police service at a ratio of approximately one officer per 750 people. The Puna Patrol Division has 69 sworn officers and three civilians (HPD, 2021). There are two police stations with a similar distance to the Project Site. The Kea'au Station is located at 16-0579 Old Volcano Road, Kea'au, and is approximately 5.5 miles from the Project Site; and the Pāhoa Station located at 15-2615 Pāhoa Village Road, and is approximately six (6) miles from the Project Site.

Fire

The County of Hawai'i Fire Department (HFD) is responsible for fire protection and suppression, pre-hospital emergency medical services, land and sea search and rescue, hazardous materials response, ocean safety, and fire prevention and public education for the County. HFD is comprised of 38 fire stations (20 paid fire stations and 18 volunteer fire stations), 16 ambulances, two (2) ladder trucks, two (2) helicopters, four (4) boats, two (2) hazmat vehicles, two (2) heavy rescue vehicles, two (2) light rescue vehicles, and five (5) rescue watercraft. HFD is divided into two Battalions: Battalion 1 – East Hawai'i and Battalion 2 – West Hawai'i (HFD, 2021). The nearest fire station is the HPP Fire Station (Station 18), which contains a fire truck, brush truck, and EMS unit and 4-5 career personnel. It is located at 15-1575 Paradise Drive, approximately 1.5 miles from the Project Site.

Medical Services

There is one hospital in Hilo: the Hilo Medical Center. The Medical Unit consists of 46 beds and cares for patients with a variety of medical conditions. The Progressive Care Unit is a 15-bed telemetry monitoring unit that offers a comprehensive range of diagnostic and interventional services. The hospital also consists of an imaging department, maternity ward, intensive care unit, rehabilitation services, and a pharmacy (Hawai'i Health Systems Corporation, 2021). The Hilo Medical Center is located at 1190 Waianuenue Avenue approximately 15 miles north-west of the Project Site.

The locations of nearby police stations, fire stations, and hospital are shown in **Figure 9.**

Schools

There are 40 public schools operated by the State Department of Education on the Island of Hawai'i: 23 kindergarten through 5th/6th grade, three (3) kindergarten through 8th/9th grade, five (5) 6th/7th through 8th grade, six (6) 9th through 12th grade, two (2) 7th through 12th grade, and one kindergarten through 12th grade. In addition, there are 15 public charter schools (three (3) elementary/intermediate and 12 high

school grade levels), 16 private schools (seven serving through 12th grade), and two (2) community schools (i.e., adult education) on the island of Hawai‘i.

The Project Site is located within the Ka‘ū-Kea‘au-Pāhoa Complex Area of the State of Hawai‘i Department of Education. In the 2021-2022 school year, there were approximately 2,627 elementary school students, 1,227 middle school students, and 1,573 high school students in the Ka‘ū-Kea‘au-Pāhoa Complex Area (DOE, 2023). The Project Site is served by Keonepoko Elementary and Pāhoa High and Intermediate School which are shown in **Figure 10**.

Recreation Areas

There are eleven (11) recreational facilities in the Puna district: A.J. Watt Gym, Glenwood Park, Hawaiian Beaches Park, Herbert Shipman Park, Isaac Kepo‘okalani Hale Beach Park, Kahakai Park, Kea‘au Community Center, Kurtistown Park, Mountain View Park, William “Billy” Kenoi District Park, and the Volcano Park (see **Figure 11**). Currently, these recreational facilities service a population of over 50,000 people who live in the district. According to the Hawai‘i County Code, Chapter 8, Article 1, Park Dedication Code, Section 8-6, Population Density Requirements, there shall be a minimum ratio of five (5) acres of land for park and playground purposes for each one thousand persons in every district. This would include Federal, State, County, and privately owned parks of which the County does not have a sum of the complete parks acreage in Puna. According to the U.S. Census, the population of HPP in 2020 was approximately 14,482. A 2005 HPP Master Plan published by the HPPOA estimated that full buildout of the subdivision would result in a population of 30,000 people. The current HPP Community Park, operated by the HPPOA and the Proposed Action would contribute toward meeting that the Park Dedication Code standard for the current population and into the future.

Table 14. County of Hawai‘i Department of Parks and Recreation Puna Facilities

Facility	Tax Map Key
A.J. Watt Gym	1-8-002:049
Glenwood Park	1-8-009:023
Hawaiian Beaches Park	1-5-067:037; 1-5-083:037
Herbert Shipman Park • Buddy Perry Soccer Field • Kea‘au Armory	1-6-003:007 (portion), 058, 086
Isaac Kepo‘okalani Hale Beach Park	1-3-008:014. 016, 021, 033; 1-4-093:048
Kahakai Park	1-5-063:001
Kea‘au Community Center	1-6-143:041
Kurtistown Park	1-7-003:019
Mountain View Park	1-8-004:030
William “Billy” Kenoi District Park • Ginny Aste Skate Park • Pāhoa Aquatic Center • Pāhoa Neighborhood Facility • Pāhoa Senior Center	1-5-002:020
Volcano Park	1-9-003:017

Figure 9. Public Services and Facilities

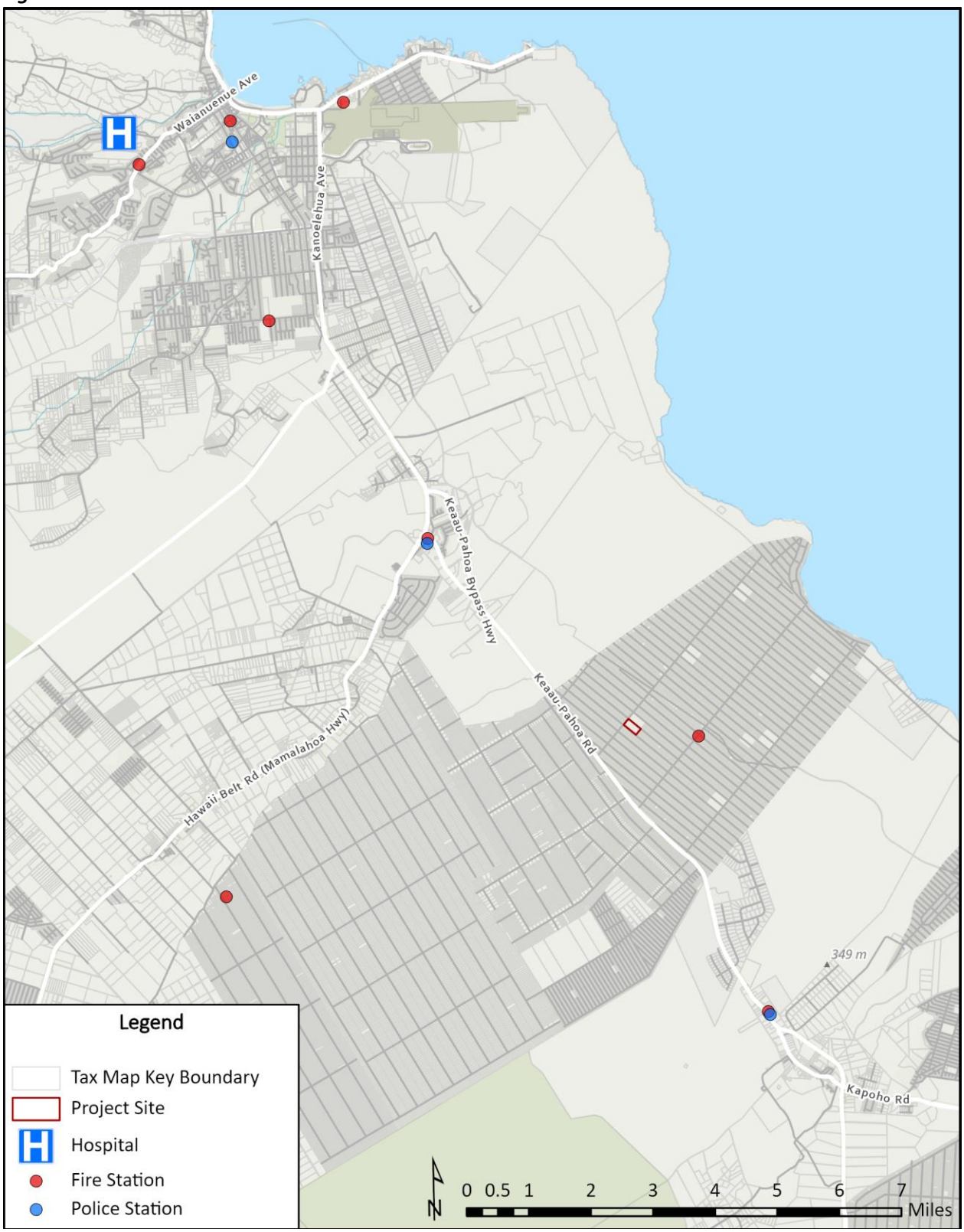


Figure 10. Schools

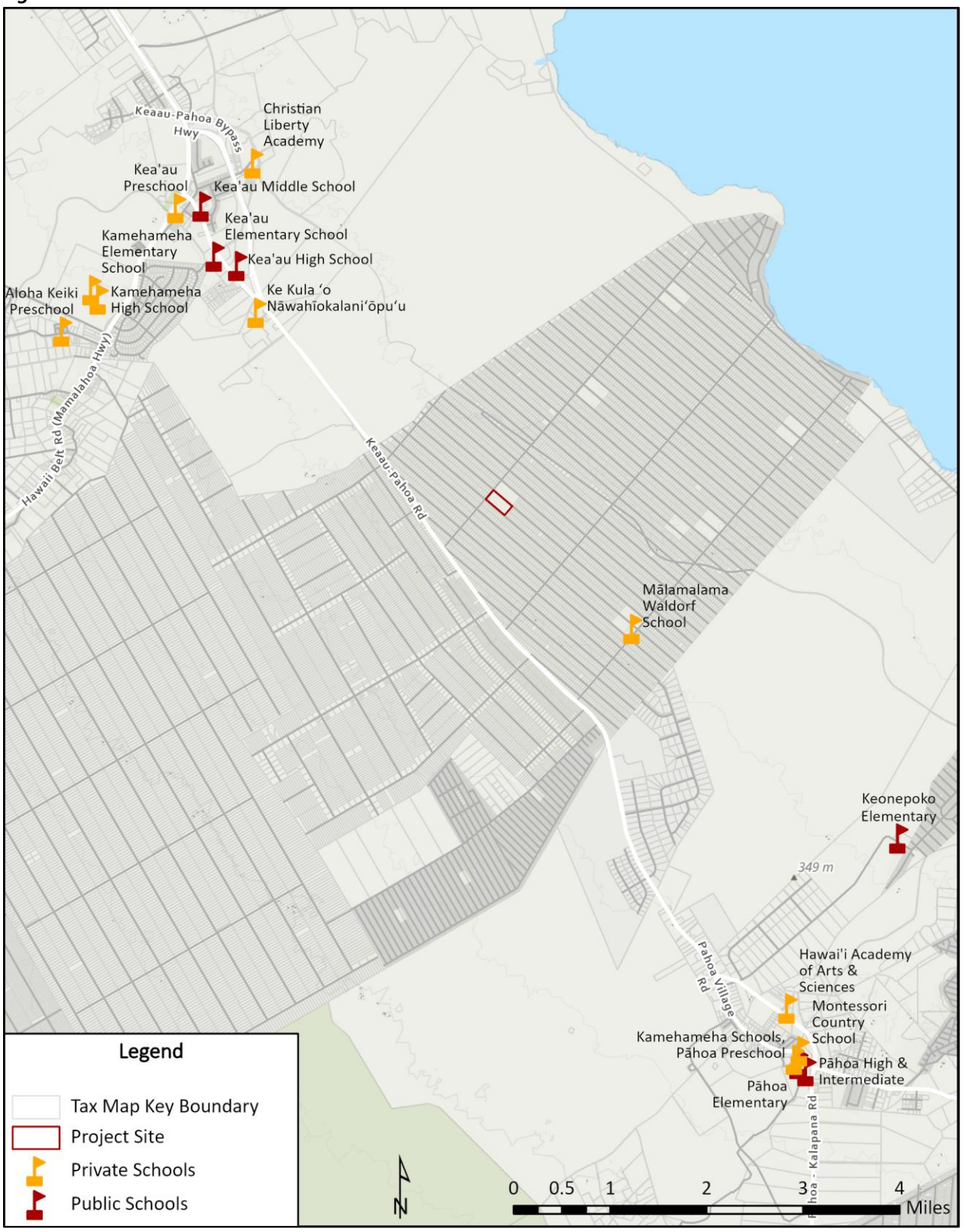
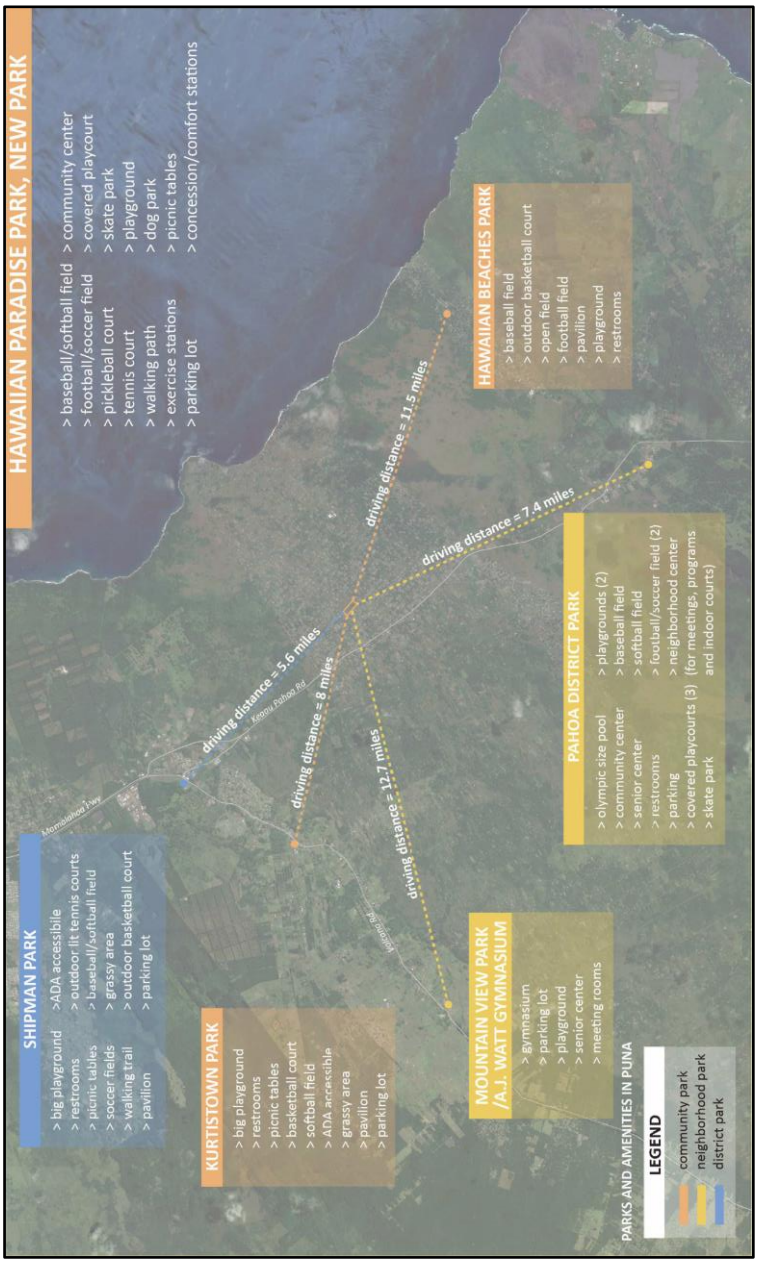


Figure 11. Puna District Recreational Facilities



Source: HPP District Park Master Plan (2018)

3.11.2 Potential Impacts

Construction

Proposed Action

The Proposed Action would include establishing new connections for on-site utilities. The contractor would coordinate with the utility companies to ensure any interruptions in service, if any, are minor.

It is not anticipated that construction activities associated with the Proposed Action would result in an increase in calls for fire, police, or medical services. If an incident were to occur during construction that required emergency services, the level of demand could be met by the existing emergency service providers in Hilo.

Construction of the Proposed Action would be completed by a local workforce; therefore, there would not be an influx of school-aged children and there would be no impact to schools.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no construction-related impacts to public facilities and services.

Operation

Proposed Action

Operation of the Proposed Action would not have an impact on local utilities.

The Proposed Action is not anticipated to result in an increase in calls for fire, police, or medical services. If an incident were to occur during construction that required emergency services, the level of demand could be met by the existing emergency service providers in Puna and Hilo.

The Proposed Action would provide a venue with several sporting and recreational facilities that could be utilized for school sports, Summer Fun, and other programs, which could increase the capacity of these services for school-aged children. The development of community and County recreational programs and sports activities also contributes positively to the pool of athletes pursuing school athletic participation and creates opportunities for athletes to pursue career opportunities in athletics, both abroad and locally through coaching and fitness programs. The Proposed Action would contribute toward the recreational needs of the Puna district population by providing this additional service within the HPP subdivision.

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be in operation; therefore, there would be no impacts to public facilities and services. HPP residents would continue to drive five (5) to 12 miles to get to recreational facilities in the Puna district which have limited capacity to support a growing population. HPP residents would have reduced options for after school and summer fun programs which benefit the lives of school children by providing safe places to spend their time in a structured environment. HPP residents would utilize other recreational facilities in the Puna District, reducing the capacity for such facilities to serve the needs of these communities.

3.11.3 Avoidance and Minimization Measures

The following measures would be implemented to avoid and minimize potential impacts to public facilities and services:

- The contractor shall contact Hawai'i One Call Center at least five (5) days prior to the start of work to have respective utility companies locate and mark where their underground utilities are located.
- The contractor shall coordinate and schedule all work with agencies and utility companies. All utility work with underground installations would be completed prior to paving work.
- Grubbed material would be disposed of in accordance with regulations of the DEM, Solid Waste Division. All wastes generated by construction would be disposed of at the West Hawai'i Sanitary Landfill.
- Sanitary waste would be collected from the portable units a minimum of once per week, or as required.

3.12 Natural Hazards

3.12.1 Affected Environment

The island of Hawai'i is susceptible to potential natural hazards, including flooding, earthquakes, hurricanes and tropical storms, tsunami, lava flows, and wildfires. The Hawai'i Emergency Management Agency operates a system of civil defense sirens throughout the state to alert the public of emergencies and natural hazards, especially tsunamis and hurricanes.

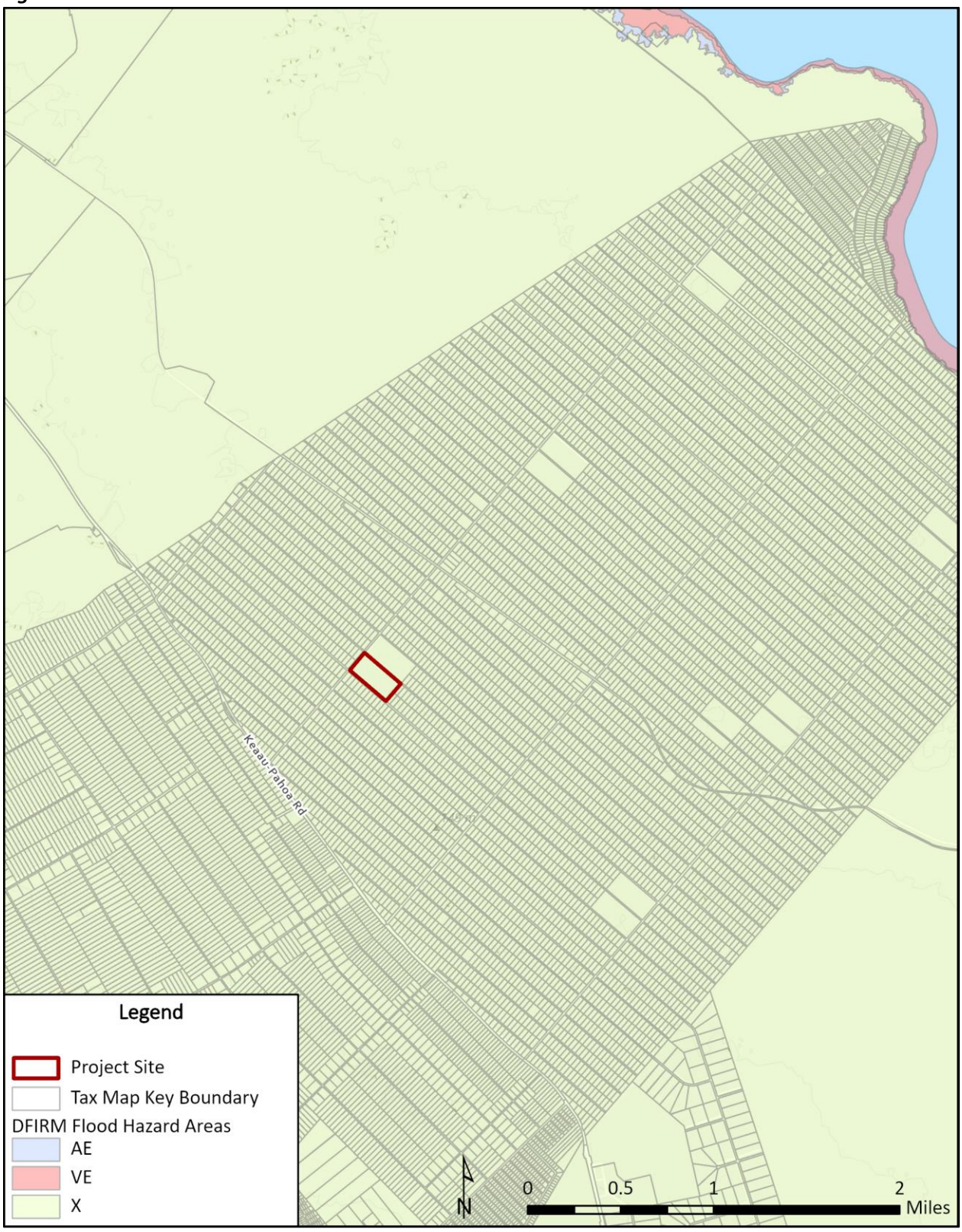
Floods

The Federal Emergency Management Agency (FEMA) creates Flood Insurance Rate Maps (FIRM) that delineate flood hazard areas. The FEMA FIRM flood zone designations include the following:

- A – Areas of 100-year flood, base flood elevations not determined
- AE – Areas of 100-year flood, base flood elevation determined
- XS – Areas of 500-year flood; areas of 100-year flood with average depths of less than one foot or within the drainage area less that one square mile, and areas protected by levees from 100-year flood
- X – Areas determined to be outside the 500-year floodplain
- D – Areas in which flood hazard is undetermined
- VE – Areas of 100-year coastal flood with velocity (wave action), base flood elevations determined (Coastal High Hazard District)

As shown in **Figure 12**, the Project Site is located entirely within Flood Hazard Zone X. Zone X delineates an area of moderate flood hazard, usually the area between the limits of the 100- year and 500-year floods.

Figure 12. Flood Hazard Zones



Tsunami

A tsunami involves the generation of a series of destructive ocean waves that can affect all shorelines. These waves can occur at any time with limited or no warning and are most commonly generated by earthquakes in marine and coastal regions (NOAA, 2017). The Proposed Action is not located within the tsunami evacuation zone.

Earthquakes

Strong earthquakes endanger people and property by shaking structures and by causing ground cracks, ground settling, and landslides. The size of an earthquake is commonly expressed by its magnitude on the Richter scale, which is a measure of the relative size of the earthquake wave recorded on seismographs. Thousands of earthquakes occur every year in Hawai'i, most on and around the island of Hawai'i. Many of these earthquakes are directly related to volcanic activity. Several of the significant earthquakes on the Island of Hawai'i have occurred on the east side of the island in the past 100 years. Therefore, it may be concluded that the east side of the island could experience moderate to severe earthquakes and associated ground shaking, depending on the earthquake origin.

The National Earthquake Hazard Reduction Program (NEHRP) defined five soil types based on their shear-wave velocity which are provided in **Table 15**. One contributor to shaking amplification is the velocity at which the rock or soils transmits shear waves. The potential intensity of shaking is measured using a Modified Mercalli Intensity (MMI) scale. The soil classifications range from "A" to "E" with "A" equating to hard rock and E representing soft soils. The softer a soil is the more it would amplify ground shaking and increase building damage and losses. Based on the subsurface conditions discussed in **Section 3.4**, the Project Site would be classified from a seismic analysis standpoint as having "Very dense soil and soft rock" corresponding to a soil classification C.

Table 15. NEHRP Soil Classifications

Soil Classification	Description
A	Hard Rock
B	Rock
C	Very dense soil and soft rock
D	Stiff soils
E	Soft soils

Source: FEMA 2015, accessed via the 2018 State of Hawai'i Multi-Hazard Mitigation Plan

Seismic hazards for the state of Hawai'i are based on past earthquakes and corresponding ground shaking and are categorized in Seismic Design Categories (SDCs) that reflect the likelihood of experiencing earthquake shaking of various intensities. SDCs are an indicator of how much attention must be paid to the seismic design and construction of a building. The measure is calculated by weighing the NEHRP Soil Classification against building code classifications for risk categories which are provided in **Table 16**.

Table 16. Building Risk Categories

Risk Category	Nature of Occupancy
I	Buildings and other structures that represent a low hazard to human life in the event of failure.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure.
IV	Buildings and other structures designated as essential facilities

Source: 2018 International Building Code (abbreviated)

The SDCs range from "A" to "F". Buildings with an SDC of "A" must be designed for seismic forces, but do not require any special seismic attention. Accordingly, buildings with an SDC of "F" are often near active fault lines and require significant consideration of seismic impacts. The SDC is a classification assigned to a structure based on its occupancy category and the severity of the design earthquake ground motion at the site. Based on the subsurface conditions discussed in **Section 3.4**, the Project Site would be classified as Seismic Design Category D. SDC descriptions are provided in **Table 17**.

Table 17. Seismic Design Category Descriptions

Seismic Design Category	Building Type and Expected MMI	Seismic Criteria
A	Buildings located in regions having a very small probability of experiencing damaging earthquake effects	• No specific seismic design requirements but structures are required to have complete lateral force-resisting systems and to meet basic structural integrity criteria.
B	Risk Category I, II, and III structures that could experience moderate (MMI VI) intensity shaking.	• Structures must be designed to resist seismic forces.
C	Risk Category I, II, and III structures that could experience strong (MMI VII) shaking and Risk Category IV structures that could experience moderate (MMI VI) shaking	• Structures must be designed to resist seismic forces. • Some types of structural systems are prohibited. • Critical nonstructural components must be provided with seismic restraint.

Seismic Design Category	Building Type and Expected MMI	Seismic Criteria
D	Risk Category I, II, and III structures that could experience very strong shaking (MMI VIII or greater) and Risk Category IV structures that could experience strong (MMI VII) or greater shaking.	• Structures must be designed to resist seismic forces. • Only structural systems capable of providing good performance are permitted. • Nonstructural components that could cause injury must be provided with seismic restraint. • Nonstructural systems required for life safety protection must be demonstrated to be capable of post-earthquake functionality. • Special construction quality assurance measures are required.
E	Risk Category I, II, and III structures located within a few kilometers of major active faults capable of producing MMI IX or more intense shaking.	• Structures must be designed to resist seismic forces. • Only structural systems that are capable of providing superior performance permitted. • Some types of irregularities are prohibited. • Nonstructural components that could cause injury must be provided with seismic restraint. • Nonstructural systems required for life safety protection must be demonstrated to be capable of post-earthquake functionality. • Special construction quality assurance measures are required.

Seismic Design Category	Building Type and Expected MMI	Seismic Criteria
F	Risk Category IV structures located within a few kilometers of major active faults capable of producing MMI IX or more intense shaking	• Structures must be designed to resist seismic forces. • Only structural systems capable of providing superior performance are permitted. • Some types of irregularities are prohibited. • Nonstructural components that could cause injury must be provided with seismic restraint. • Nonstructural systems required for facility function must be demonstrated to be capable of post-earthquake functionality. • Special construction quality assurance measures are required.

Source: FEMA, 2022

Hurricanes and Tropical Storms

The Hawaiian Islands are seasonally affected by Pacific hurricanes from June through November. On average, there are between four and five tropical cyclones observed in the Central Pacific every year. The state has been affected by significant hurricanes and tropical storms over the years. These include Hiki (1950), Nina (1957), Dot (1959), Iwa (1982), ‘Iniki (1992), Iselle (2014), Lane (2018), and Olivia (2018).

According to a report presented at the International Union of Conservation of Nature World Conservation Congress, global climate change could mean that Hawai‘i may experience more frequent and more severe hurricanes in the future.

Volcanic Hazards

Lava flow hazard zones have been mapped for the five volcanoes that comprise the Island of Hawai‘i. These lava flow hazard zones are based on the location of eruptive vents, past lava coverage, and topography. There are nine lava flow hazard zones with Zone 1 having the most severity of hazard. The Project Site is located in Zone 3 (Wright, et.al., 1992).

There were three significant eruption events that occurred in recent years that impacted Hawai‘i Island. In June 2014 the Kīlauea volcano erupted from the Pu‘u ‘Ō‘ō cinder cone and its lava flow traveled northeast toward Pāhoa Village. It eventually reached the Pāhoa Recycling Facility causing it to be

temporarily relocated, destroyed one home, and stopped short of reaching Highway 130. In 2018 another Kīlauea eruption originated from a series of fissures that started near the Leilani Estates and Lanipuna Gardens subdivisions. The eruption resulted in the destruction of around 700 homes and covered several roadways, including the Kapoho-Kalapana road, and causing significant damage to Highway 130. Additionally, in November of 2022, the Mauna Loa volcano erupted in its northeast rift zone causing a lava flow to run toward and stop just short of the Daniel K. Inouye Highway.

Wildfires

According to the County of Hawai'i Multi-Hazard Mitigation Plan the fire season in Hawai'i typically occurs from April to October, however periods of drought can cause that season to extend. Wildfires may be caused by land clearing, debris burning, smoking, and campfires. Therefore, it is generally understood that most wildfires are caused by humans, either accidently or intentionally. Between 2010 and 2019 there were 41 wildfires recorded by the County of Hawai'i of varying levels of severity. The Hawai'i Wildfire Management Organization has developed mapping of Communities at Risk from Wildfire, which delineates communities that share similar environmental conditions, land use characteristics, fuel types, hazards, and general wildfire issues. They provide ratings to characterize generalized hazards in each area. The HPP subdivision was designated as a low risk community.

3.12.2Potential Impacts

Construction

Proposed Action

Construction of the Proposed Action would not create conditions that would exacerbate natural hazards. The County of Hawai'i Civil Defense directs and coordinates the County's emergency preparedness and response program to ensure prompt and effective action when natural or human-caused disaster threatens or occurs anywhere in the County of Hawai'i. Construction personnel would respond to any emergency messages or alerts, as appropriate, to ensure their safety during construction.

No-Action Alternative

Under the No-Action Alternative, no construction activities would occur and there would be no change in existing conditions.

Operation

Proposed Action

The HPP District Park would be designed using the International Building Code, 2018 Edition as adopted and amended by the County of Hawai'i to ensure it can withstand potential impacts from natural hazards. DPR is the lead agency in opening, staffing, and maintaining public emergency shelters and post-impact civic centers for addressing public needs related to sheltering, emergency assistance, food distribution, and more. This facility could be used as a shelter, place of respite, or as a support facility during and/or following natural and human-caused emergencies. This would reduce capacity stressors on other nearby shelter facilities or create necessary shelter alternatives/redundancies ultimately providing more options for the community in the event of a disaster.

No-Action Alternative

Under the No-Action Alternative, the HPP District Park would not be in operation. The HPP community would not experience increased options for gathering places, shelter, and respite in the event of a disaster.

3.12.3 Avoidance and Minimization Measures

To minimize impacts associated with natural hazards, the Proposed Action would comply with the following:

- Title 44, Code of Federal Regulations, Chapter 1, Subchapter B, Part 60
- Hawaii County Code Section 27-18, Floodplain Management
- Hawai'i County Code 5A, Building Code

3.13 Secondary and Cumulative Impacts

3.13.1 Secondary Impacts

Secondary impacts are those effects that are caused by an action and are later in time or farther removed in distance but are reasonably foreseeable. They may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related to effects on air and water or other natural systems.

The Proposed Action would address a critical need within the HPP community for enhanced recreational facilities. Historically, this area has been underserved, lacking in both facilities and infrastructure that are crucial for fostering a healthy community environment. The Puna district is experiencing rapid population growth, a trend expected to outpace other districts in Hawai'i County. This growth is projected to continue irrespective of the new park's development.

However, the introduction of the HPP District Park could potentially influence local land use patterns and accelerate population density changes. By providing a centralized, appealing recreational space, the park might attract new residents and encourage further residential development in the vicinity. Such developments could lead to increased traffic and demand for additional services and infrastructure, including roads, schools, and healthcare facilities, which in turn could stress existing resources or foster the development of more centralized, easily accessible services addressing these needs.

In response to these potential effects, the planning process continues to be steered by community feedback, aiming to ensure that it serves the existing population without compromising the environmental or social integrity of the area. This approach seeks to balance growth and development with the preservation of community character and natural resources, ensuring that the HPP District Park contributes positively to the surrounding community.

3.13.2 Cumulative Impacts

Cumulative impacts refer to the impact on the environment that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of

what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant impacts taking place over time.

The development of the HPP District Park is one of several ongoing and planned projects in the Puna District that, collectively, may impact the environment and community. These projects, though individually may not result in significant impacts, could together affect the region’s infrastructure, natural resources, and social fabric.

Hawai‘i County is currently taking preliminary actions to plan for future wastewater improvements for the Puna District. The Puna Wastewater Programmatic Environmental Impact Statement was recently released and details the need to establish wastewater collection, treatment, and disposal infrastructure and services to major town centers in Puna. The alternatives for this project include decentralized systems, subregional wastewater treatment plants, or one regional wastewater treatment plant. Construction of the HPP District Park is not expected to have significant adverse impacts to this infrastructure effort.

The construction of a new public library in the Kea‘au-Mountain View area is another project that, when considered alongside the park and wastewater infrastructure upgrades, could contribute to cumulative impacts. An Environmental Assessment for this project was published in 2023 and is intended to replace the two existing public libraries located in Kea‘au and Mountain View. While this project would increase access to public library services for the Kea‘au community, it is not expected to induce additional growth in the area.

The Kea‘au Village Master Plan is a two-phase Master Plan to infill areas adjacent to the existing Kea‘au Village to create a mixed-use, walkable community. The Project will infill vacant lands between the existing village, Kea‘au Middle School, Kea‘au High School, and Kea‘au Elementary School, and establish a new regional commercial center on the west side of Volcano Highway. The Project will provide a range of housing opportunities to be located near existing public schools and commercial development opportunities that will provide needed services for the Kea‘au area.

The Pāhoa Transit Hub and Library is a proposed project to construct a transit hub and public library with a variety of civic services and community amenities in Pāhoa Village. This would include a mass transit facility and a library with a broad range of community programs and services. There would also be sufficient space to include a day care center and other facilities to accommodate community needs, provide learning resources, and create a gathering space for the surrounding Puna community. This project is not anticipated to induce population growth on its own but it would provide additional services to the surrounding community that could have cumulative growth impacts.

While these projects, including the Proposed Action, have their own set of direct impacts, their cumulative effect could significantly shape the Puna District’s future landscape, both environmentally and socially. These effects underscore the importance of integrated planning and the need for careful consideration of how multiple developments interact with each other and with the natural environment.

4.0 Relationship to Land Use Plans and Policies

4.1 State of Hawai'i Planning Documents

4.1.1 The Hawai'i State Plan

The Hawai'i State Plan, codified as HRS Chapter 226, provides goals, objectives, policies, and priorities for the State. The Hawai'i State Plan also provides a basis for determining priorities, allocating limited resource, and improving coordination of State and County plans, policies, programs, projects, and regulatory activities. It establishes a set of themes, goals, objectives, and policies that are meant to guide the State's long-range growth and development activities. Applicable sections of HRS Chapter 226 to the Proposed Action are shown in **Table 18** and discussed below.

Table 18. Summary of Applicability of HRS Chapter 226 to the Proposed Action

HRS Chapter 226 Hawai'i State Planning Act	Applicability to Project
Part I. Overall Theme, Goals, Objectives, and Policies	
§226-5 Objective and policies for population	Not applicable
§226-6 Objectives and policies for the economy--in general	Not applicable
§226-7 Objectives and policies for the economy-- agriculture	Not applicable
§226-8 Objective and policies for the economy--visitor industry	Not applicable
§226-9 Objective and policies for the economy--federal expenditures	Not applicable
§226-10 Objective and policies for the economy--potential growth and innovative activities	Not applicable
§226-10.5 Objectives and policies for the economy--information industry	Not applicable
§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources	**Applicable**
§226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources	**Applicable**
§226-13 Objectives and policies for the physical environment--land, air, and water quality	**Applicable**
§226-14 Objective and policies for facility systems--in general	**Applicable**
§226-15 Objectives and policies for facility systems--solid and liquid wastes	**Applicable**
§226-16 Objective and policies for facility systems--water	**Applicable**
§226-17 Objectives and policies for facility systems--transportation	Not applicable
§226-18 Objectives and policies for facility systems--energy	Not applicable
§226-18.5 Objectives and policies for facility systems--telecommunications	Not applicable
§226-19 Objectives and policies for socio-cultural advancement--housing	Not applicable
§226-20 Objectives and policies for socio-cultural advancement--health	Not applicable
§226-21 Objective and policies for socio-cultural advancement--education	Not applicable
§226-22 Objective and policies for socio-cultural advancement--social services	Not applicable
§226-23 Objective and policies for socio-cultural advancement--leisure	**Applicable**
§226-24 Objective and policies for socio-cultural advancement--individual rights and personal well-being	Not applicable
§226-25 Objective and policies for socio-cultural advancement--culture	Not applicable
§226-26 Objective and policies for socio-cultural advancement--public safety	Not applicable
§226-27 Objective and policies for socio-cultural advancement--government	Not applicable
Part III. Priority Guidelines	
§226-103 Economic priority guidelines	**Applicable**

HRS Chapter 226 Hawai'i State Planning Act	Applicability to Project
§226-104 Population growth and land resources priority guidelines	Not applicable
§226-105 Crime and criminal justice	Not applicable
§226-106 Affordable housing	Not applicable
§226-107 Quality education	Not applicable
§226-108 Sustainability	Not applicable
§226-109 Climate change adaptation priority guidelines	**Applicable**

Section 226-11. Objectives and policies for the physical environment – land-based, shoreline, and marine resources.

(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:
  (1) Prudent use of Hawai'i's land-based, shoreline, and marine resources.
  (2) Effective protection of Hawai'i's unique and fragile environmental resources.

(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:
  (3) Take into account the physical attributes of areas when planning and designing activities and facilities.
  (6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.
  (8) Pursue compatible relationships among activities, facilities, and natural resources.

Discussion: The Proposed Action has been designed using the International Building Code, 2018 Edition (IBC, 2018) to ensure it can withstand potential impacts from natural hazards. The environmental review process has included a biological survey to identify the presence of rare or endangered plant and animal species to ensure that construction activities would not have adverse impacts on sensitive flora and fauna. Construction of the Proposed Action would incorporate BMPs and other measures to minimize impacts to natural resources. The Proposed Action would not alter existing land use and activities and use of the new facility would not have adverse impacts to natural resources.

Section 226-12. Objectives and policies for the physical environment – scenic, natural beauty, and historic resources.

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.

(b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:
  (5) Encourage the design of developments and activities that complement the natural beauty of the islands.

Discussion: The Proposed Action has been designed to be compatible with the surrounding area. Construction of the Proposed Action is not expected to impact archaeological resources since no

Precontact sites or features are expected within the project area due to the intensive Historic Period land clearing that is known to have occurred within the project area.

Section 226-13. Objectives and policies for the physical environment – land, air, and water quality.

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:
    (1) Maintenance and pursuit of improved quality in Hawai'i's land, air, and water resources.
(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:
    (5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.
    (6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.
    (7) Encourage urban developments in close proximity to existing services and facilities.

Discussion: The Proposed Action includes the construction and operation of a district park with several community recreational amenities that could double as a shelter in the case of a natural or man-induced hazard or disaster. The Proposed Action has been designed to be compatible with the surrounding area and has been designed using the International Building Code, 2018 Edition (IBC, 2018) to ensure it can withstand potential impacts from natural hazards. The Proposed Action would provide recreational resources in a central area within a large community with a growing population.

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

(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, sustainable development, climate change adaptation, sea level rise adaptation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.
(b) To achieve the general facility systems objective, it shall be the policy of this State to:
    (1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.

Discussion: The Proposed Action actively implements the HPP District Park Master Plan that was drafted in concert with intensive community engagement activity. It is also in alignment with the Puna Community Development Plan in the creation of a 20-acre district park (Action 3.5.3.c.3) in the Hawaiian Paradise Park subdivision.

Section 226-15. Objectives and policies for facility systems – solid and liquid wastes.

(a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:
    (2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.
(b) To achieve solid and liquid waste objectives, it shall be the policy of this State to:

(1) Encourage the adequate development of sewerage facilities that complement planned growth.

Discussion: There is no County sewer system in the vicinity of the Project Site. The Proposed Action would include the installation of a new septic system designed to handle anticipated sewer flows at the site. A permit from the DOH, Wastewater Division, would be required.

Section 226-16. Objective and policies for facility systems – water.

(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.
(b) To achieve the facility systems water objective, it shall be the policy of this State to:
    (1) Coordinate development of land use activities with existing and potential water supply.

Discussion: The Proposed Action would include establishing new connections for on-site utilities, including water. The availability of water for the site would be determined through the design process and in coordination with the County of Hawai‘i Department of Water Supply. During construction, the contractor would coordinate with the utility companies to ensure any interruptions in service, if any, are minor.

Section 226-23. Objective and policies for socio-cultural advancement – leisure.

(a) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.
(b) To achieve the leisure objective, it shall be the policy of this State to:
    (1) Foster and preserve Hawaii's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.
    (2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.
    (3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.
    (5) Ensure opportunities for everyone to use and enjoy Hawai‘i's recreational resources.
    (6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.
    (7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaii's people.
    (8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.

Discussion: The HPP District Park would become a central hub for the HPP community, offering a wide range of sports, recreation activities, and a venue for community gatherings. This facility could one day host countless events, programs, classes, County programs particularly aimed at youth and elders

(kupuna), and festivities that would contribute to the health and well-being of HPP residents. It would be a place where people from all walks of life can come to enjoy leisure activities, and celebrate special occasions. Having proximity to social and recreational amenities would bolster community connections and strengthen the social fabric of the surrounding community. Moreover, it would provide a safe environment for children (keiki), kūpuna, parents (mākua), and families ('ohana) to engage in various sports activities and competitions as well as social functions (community meetings, social activities, social programs, host private parties and celebrations, and more).

The population of the HPP neighborhood, and the Puna district as a whole, has a quickly growing population. Of all the districts in Hawai'i County, the Puna district has seen the fastest rate of growth and is anticipated to continue growing in the future. The HPP community is considered by many to be underserved, lacking the amenities that are proven to improve community development and quality of life. Across the County it is challenging to secure access to gym facilities and fields. The proposed HPP District Park community center seeks to address this issue by expanding access to park facilities and offering a space for community gatherings and social events. The Proposed Action aims to provide a larger venue that would accommodate school programs like Summer Fun and others. Furthermore, the proposed community center may serve as an additional venue for visiting hālau, contributing to the preservation and practice of traditional hula.

The following themes of Part I of the Hawai'i State Plan are not applicable to the Proposed Action for the following reasons:

- **Section 226-5.** Objective and policies for population: The Proposed Action would not result in population growth.
- **Section 226-6.** Objectives and policies for the economy--in general. The Proposed Action would not provide employment opportunities and does not diversify the economic base.
- **Section 226-7.** Objectives and policies for the economy – agriculture. The Proposed Action would have no impacts on agriculture.
- **Section 226-8.** Objectives and policies for the economy – visitor industry. The Proposed Action does not involve the visitor industry.
- **Section 226-9.** Objective and policies for the economy – federal expenditures: The Proposed Action does not include the use of federal funds.
- **Section 226-10.** Objective and policies for the economy – potential growth and innovative activities: The Proposed Action does not provide employment opportunities or innovate the economy.
- **Section 226-10.5.** Objective and policies for the economy – information industry: The Proposed Action does not include nor impact telecommunications or information technology resources.
- **Section 226-17.** Objectives and policies for facility systems – transportation. The Proposed Action does not include transportation systems.
- **Section 226-18.** Objectives and policies for facility systems – energy. The Proposed Action does not involve energy generation.

- **Section 226-18.5.** Objective and policies for facility systems – telecommunications. The Proposed Action does not include new telecommunication facilities.
- **Section 226-19.** Objectives and policies for socio-cultural advancement – housing. The Proposed Action does not include development of housing.
- **Section 226-20.** Objectives and policies for socio-cultural advancement – health. The Proposed Action does not include health facilities or services.
- **Section 226-21**. Objectives and policies for socio-cultural advancement – education. The Proposed Action does not include educational facilities or services.
- **Section 226-22.** Objectives and policies for socio-cultural advancement – social services. The Proposed Action does not include social services or activities.
- **Section 226-24.** Objectives and policies for socio-cultural advancement – individual rights and personal well-being. The Proposed Action would have no impact to personal rights and personal well-being.
- **Section 226-25.** Objectives and policies for socio-cultural advancement – culture. The Proposed Action does not include activities that would impede the enhancement of cultural identities, traditions, values, customs, and arts.
- **Section 226-26.** Objectives and policies for socio-cultural advancement – public safety. The Proposed Action does not include public safety programs.
- **Section 226-27.** Objectives and policies for sociocultural advancement – government. The Proposed Action would have no impact on government services.

The themes of Part II of the Hawai‘i State Plan are not applicable to the Proposed Action since the Proposed Action does not involve the preparation of planning documents.

The following themes of Part III of the Hawai‘i State Plan are not applicable to the Proposed Action for the following reasons:

- **Section 226-103.** Economic priority guidelines. The Proposed Action would not stimulate economic growth or encourage business expansion and development.
- **Section 226-104.** Population growth and land resources priority guidelines. The Proposed Action would not result in population growth nor any change in land use.
- **Section 226-105.** Crime and criminal justice. The Proposed Action does not involve the criminal justice system.
- **Section 226-106.** Affordable housing. The Proposed Action would not provide housing.
- **Section 226-107.** Quality education. Although the Proposed Action would provide programs for school-aged children, it does not specifically pertain to education and schools.
- **Section 226-108.** Sustainability. The Proposed Action would have no impact on sustainability.
- **Section 226-109.** Climate change adaptation priority guidelines. The Proposed Action does not specifically address climate change adaptation.

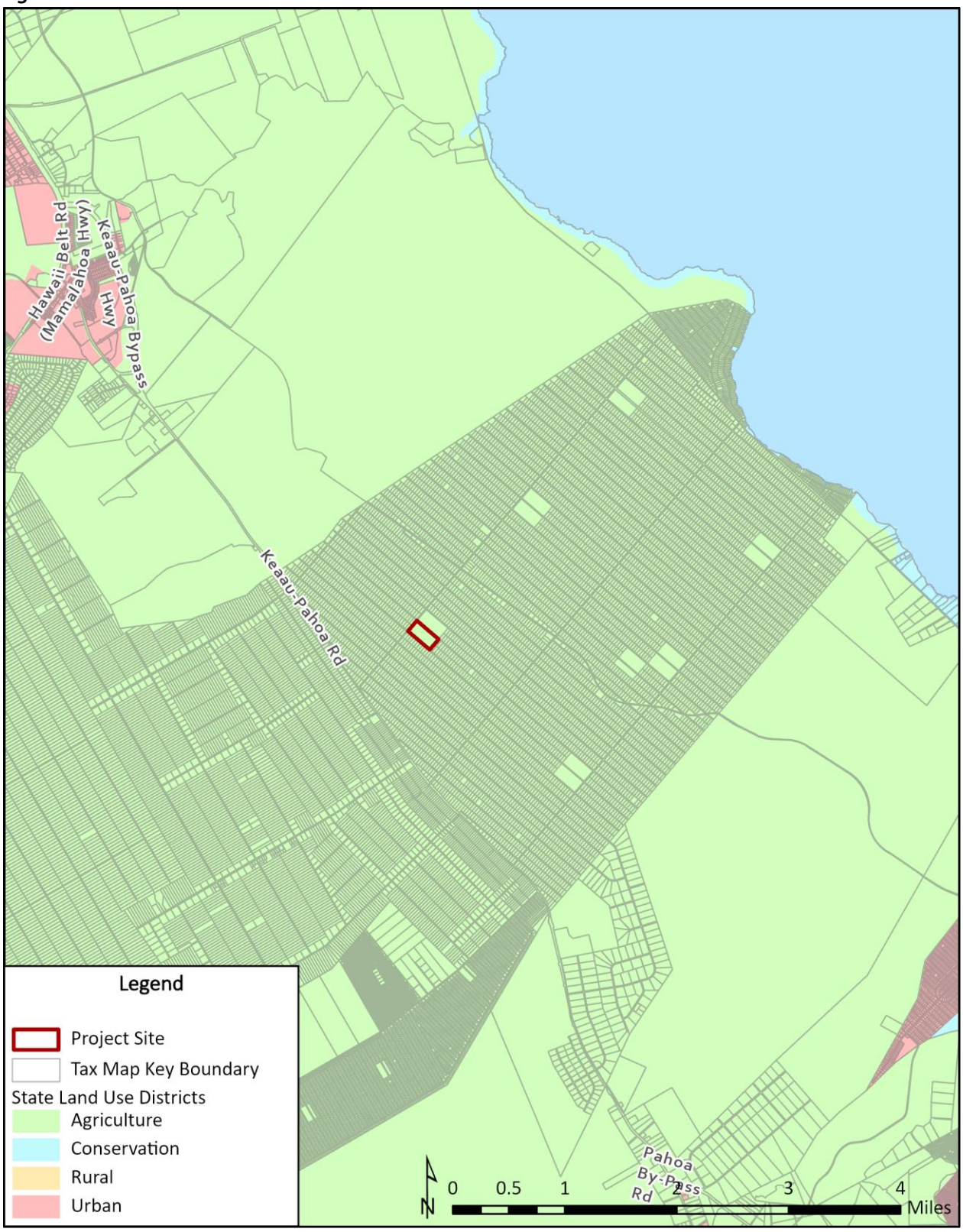
4.1.2 State Land Use Law

Hawai'i was the first of the fifty States to have a State Land Use Law and a State Plan. Today, Hawai'i remains unique among the fifty states with respect to the extent of control that the state exercises in land use regulation. The State Land Use Law, HRS Chapter 205, was originally adopted by the State Legislature in 1961. This law establishes an overall framework of land use management whereby all lands in the State of Hawai'i are classified into one of four land use districts: Urban, Agricultural, Conservation, and Rural.

The State Land Use Law is administered by the Land Use Commission. The Commission is "responsible for preserving and protecting Hawai'i's lands and encouraging those uses to which lands are best suited."

Discussion: As shown in **Figure 13**, the Proposed Action is in the Agricultural State Land Use District. As per HRS Section 205-4.5(6), "public and private open area types of recreational uses . . ." are permitted uses within the Agricultural State Land Use District. Therefore, the Proposed Action is consistent with State Land Use Law.

Figure 13. State Land Use Districts



4.1.3 Hawai'i Coastal Zone Management Program

The National Coastal Zone Management (CZM) Program was created with the passage of the Coastal Zone Management Act of 1972 (CZMA). Hawai'i's CZM Program, established pursuant to HRS Chapter 205A, as amended, is administered by the State of Hawai'i Office of Planning and provides for the beneficial use, protection, and development in the State's coastal zone. The objectives and policies of the Hawai'i CZM Program encompass a wide array of concerns including impacts to recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. The Hawai'i CZM area includes all lands within the State and the areas seaward to the extent of the State's management jurisdiction. Therefore, the Proposed Action is located within the CZM area.

The Proposed Action is consistent with the following objectives and policies of the Hawai'i CZM Program:

RECREATIONAL RESOURCES

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

1) Improve coordination and funding of coastal recreational planning and management.
2) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:
    a) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas.
    b) Requiring replacement of coastal resources having significant recreational value including, but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable.
    c) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value.
    d) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation.
    e) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources.
    f) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.
    g) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing.
    h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Hawai'i Revised Statutes, section 46-6.

Discussion: The Proposed Action does not impact shoreline recreational resources and is not located on the coastline; therefore, policies regarding shoreline recreational resources are not applicable. To protect the recreational value of coastal waters, the State of Hawai'i has adopted water quality standards. Generally, these standards require submittal and adherence to the conditions in a NPDES permit. This permit requires compliance with BMPs during construction to minimize soil erosion into adjacent waterways and to maintain water quality during operation. An NPDES permit will be required for the Proposed Action.

HISTORIC RESOURCES

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

Policies:

1) Identify and analyze significant archaeological resources.
2) Maximize information retention through preservation of remains and artifacts or salvage operations.
3) Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion: Construction of the Proposed Action is not expected to impact archaeological resources since no Precontact sites or features are expected within the project area due to the intensive Historic Period land clearing that is known to have occurred within the project area.

SCENIC AND OPEN SPACE RESOURCES

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

Policies:

1) Identify valued scenic resources in the coastal zone management area.
2) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.
3) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources.
4) Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion: The Proposed Action is not located in an area with "valued scenic resources" and is located away from coastal areas. The Proposed Action has been designed to be consistent with the visual environment of the surrounding areas.

COASTAL ECOSYSTEMS

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

Policies:

1) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources.
2) Improve the technical basis for natural resource management.
3) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance.
4) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land water uses, recognizing competing water needs.
5) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: The Proposed Action includes earth-moving activities but does not include any work within existing streams or waterways. To protect coastal ecosystems from adverse impacts associated with water quality, the State of Hawai'i has adopted water quality standards. Generally, these standards require submittal and adherence to the conditions in an NPDES permit, which requires compliance with BMPs during construction to minimize soil erosion into adjacent waterways and to maintain water quality during operation. An NPDES permit would be required for the Proposed Action.

ECONOMIC USES

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

Policies:

1) Concentrate coastal development in appropriate areas.
2) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.
3) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
    a) Use of presently designated locations is not feasible;
    b) Adverse environmental effects are minimized; and
    c) The development is important to the State's economy.

Discussion: The Proposed Action does not involve coastal development.

COASTAL HAZARDS

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

Policies:

1) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards.
2) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards.
3) Ensure that developments comply with requirements of the Federal Flood Insurance Program.
4) Prevent coastal flooding from inland projects.

Discussion: The Proposed Action would be designed using the International Building Code, 2018 Edition (IBC, 2018) to ensure it can withstand potential impacts from natural hazards. This facility could be used as a shelter, place of respite, or as a support facility during and/or following natural and human-caused emergencies. This would reduce capacity stressors on other nearby shelter facilities or create necessary shelter alternatives/redundancies ultimately providing more options for community in the event of a disaster.

MANAGING DEVELOPMENT

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

Policies:

1) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.
2) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements.
3) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: The Draft Environmental Assessment is being provided for public comment and review. To facilitate the agency review process for the required permits for the Proposed Action, DPR would meet with the various agencies prior to submitting permit application packages. The permit review process could potentially provide additional opportunities for public involvement.

PUBLIC PARTICIPATION

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

1) Promote public involvement in coastal zone management processes.
2) Disseminate information on coastal management issues by means of educational materials,

published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities.

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

Discussion: Opportunities for public awareness, education, and participation in coastal management are provided through the regulatory review processes. The Draft Environmental Assessment is being provided for public comment and review. The permit review process could potentially provide additional opportunities for public involvement.

BEACH PROTECTION

Objective: Protect beaches for public use and recreation.

Policies:

1) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion.
2) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities.
3) Minimize the construction of public erosion-protection structures seaward of the shoreline.
4) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor.
5) Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.

Discussion: The Proposed Action is located inland, away from shoreline; therefore, there would be no effect on the use of beaches for public use and recreation.

MARINE RESOURCES

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

Policies:

1) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.
2) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency.
4) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone.
5) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources.
6) Encourage research and development of new, innovative technologies for exploring, using, or

protecting marine and coastal resources.

Discussion: The Proposed Action is located inland, away from marine resources. To protect marine water quality, the Proposed Action will be designed and constructed in compliance with all applicable Federal, State, and County regulations pertaining to storm water management, as discussed in **3.5**.

4.2 County of Hawai'i Planning Documents

4.2.1 Hawai'i County General Plan

The *County of Hawai'i General Plan*, February 2005 (as amended) (2005 General Plan) is the policy document for the long-range comprehensive development of the island of Hawaii. The purposes of the General Plan are as follows:

- Guide the pattern of future development in this County based on long-term goals;
- Identify the visions, values, and priorities important to the people of this County;
- Provide the framework for regulatory decisions, capital improvement priorities, acquisition strategies, and other pertinent government programs within the County organization and coordinated with State and Federal programs.
- Improve the physical environment of the County as a setting for human activities; to make it more functional, beautiful, healthful, interesting, and efficient.
- Promote and safeguard the public interest and the interest of the County as a whole.
- Facilitate the democratic determination of community policies concerning the utilization of its natural, man-made, and human resources.
- Effect political and technical coordination in community improvement and development.
- Inject long-range considerations into the determination of short-range actions and implementation.

The County's existing 2005 General Plan is currently undergoing revision. The initial draft of the new General Plan 2040 has undergone public review and the recommended plan has been prepared. The recommended plan will undergo Planning Commission review and Hawai'i County Council review and adoption.

The following analyzes the consistency between the Proposed Action and the goals and policies of the 2005 General Plan. The Proposed Action is consistent with the following applicable goals and policies of the 2005 General Plan:

ENVIRONMENTAL QUALITY

Goals:

(a) Define the most desirable uses of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.
(b) Maintain and, if feasible, improve the existing environmental quality of the island.
(c) Control pollution.

Policies:

(a) Take positive action to further maintain the quality of the environment.

Discussion: The Proposed Action would have short-term and temporary impacts during construction. BMPs and other measures would be implemented to minimize impacts, as applicable. The park's development would also contribute to the quality of life for residents and could improve the environment through appropriate landscape design and maintenance of native plants and trees in the park. The park's maintenance operations would ensure responsible collection of trash and reduction of pollution.

FLOODING AND OTHER NATURAL HAZARDS

Goals:

(a) Prevent damage to man-made improvements.
(b) Control pollution.
(c) Prevent damage from inundation.
(d) Reduce surface water and sediment runoff.

Policies:

(g) Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works (DPW) and in compliance with all State and Federal laws.
(j) The County and private sector shall be responsible for maintaining and improving existing drainage systems and constructing new drainage facilities.
(q) Consider natural hazards in all land use planning and permitting.

Discussion: The Proposed Action would be designed using the International Building Code, 2018 Edition (IBC, 2018) to ensure it can withstand potential impacts from natural hazards. The facility could be used as a shelter, place of respite or support facility during and/or following natural and man-made emergencies.

The Proposed Action would include drainage improvements, which are expected to prevent flooding on the site and drainage off-site onto adjacent properties.

HISTORIC SITES

Goals:

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai'i.
(g) Collect and distribute historic sites information of public interest and keep an inventory of sites.
(h) Aid in the development of a program of public education concerning historic sites.

Policies:

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

Discussion: An AA and CIA were completed for the Proposed Action in December 2023 by ASM Affiliates, Inc. Field work for the study identified no archaeological historic properties of any kind within the current project area. With respect to the historic preservation review process of both the SHPD and the County of Hawai'i Planning Department, the study recommended determination is "no historic properties affected" for the project currently proposed for TMK: (3) 1-5-039:267 and that no further work needs prior to permit issuance or during any subsequent development activities. In the unlikely event that significant archaeological resources are discovered during the proposed ground disturbing activity, work will cease in the area of the discovery and SHPD would be contacted pursuant to HAR Section 13-275-12.

NATURAL RESOURCES AND SHORELINE

Goals:

(a) Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.
(b) Ensure that alterations to existing landforms, vegetation, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.

Policies:

(p) Encourage the use of native plants for screening and landscaping.
(u) Ensure that activities authorized or funded by the County do not damage important natural resources.

Discussion: This Draft Environmental Assessment has been prepared to analyze the potential impacts of the Proposed Action on natural resources. The Proposed Action would have short-term and temporary impacts during construction. BMPs and other measures would be implemented to minimize impacts, as applicable.

The Proposed Action would be designed using the International Building Code, 2018 Edition (IBC, 2018) to ensure it can withstand potential impacts from natural hazards. The facility could be used as a shelter, place of respite or support facility during and/or following natural and man-made emergencies.

The Proposed Action would include drainage improvements, which are expected to eliminate flooding on the site and drainage off-site onto adjacent properties.

The landscape design for the Proposed Action would focus on the use of native plants in as much as is appropriate and practicable.

RECREATION

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.

Policies:

(a) Strive to equitably allocate facility-based parks among the districts relative to population, with public input to determine the locations and type of facilities.
(c) Recreational facilities shall reflect the natural, historic, and cultural character of the area.
(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, elderly, and young children.
(o) Develop facilities and safe pathway systems for walking, jogging, and biking activities.

Discussion: The HPP District Park has the potential to become a central hub for the HPP community, offering a wide range of sports, recreation activities, and a venue for community gatherings. This facility could one day host countless events, programs, classes, and festivities that would contribute to the health and well-being of HPP residents. It would be a place where people from all walks of life can come to enjoy leisure activities and celebrate special occasions. Having proximity to social and recreational amenities would bolster community connections and strengthen the social fabric of the surrounding community. Moreover, it would provide a safe environment for children (keiki), elders (kūpuna), parents (mākua), and families ('ohana) to engage in various sports activities and competitions.

The population of the HPP neighborhood, and the Puna district as a whole, has a quickly growing population. Of all the districts in Hawai'i County, the Puna district has seen the fastest rate of growth and is anticipated to continue growing in the future. The HPP community is considered by many to be underserved, lacking the amenities that are proven to improve community development and quality of life. Across the County it is challenging to secure access to gym facilities and fields. The proposed HPP District Park community center seeks to address this issue by expanding access to park facilities and offering a space for community gatherings and social events. The Proposed Action aims to provide a larger venue that would accommodate school programs like Summer Fun and others. Furthermore, the proposed community center may serve as an additional venue for visiting hālau, contributing to the preservation and practice of traditional hula.

4.2.2 Land Use Pattern Allocation Guide

The Land Use Pattern Allocation Guide (LUPAG) is part of the Hawai'i County General Plan. LUPAG is a land designation that guides the ideal location of various land uses for future developments.

Discussion: As shown in **Figure 14**, the Proposed Action is located within an area designated Rural (rur). According to the 2005 General Plan the Rural LUPAG designation is described as follows:

> *Rural: This category includes existing subdivisions in the State Land Use Agricultural and Rural districts that have a significant residential component. Typical lot sizes vary from 9,000-square feet to two acres. These subdivisions may contain small farms, wooded areas, and open fields as well as residences. Allowable uses within these areas, with appropriate zoning, may include commercial facilities that serve the residential and agricultural uses in the area, and community and public facilities.*

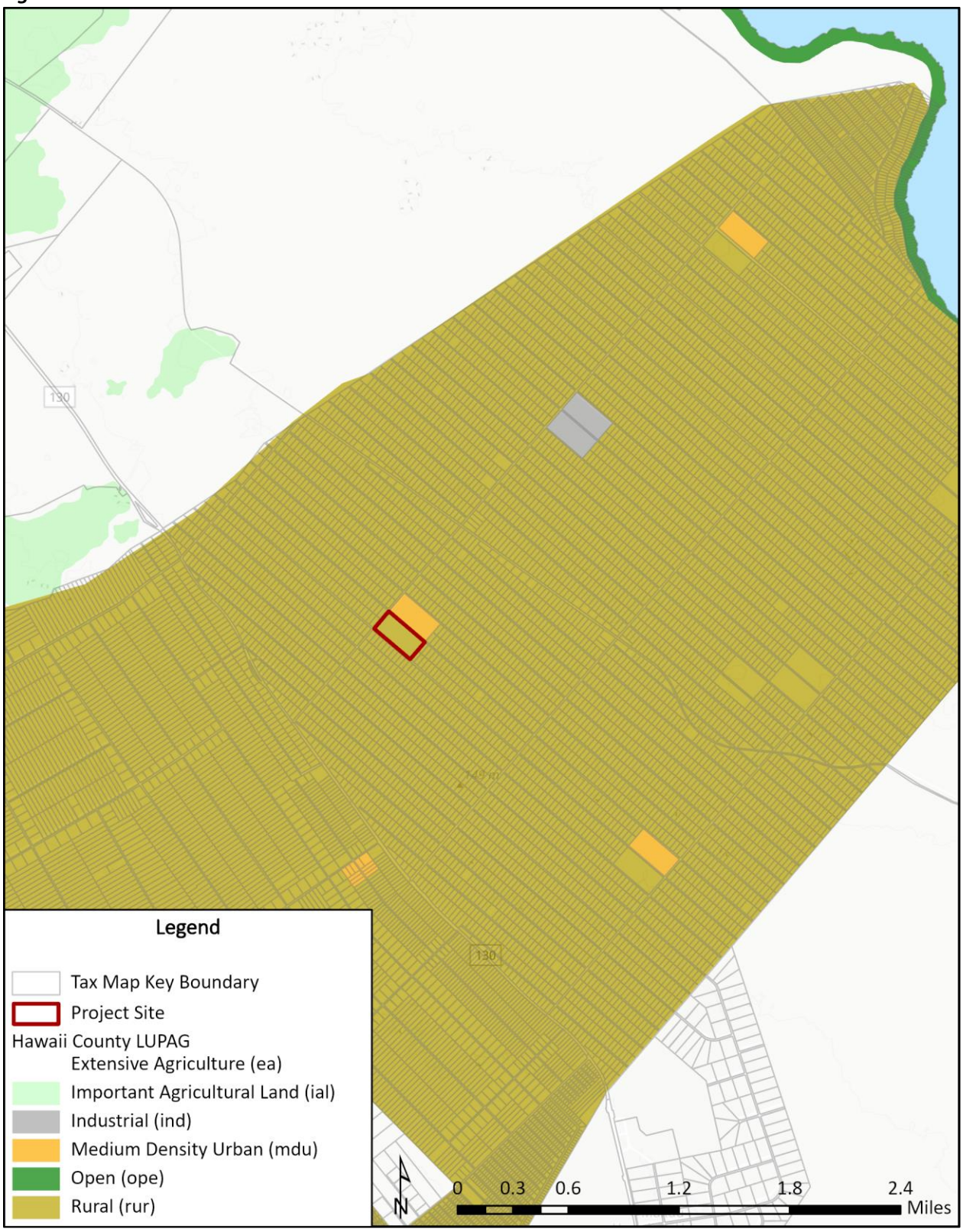
The Rural LUPAG designation is intended to ensure the continuation of rural character within a residential area. The designation creates room for community and public facilities that serve the residential and agricultural uses in the area. The 2005 General Plan further states: "*The location of urban and rural uses should be evaluated from the standpoint of how each use services existing and future land uses of the surrounding area. The direction and form of growth in accord with future demand will be influenced by many factors*."

The following quote from the 2005 General Plan speaks to the Open zoning designation, discussed in more detail in **4.2.3.**

> 14.8.1: *Open space on the island of Hawaii consists of lands zoned as Open by the County as well as those in the State Land Use Conservation District. The "Open" zoning district permits golf courses, with a use permit, some recreational facilities, and various public and utility-type facilities. There is currently no County zoning district that calls for land to be preserved in a largely natural state.*

This description of potential uses for land zoned Open per the Hawai'i County Zoning Code describes recreational facilities and various public and utility-type facilities. The 2005 General Plan points to the favorable use of land to provide services to the surrounding rural residential community in accordance with community needs and preferences. Therefore, the Proposed Action would be consistent with the LUPAG designation.

Figure 14. Land Use Pattern Allocation Guide Districts



4.2.3 Hawai‘i County Zoning Code

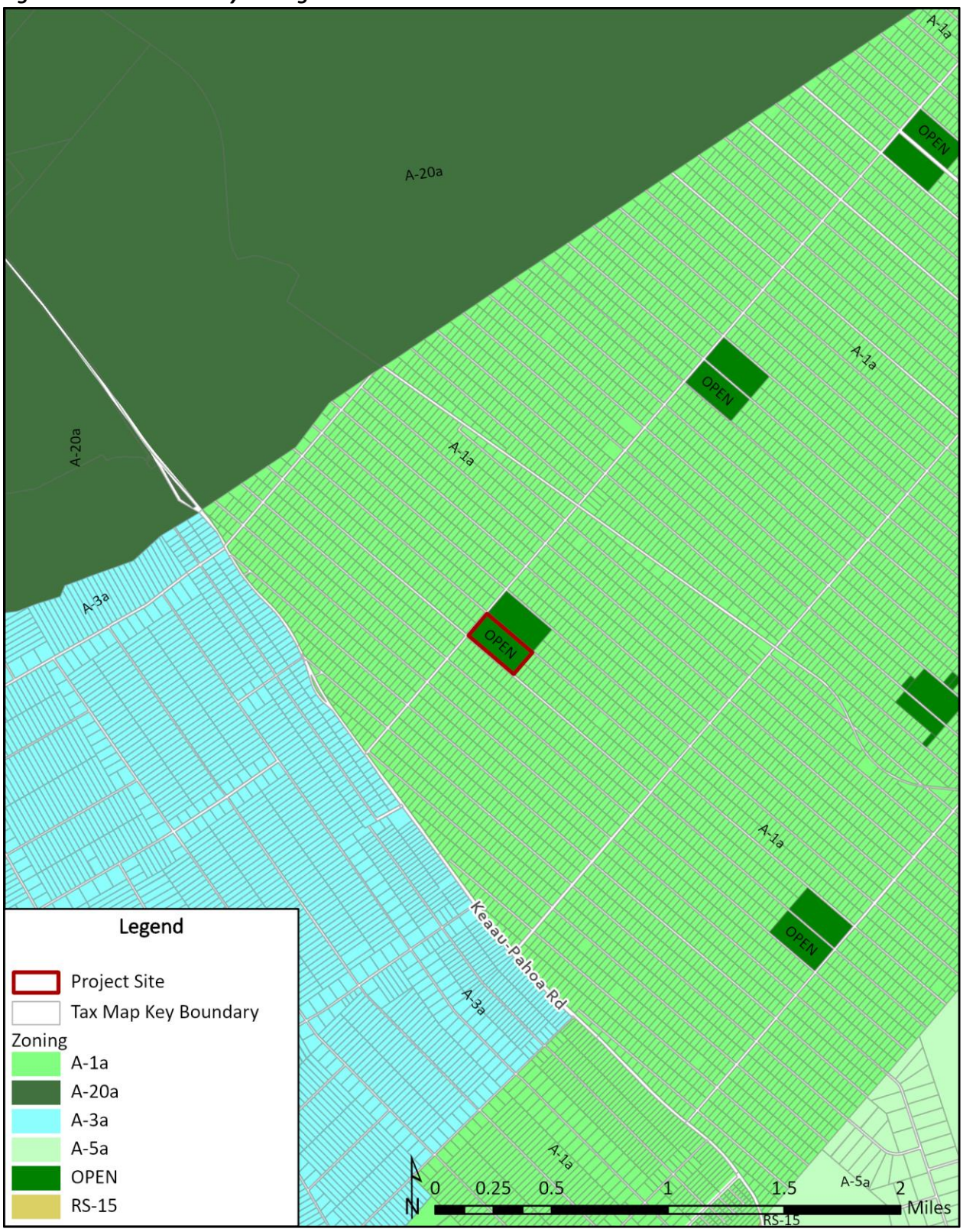
The County of Hawai‘i did not have island-wide zoning until 1967. Prior to that, only Hilo and some other towns were zoned. Zoning is the main county land use control. All areas on the island, except for Federal lands like national parks and some areas in the conservation district, are zoned. The Zoning Code lists the permitted uses within each zone. Permitting uses are those that are allowed without further Planning Department or Planning Commission approval.

The Hawai‘i County Code Chapter 25, Zoning Code, defines permitted land uses within the State Land Use “Urban” and “Agricultural” districts. For each zoning district, the code defines required building setbacks, height limits, and other constraints. As shown in **Figure 15**, the Proposed Action would be located in Zone Open. The Zoning Code describes the Open Zoning designation as follows:

> *The O (open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands).*

Among the permitted uses outlined within areas zoned Open by the Hawai‘i County Zoning Code include Community Buildings, Public Parks, and Public Uses and Structures. In addition, the Proposed Action is consistent with Hawai‘i County Code Section 25-5-72(c)(4): “Community buildings, as permitted under section 25-4-11.” Section 25-4-11(c) further states “Public uses, structures and buildings and community buildings are permitted uses in any district, provided that the [Planning] director has issued plan approval for such use.” Therefore, the Proposed Action is consistent with the County of Hawai‘i Zoning Code.

Figure 15. Hawai‘i County Zoning



4.2.4 Puna Community Development Plan

CDPs were created by the 2005 Hawai'i County General Plan to "translate the broad General Plan statements to specific actions as they apply to specific geographical areas." The Puna CDP, adopted in 2008 (as amended), has three overarching themes:

- **Mālama I Ka 'Āina** - establishes how the contextual natural, historic and cultural features of Puna should be preserved and respected. The goals, objectives and implementing actions under this theme address cultural and historic sites and districts; forest lands and unique geological features; scenic resources; and drainage, aquifers and coastal water quality.
- **Growth management** - addresses how the future pattern of human settlement and land use should be shaped to respect that context and support the desired quality of life for Puna's residents. The goals, objectives and implementing actions under this theme address the land use pattern; agricultural and economic development; public services, social services and housing; parks and recreation and renewable energy and energy efficiency.
- **Transportation** - focuses on sustainable approaches to transportation to support the goals of the two above themes. The goals, objectives and implementing actions under this theme address mass transit and alternative travel modes, travel demand management and roadway connectivity and safety.

Managing Growth

3.1.1 Goals:

a. The quality of life improves and economic opportunity expands for Puna's residents.
b. Services and community facilities are more accessible in village/town centers that are distributed throughout the region, including the underserved subdivisions that have been experiencing higher levels of development growth.

3.1.2 Objectives:

c. Enhance the role of existing and new village/town centers by allowing expanded commercial uses, facilitating the development of farmers markets and community gathering places, opportunities for special needs housing, and infrastructure to support more compact development form and multi-modal travel.
e. Target investments in public services and infrastructure to promote the development of village/town centers and, secondarily, to serve the peripheral subdivision areas.
    1. Kea'au, Pāhoa, and Hawaiian Paradise Park shall serve as Regional Town Centers to provide a wide range of services for the Puna district;

The Puna CDP defines Regional Town Centers in *Table 5-1:*

- Service Area: 2,000 – 50,000 residents, more than 30 acres;
- Components: More than 40 tenant spaces for full range of retail and personal services, repair shops and other light industrial uses; regional park; schools (all grades); community hall, theater; outdoor events area; bed-and-breakfast homes and small inns; elderly or other

special needs housing; transit hub; medical facility with emergency room; police and fire station; walking and bicycling paths.

3.1.3 Actions:

b. Establish the following general classifications and locations for village and town centers in Puna:
    3. Kea'au, Pāhoa, and Hawaiian Paradise Park shall serve as Regional Town Centers to provide a wide range of services for the Puna district;

Discussion: The Puna CDP defines the Project Site and the area surrounding it as one of three HPP Regional Town Centers and further defines the types of amenities and services that these town centers should provide. The Proposed Action would provide increased access to a wide variety of community and recreational facilities to support the furtherance of this space as a Town Center for the HPP neighborhood. See **Figure 16** which is the map of Hawaiian Paradise Park from the Puna CDP that depicts the location of this town center.

Puna CDP section 3.5.2 speaks to the need for a community park in Hawaiian Paradise Park, describing the neighborhood as an underserved large subdivision. This is further evidenced from the socioeconomic discussion in **3.10.**

> *Puna will clearly need to expand its parks and recreation facilities as the population grows. There is a particular need to develop community parks in underserved large subdivisions, such as Hawaiian Paradise Park, where development is occurring at a relatively fast pace.*

The goals, objectives, and actions in the Managing Growth section of the Puna CDP further describe the need for a community park in HPP:

3.5.1 Goals:

a. Puna offers a variety of public recreational areas, reflecting the beauty and diversity of the natural setting, and recreational programs for people of all ages and physical abilities that are not currently available.
c. There is an equitable dispersal of parks and recreation facilities readily accessible to most Puna residents.
d. The development of future parks supports the growth management goals, objectives and actions set forth in Section 3.1 of this plan.

3.5.2 Objectives:

a. Adopt the following classification for expansion and improvement of parks in Puna:
    1) Community Park: A recreational park or facility intended to be used primarily by residents of the area that is owned and maintained by the County or by a private entity with unrestricted public access.
c. Identify lands to be used for parks in connection with subdivision interconnectivity.

3.5.3. Actions:

c. Improve and expand Community Parks as follows:

1. Develop new Community Parks in:
    a) Hawaiian Acres subdivision, at three sites to be determined later through a community involvement process;
4. Develop a new District Park on a 20-acre parcel owned by Hawaiian Paradise Park Owners' Association at 16th Avenue and Maku'u Drive. Improvements would include a swimming pool, a gym, field complex and community center.

Figure 16. Hawaiian Paradise Park Regional Town Center

Discussion: The Puna CDP refers to a Community Center that is located on a 20-acre parcel on 16th Avenue and Maku'u Drive for additional improvements to include a swimming pool, gym, field complex, and community center. In 2016 the HPPOA dedicated a different parcel (the Project Site) to the County for the development of a community park. This came packaged with a petition of 232 community members who sought the County Council's approval of implementing the park on this parcel. The Proposed Action seeks to provide the services and amenities identified by the community in the Puna CDP within one of the three areas identified as a Regional Town Center in HPP. The Proposed Action is therefore not only consistent

with the Puna CDP but seeks to actively implement the plan by following the community-driven needs and preferences that were identified through collective community planning efforts.

4.2.5 Kīlauea Recovery and Resilience Plan

The Kīlauea Recovery and Resilience Plan was drafted in response to the 2018 Kilauea Eruption that resulted in the loss of over 700 structures, along with the agricultural and fishing grounds, and road access. The eruption exacerbated existing socioeconomic challenges in the Puna district by limiting affordable housing options, limiting opportunities for job growth and access to health and social services. The Kīlauea Recovery and Resilience Plan builds upon goals of the Puna community and strategizes on a plan for increased resiliency moving forward.

Discussion: The plan includes a Parks and Recreation Recovery Initiative that references impacts to the Ahalanui Beach Park and Isaac Hale Beach Parks which were both significantly impacted by the eruption. It states, "Due to feasibility concerns related to rebuilding the inundated facilities as well as limited funding made available by FEMA for the costs to restore the facilities the properties will not be rehabilitated. Available recovery funding may be allocated to planning and pre-construction activities for identified parks projects in Puna" (page 66). The plan does not speak to the implementation of new parks or a new district park in the HPP subdivision.

4.2.6 Hawaiian Paradise Park District Park Master Plan

A Hawaiian Paradise Park Community Master Plan was prepared in 1997 by the HPPOA and adopted by County Resolution No. 184-97. Section IV of the master plan refers to developing a new 20-acre community park and recreational facility that "could include a ballfield, swimming pool, tennis courts, basketball courts, picnic areas, tot lots and related facilities."

The HPPOA Community Action Committee updated the 1997 master plan in 2015 with Data Amendments adopted by County Resolution 284-15. As part of the update, a survey to solicit feedback on the community's needs was completed by more than 400 HPP residents which indicated that recreational facilities (i.e. parks and recreational opportunities and sports fields) was the highest priority for the community. The park and recreational amenities desired by the community included a park, walking and biking trails, swimming pool, gymnasium, sports fields, community hall, theater, library, after school center, senior center, dog park, skateboard park, tennis courts, and playgrounds. In 2016, the HPPOA Parks Committee conducted another survey of HPP residents to identify community park and recreational needs.

In 2016, County Resolution number 360-16, Hawai'i County dedicated a 20-acre parcel (Tax Map Key (3) 1-5-039:267) to the HPPOA for the purpose of establishing a park in the HPP subdivision to support and encourage healthy lifestyles and healthy families. As a condition of the resolution, the County Department of Parks and Recreation was tasked to complete a master plan for the park.

In 2017 SSFM International, Inc. (SSFM) was contracted by the County of Hawai'i, Department of Parks and Recreation to update the Master Plan to incorporated the feedback and survey data collected after

the previous update. Two public meetings were held in HPP for the purpose of gathering the community's input in preparing alternatives and the final master plan. The first public meeting was held on Sunday, January 7, 2018 at the HPPOA Activity Center to present the vision goals and preliminary alternative plans. The second public meeting was held on February 19, 2018 to present the preliminary master plan and collect feedback on the conceptual design alternatives that were created based on previous input.

Discussion: The Proposed Action is intended to implement the conceptual plans that were identified during the intensive stakeholder and community engagement process to create the HPP District Park Master Plan. To ensure that the Proposed Action accurately carries out the vision laid out by the community, any significant changes to the Proposed Action as a result of the environmental review process to necessitate compliance with applicable laws and best practices would be reflected in an updated version of the plan prior to permitting and construction. **Figure 17** shows the conceptual design of the Proposed Action as created through the HPP District Park Master Plan drafting process.

4.2.7 Special Management Area

The Special Management Area (SMA) is the area of the island that is in close proximity to the shoreline. The SMA permit was established in 1975 with the enactment of Act 176, Shoreline Protection Act. Pursuant to HRS Chapter 205A, all state and county agencies shall enforce the CZM objectives and policies defined in HRS Section 205A-2 (see **Section 4.1.3**). The County of Hawai'i Planning Department administers SMA permits for the island of Hawaii.

The Proposed Action is inland, away from shoreline, and is not located within the SMA.

Figure 17. Hawaiian Paradise Park Final Master Plan

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5.0 Findings and Conclusions

5.1 Significance Criteria

HAR Chapter 11-200.1 provides significance criteria for which all projects in Hawaii are assessed. These significance criteria and their relationship to the Proposed Action are as follows:

(1) Irrevocably commit a natural, cultural, or historic resource.

The Proposed Action would not irrevocably commit a natural, cultural, or historic resource. Construction of the Proposed Action would involve vegetation clearing. A biological survey was conducted for the project site in November 2023 by Geometrician Associates, LLC and may be found in **Appendix C**. There is a history of continuous disturbance on the property. In addition, the vegetation is dominated by non-native species, many of which are considered invasive. Vegetation at the project site has little value in terms of conserving native vegetation or threatened or endangered plant species. No rare, threatened, or endangered plant or animal species were present on the project site for the Proposed Action. Measures to minimize potential impacts to native species that may habitat or transit through the project area are discussed in **Section 3.3.3**. Therefore, no significant adverse biological impacts are expected from construction of the Proposed Action.

A Cultural Impact Assessment (CIA) was completed for the Proposed Action in December 2023 by ASM Affiliates, Inc. The study concludes that the proposed project may impact native plant resources, particularly the culturally significant ‘ōhi‘a and the Puna Cave System. To address potential impacts, the study recommended investigating the presence of Rapid ‘Ōhi‘a Death (ROD), and incorporating ecologically appropriate native plants in landscaping plans. The CIA recommended the completion of an AIS; however, this was found unnecessary following the Archeological Assessment that was completed. An AIS may be required if requested by SHPD.

An Archaeological Literature Review and Field Inspection was completed for the Proposed Action in December 2023 by ASM Affiliates, Inc. Field work for the study identified no archaeological historic properties of any kind within the current project area. With respect to the historic preservation review process of both the SHPD and the County of Hawai‘i Planning Department, the study recommended determination is “no historic properties affected” for the project currently proposed for TMK: (3) 1-5-039:267 and that no further work is needed. In the unlikely event that significant archaeological resources are discovered during the proposed ground disturbing activity, work will cease in the area of the discovery and SHPD would be contacted pursuant to HAR 13§13-275-12.

(2) Curtail the range of beneficial uses of the environment.

The Proposed Action would implement community and recreational facilities within a quickly growing population where the project would respond to a long-standing community need for quality of life improvements. The development of the HPP District Park would be consistent with future growth plans for the area and would not provide a significant negative environmental impact.

(3) Conflict with the State's environmental policies or long-term environmental goals established by law.

HRS Chapter 344 states that "It shall be the policy of the State, through its programs, authorities, and resources to:

(1) Conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State's unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which humanity and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawaii.
(2) Enhance the quality of life by:
    (A) Setting population limits so that the interaction between the natural and artificial environments and the population is mutually beneficial;
    (B) Creating opportunities for the residents of Hawaii to improve their quality of life through diverse economic activities which are stable and in balance with the physical and social environments;
    (C) Establishing communities which provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian; and
    (D) Establishing a commitment on the part of each person to protect and enhance Hawaii's environment and reduce the drain on nonrenewable resources."

As discussed in **3.0**, the Proposed Action would have short-term and temporary impacts during construction that would be less than significant to water resources, biological resources, archaeological and historic resources, cultural practices and beliefs, geology and soils, traffic and transportation, air quality, the existing noise environment, and public facilities and services. BMPs and other measures would be implemented to minimize impacts, as applicable.

(4) Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community or State.

The establishment of the HPP District Park would provide sporting and recreational facilities aimed at enriching the lives of residents in the surrounding area. The implementation of the park would satisfy a longstanding community demand and significantly enhance the quality of life for surrounding residents.

It would also provide a community space for social functions (community meetings, social activities, social programs, host private parties and celebrations, and more).

The HPP District Park would be designed using the International Building Code, 2018 Edition as adopted and amended by the County of Hawai'i to ensure it can withstand potential impacts from natural hazards. DPR is the lead agency in opening, staffing, and maintaining public emergency shelters and post-impact civic centers for addressing public needs related to sheltering, emergency assistance, food distribution, and more. This facility could be used as a shelter, place of respite, or as a support facility during and/or following natural and human-caused emergencies. This would reduce capacity stressors on other nearby

shelter facilities or create necessary shelter alternatives/redundancies ultimately providing more options for the community in the event of a disaster.

Public outreach efforts that were conducted during the creation of the HPP District Park Master Plan confirmed the demand for having convenient access to recreational amenities. The features in the park design were intentionally proposed to satisfy needs that were heard in the public engagement events. Some features, such as the pickleball courts are proposed to provide an outlet for park users of varying degrees of mobility. The park would offer a safe space for keiki (children) to play, socialize, and engage in sporting activities. For older kids and teens, the park would offer a space for teams to practice and participate in sporting events or celebratory events. Kupuna (seniors), among other park users, could enjoy the walking path that would encircle the outside perimeter of the park or the swimming pools. Sporting events could be hosted that would allow that would range from sporting activities for keiki (children), competition fields for teens and adult sporting clubs, to walking paths and swimming for kupuna (seniors).

The HPP District Park would be a substantial contribution to the community's vision for a vibrant and inclusive community gathering space. Research has also shown that households within a close proximity to good quality park facilities have better mental and physical health outcomes. Similarly, people of lower socioeconomic status typically have less access to parks and recreational facilities (Rigolon, 2016). The HPP District Park would be an action to reduce inequities in Hawai‘i County and is anticipated to have overall positive, long-term impacts on the surrounding community.

The Proposed Action would result in temporary, positive economic activity in the form of construction jobs and material procurements.

A CIA was completed for the Proposed Action in December 2023 by ASM Affiliates, Inc. The study concludes that the proposed project may impact native plant resources, particularly the culturally significant ‘ōhi‘a and the Puna Cave System. To address potential impacts, the study recommended investigating the presence of ROD, incorporating ecologically appropriate native plants in landscaping plans, and conducting an AIS before construction.

(5) Have a substantial adverse effect on public health.

Construction of the Proposed Action would have some temporary, short-term, minor impacts to water resources, air quality, and the existing noise environment; however, these impacts would be minimized through the implementation of BMPs and other measures, as applicable, and would not affect public health. Conversely, the Proposed Action would have tremendous positive impacts on the community’s collective, as well as individuals’, health and wellbeing through the services these improvements would provide.

(6) Involve adverse secondary impacts, such as population changes or effects on public facilities.

The Proposed Action would not involve a change in land use and would not induce growth. Therefore, there would be no impact on public facilities from changes in population.

(7) Involve a substantial degradation of environmental quality.

As discussed in **3.0**, the Proposed Action would have short-term and temporary impacts during construction that would be less than significant to water resources, biological resources, archaeological and historic resources, cultural practices and beliefs, geology and soils, traffic and transportation, air quality, the existing noise environment, and public facilities and services. BMPs and other measures would be implemented to minimize impacts, as applicable.

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

Hawai‘i County is currently taking preliminary actions to plan for future wastewater improvements for the Puna District. The Puna Wastewater Programmatic Environmental Impact Statement was recently released and details the need to establish wastewater collection, treatment, and disposal infrastructure and services to major town centers in Puna. The alternatives for this project include decentralized systems, subregional wastewater treatment plants, and one regional wastewater treatment plant. Construction of the Proposed Action is not expected to have significant adverse impacts to this infrastructure effort.

The construction of a new public library in the Kea‘au-Mountain View area is another project that, when considered alongside the park and wastewater infrastructure upgrades, could contribute to cumulative impacts. An Environmental Assessment for this project was published in 2023 and is intended to replace the two existing public libraries located in Kea‘au and Mountain View. While this project would increase access to public library services for the Kea‘au community, it is not expected to induce additional growth in the area.

The Kea‘au Village Master Plan is a two-phase Master Plan to infill areas adjacent to the existing Kea‘au Village to create a mixed-use, walkable community. The Project will infill vacant lands between the existing village, Kea‘au Middle School, Kea‘au High School, and Kea‘au Elementary School, and establish a new regional commercial center on the west side of Volcano Highway. The Project will provide a range of housing opportunities to be located near existing public schools and commercial development opportunities that will provide needed services for the Kea‘au area.

The Pāhoa Transit Hub and Library is a proposed project to construct a transit hub and public library with a variety of civic services and community amenities in Pāhoa Village. This would include a mass transit facility and a library with a broad range of community programs and services. There would also be sufficient space to include a day care center and other facilities to accommodate community needs, provide learning resources, and create a gathering space for the surrounding Puna community.

This project is not anticipated to induce population growth on its own, but it would provide additional services to the surrounding community that could have cumulative growth impacts. While these projects, including the Proposed Action, have their own set of direct impacts, their cumulative effect could significantly shape the Puna District’s future landscape, both environmentally and socially. The project is proposed with the consideration that the benefits conferred by the development of an HPP District Park would counteract these challenges in terms of enhanced services and the creation of community spaces.

By enhancing the quality of life for HPP residents, providing adequate services for a growing community, and aligning with regional planning objectives, the HPP District Park positions itself as part of a broader effort to introduce services to support a more resilient and cohesive community.

(9) Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.

A biological survey was conducted for the project site in November 2023 by Geometrician Associates, LLC and may be found in **Appendix G**. No rare, threatened, or endangered plant or animal species were present on the project site for the Proposed Action. Lesser disturbed areas did contain native shrubs, ferns, and trees which are components for the habitats of many native animal species as well.

An issue for construction in properties with ‘ōhi‘a trees includes the propagation of two species of fungus called *Ceratocystis lukuohia* and *C. huliohia* produce a disease called ROD. Projects that harm or relocate ‘ōhi‘a trees can spread the disease, and certain mitigation measures are recommended. It was recommended that the extant stands of ‘ōhi‘a within the project area be inspected to determine whether ROD is present. If ROD is present, then cautionary measures including those that have been put forth by the DLNR, the UH CTAHR, the DOA, and other agencies should be undertaken to reduce the spread of this fungus.

Although not expected, any grading, tree removal, or other construction activities could disturb nesting activities of the Hawaiian hawk if nests are near enough to the construction area. A pre-construction survey for hawk nests would be completed if construction is initiated during the breeding season (March 1 through September 30). If hawk nests are found to be present on or near the project site, a buffer zone of 100 meters (330 feet) will be established around it where no construction shall occur until the chick or chicks have fledged, or the nest is abandoned.

Construction activity would be restricted to daylight hours as much as practicable during the seabird peak fledgling fallout period (September 15 to December 15) to avoid the use of nighttime lighting that could attract seabirds. All outdoor lights would be shielded to prevent upward radiation to reduce the potential for seabird attraction and shall not be directed to travel across property boundaries toward the shoreline and ocean waters. Outside lights not needed for security or safety would be turned off from dusk through dawn during the fledgling fallout period.

Construction of the Proposed Action would involve removing trees greater than 15-feet-tall. There would be no tree trimming or clearing during the bat breeding season (June 1 through September 15). During construction of the Proposed Action, the Hawaiian hoary bat may be temporarily displaced from the project area. The temporary displacement of these individuals at the project site is not expected to affect individual survival or overall species populations. BMPs would be implemented to minimize potential impacts to the Hawaiian hoary bat.

Construction of the Proposed Action would involve the movement of soil and plant materials to and from the site. Construction activities could spread invasive species to new areas through the movement of vehicles and materials.

These potential impacts and minimization measures are discussed in greater detail in **Section 3.3**.

(10) Have a substantial adverse effect on air and water quality or ambient noise levels.

Air pollutant emissions from construction activities would include dust or particulate matter and exhaust fumes from vehicular travel to and from the project site and from equipment operations. Potential impacts would be short-term and temporary and would be minimized through the implementation of BMPs and other measures.

There would be no direct impacts to surface waters from the Proposed Action. Construction activities may produce sediment from soil erosion during and after excavation. In addition, contaminants associated with equipment during construction may leak percolate into groundwater. With the implementation of BMPs, potential indirect impacts to water resources during the short-term construction period would be less than significant.

The Proposed Action would result in a short-term increase in noise levels during construction activities. Noise generated from short-term construction activities and the use of machinery would be minimized by requiring contractors to adhere to state and county noise regulations, including HRS Chapter 342F, Noise Pollution, and HAR Chapter 11-46, Community Noise Control.

(11) Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The site is not located in an environmentally sensitive area and therefore would not have a substantial adverse effect on or likely to be damaged by related causes.

Construction of the Proposed Action would not create conditions that would exacerbate natural hazards. The County of Hawai‘i Civil Defense directs and coordinates the County’s emergency preparedness and response program to ensure prompt and effective action when natural or man-caused disaster threatens or occurs anywhere in the County of Hawai‘i. Construction personnel would respond to any emergency messages or alerts, as appropriate, to ensure their safety during construction.

The facility would be designed using the International Building Code, 2018 Edition (IBC, 2018) to ensure it can withstand potential impacts from natural hazards. It could be used as a shelter, place of respite or support facility during and/or following natural and man-made emergencies.

The Proposed Action would include drainage improvements to mitigate water run off. The Project Site is located in Flood Zone X or determined to be outside the 500-year floodplain. Therefore, the Proposed Action is not anticipated to have any significant negative impact associated with flooding.

(12) Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.

The Proposed Action is not located in an area with scenic vistas or viewplanes.

(13) Requires substantial energy consumption or emit substantial greenhouse gases.

The Proposed Action would result in increased energy consumption during the construction and operation stages. HECO would provide electrical service to the site. Lighting for parking areas and walkways would be provided as per all applicable regulations.

The Proposed Action would not substantially emit GHGs as emissions would be short-term and temporary during construction activities.

5.2 Anticipated Finding of No Significant Impact

Based on the significance criteria set forth in HAR Chapter 11-200.1 and discussed in **Section 5.1**, it is anticipated that the Proposed Action would not have a significant effect on the environment and that a Finding of No Significant Impact would be filed with the State of Hawai‘i Office of Planning and Sustainable Development’s Environmental Review Program following the public comment period.

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6.0 Agency and Public Consultation

6.1 Pre-Assessment Consultation

Table 19 identifies the State and County agencies and elected officials consulted prior to the preparation of the Draft Environmental Assessment, as well as whether a comment was received. All comments received and responses are included in **Appendix I**. In addition, letters were sent to all landowners in the vicinity of the project site.

Table 19. Pre-Assessment Agency Consultation

Agency	Pre-Assessment Consultation Comment Received
State of Hawai‘i Agencies	
State of Hawai‘i Department of Accounting and General Services	X
Office of Hawaiian Affairs	
State of Hawai‘i Department of Hawaiian Home Lands	
State of Hawai‘i Department of Health – Clean Air Branch	X
State of Hawai‘i Department of Health – Clean Water Branch	
State of Hawai‘i Department of Health – Indoor and Radiological Health Branch	
State of Hawai‘i Department of Land and Natural Resources – Land Division	X
State of Hawai‘i Department of Land and Natural Resources – Engineering Division	X
State of Hawai‘i Department of Land and Natural Resources – Division of Forestry and Wildlife	X
State of Hawai‘i Department of Transportation – Highways Division	X
State of Hawai‘i Office of Planning and Sustainable Development	
County of Hawai‘i Departments	
County of Hawai‘i Office of the Mayor	
County of Hawai‘i Civil Defense Agency	X
County of Hawai‘i Department of Environmental Management	X
County of Hawai‘i Fire Department	
County of Hawai‘i Mass Transit Agency	
County of Hawai‘i Planning Department	
County of Hawai‘i Police Department	X
County of Hawai‘i Department of Public Works	
County of Hawai‘i Department of Water Supply	
County of Hawai‘i Office of Housing and Community Development	
County of Hawai‘i Department of Information Technology	
County of Hawai‘i Office of the Prosecuting Attorney	
County of Hawai‘i Department of Research and Development	
Elected Officials	
Senator Joy San Buenaventura, District 2	
Representative Greggor Ilagan, District 4	
Councilmember Ashley Kierkiewcz, District 4	
Councilmember Matt Kaneali‘i-Kleinfelder, District 5	

6.2 Community Outreach

Public outreach efforts that were conducted during the creation of the HPP District Park Master Plan confirmed the demand for having convenient access to recreational amenities. The features in the park design were intentionally proposed to satisfy needs that were heard in the public engagement events. Some features, such as the pickleball courts are proposed to provide an outlet for park users of varying degrees of mobility.

A presentation was made to the HPPOA Board of Directors at their September 18, 2024, Board Meeting at the HPP Community Center Library. The meeting provided an opportunity for the board to learn about the Draft Environmental Assessment and provide comments on the proposed project.

A community meeting was held on October 2, 2024, at the HPP Community Center to provide the HPP community an opportunity to learn about the project and the Draft Environmental Assessment. The meeting included a presentation with an overview of the Proposed Action and the Environmental Assessment Process, as well as a question-and-answer period. A total of 73 HPP residents attended the meeting. A summary of this meeting is provided in **Appendix J**.

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APPENDIX A

Hawaiian Paradise Park District Park Master Plan

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COUNTY OF HAWAII

DEPARTMENT OF PARKS & RECREATION

HAWAIIAN PARADISE PARK NEW PARK MASTER PLAN

FINAL

MARCH 2018

Cover Photo: View of the proposed park site.
Credit: SSFM International, Inc.

ACKNOWLEDGMENTS

ELECTED OFFICIALS

- Mayor Harry Kim
- Valerie Poindexter, Council Chairwoman
- Eileen O'Hara, District 4 Councilmember
- Jennifer Ruggles, District 5 Councilmember

COMMUNITY

- Puna Community Development Plan Action Committee
- Hawaiian Paradise Park Owners Association

PROJECT TEAM

- SSFM International, Inc.
- Ki Concepts LLC
- Fleming & Associates
- Marine and Coastal Solutions International, Inc.
- J. Uno & Associates, Inc.
- Ronald N.S. Ho & Associates, Inc.

GOVERNMENT AGENCIES

- County of Hawai'i Department of Parks and Recreation
  - Parks Maintenance Division
  - Recreation Division
  - Elderly Activities Division
- County of Hawai'i Planning Department
- County of Hawai'i Department of Public Works
- County of Hawai'i Department of Environmental Management
- County of Hawai'i Department of Water Supply
- County of Hawai'i Civil Defense Agency
- County of Hawai'i Mass Transit Agency
- Hawai'i Police Department
- Hawai'i Fire Department
- Hawai'i County Office of Aging

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TABLE OF CONTENTS

FIGURES

APPENDICES

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1 INTRODUCTION

ENVISIONING A NEW PARK IN HAWAIIAN PARADISE PARK

"A safe, open, and friendly public space for children, teenagers, young adults, middle-aged adults, and the elderly, and for activity levels ranging from quiet enjoyment to intensive cardio exercise and organized sports."

Photo Credit: Wayne Joseph, www.waynejoseph.wordpress.com

1.1 Purpose for New Park

The Puna District within the County of Hawai'i is the fastest growing district on the island according to the Puna Community Development Plan, amended in 2011. Between 2000 and 2030, Puna's population is expected to grow from about 31,000 to 75,000 (a 140% increase). As the population grows in this district, more parks and recreational opportunities are needed. The Puna Community Development Plan (COH, 2011) identifies a particular need for these opportunities in Hawaiian Paradise Park where development is on the rise.

Under County Resolution No. 360-16, fee-simple ownership of a 20-acre parcel, identified as Tax Map Key (TMK) (3) 1-5-039: 267, was accepted by the County through dedication by the Hawaiian Paradise Park Owners Association (HPPOA) for the purpose of establishing a park in the Hawaiian Paradise Park (HPP) subdivision to support and encourage healthy lifestyles and healthy families. As a condition of the resolution, the County Department of Parks and Recreation (DPR) was tasked to complete a master plan for the park.

1.2 Vision and Goals

A vision for the future park and project goals were confirmed through the public engagement process (see inset on previous page). The new park's vision calls for "a safe, open, and friendly public space for children, teenagers, young adults, middle-aged adults, and the elderly, and for activity levels ranging from quiet enjoyment to intensive cardio exercise and organized sports."

Goals for the new park include: 1) providing compatible recreational uses within the park supportive of the community's needs; and 2) providing appropriate facilities within the park to support DPR's current programs and public services.

1.3 Background and History

A Hawaiian Paradise Park Community Master Plan was prepared in 1997 by the HPPOA and adopted by County Resolution No. 184-97. Section IV of the master plan refers to developing a new 20-acre community park and recreational facility that "could include a ballfield, swimming pool, tennis courts, basketball courts, picnic areas, tot lots and related facilities."

The HPPOA Community Action Committee updated the 1997 master plan in 2015 with Data Amendments adopted by County Resolution 284-15. As part of the update, a survey to solicit feedback on the community's needs was completed by more than 400 HPP residents which indicated that recreational facilities (i.e. parks and recreational opportunities and sports fields) was the highest priority for the community. The park and recreational amenities desired by the community included a park, walking and biking trails, swimming pool, gymnasium, sports fields, community hall, theater, library, after school center, senior center, dog park, skateboard park, tennis courts, and playgrounds. In 2016, the HPPOA Parks Committee conducted another survey of HPP residents to identify community park and recreational needs. The results of this 2016 survey were used in the preparation of this master plan.

Entrance Sign visible along Kea'au Pāhoa Road. Photo credit: www.bigislandnow.com

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2 BACKGROUND AND PROJECT SETTING

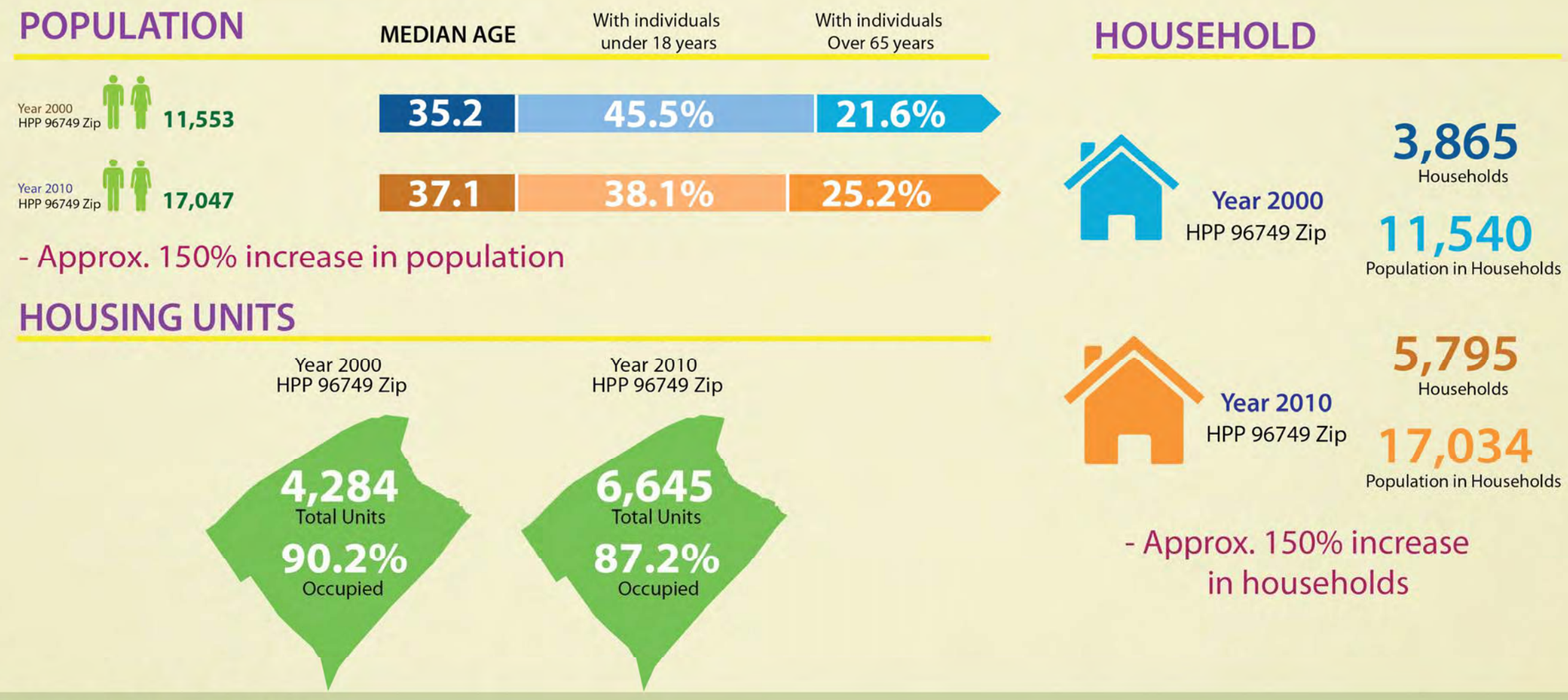
2.1 DEMOGRAPHICS
2.2 EXISTING LAND USES
2.3 COUNTY RECREATIONAL FACILITIES IN PUNA

2.1 Demographics

According to the Hawaiian Paradise Park Owners Association (HPPOA), there are 8,800 lots in Hawaiian Paradise Park (HPP) and approximately 5,700 are built out (65%). Between 2000 and 2010, the HPP zip code area (96749) experienced significant growth in population. The addition of 5,494 individuals nearly doubled HPP's population over that 10-year span. Correspondingly, the number of households in HPP also doubled over that same span.

Approximately 38% of households within the HPP zip code had individuals under 18 years old and 25% of households had individuals over 65 years old. Collectively, in 2010 the percentage of households with children and seniors are slightly higher in HPP (63.3%) than the rest of the island (60.9%) despite HPP's percentage decreasing slightly since the 2000 census (67.1%). The info-graphic below shows detailed data of Hawaiian Paradise Park zip code 96749 in Years 2000 and 2010.

Figure 1: Hawaii Paradise Park Census Data Info-graphic



2.2 Land Uses

The general area within and adjacent to the current project site has been subjected to over a century of intensive sugar cane cultivation. The developed lands around the project site consist of the HPP and Orchidland Estates residential subdivisions.

County Land Use Planning Allocation Guide

The project site is designated as "rural" according the County's Land Use Planning Allocation Guide (LUPAG) map. Use of the site as a public park is consistent with the LUPAG.

Puna Community Development Plan Land Use

The Puna Community Development Plan (Puna CDP), amended in 2011, designates the site as a portion of the "Regional Town Center" which is planned for higher densities, and connections to public infrastructure due to is location close to Kea'au-Pahoa Road (Highway 130). Another 20-acre park is currently shown on Maku'u Drive and 16th Street, however, the next update of the Puna CDP may include provisions for both parks to be developed within HPP. The Puna CDP recognizes Hawaiian Paradise Park as an area developing at a relatively fast pace and needs for park and recreational opportunities. Watumull owns the 20-acre parcel across 25th Avenue which is planned for commercial use. However, there are no known plans available from Watamull to indicate their intent to begin development of the commercial center.

State Land Use District

The State Land Use District (SLUD) designation is Agricultural. Use of the site as a public park is consistent with the Agricultural designation.

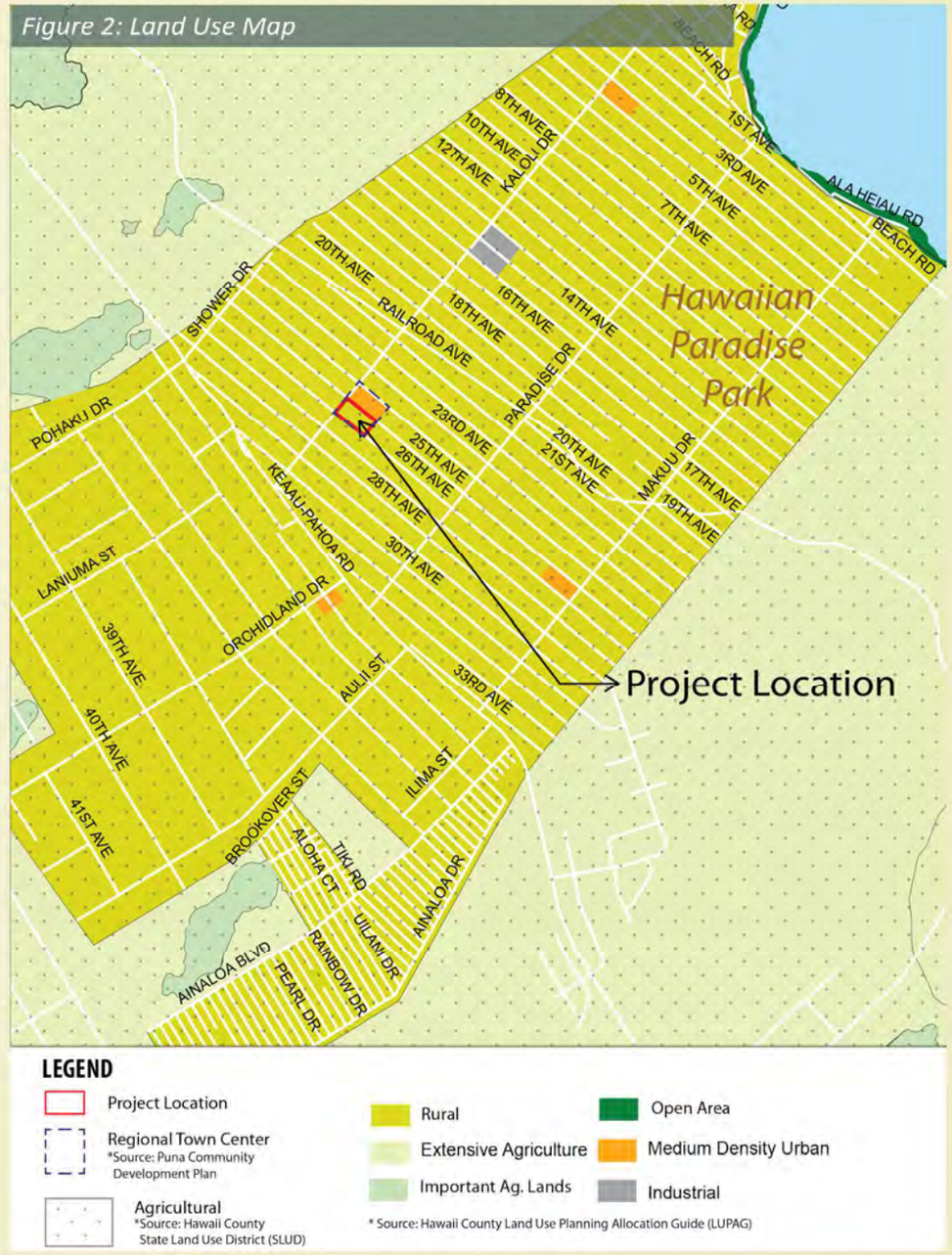
Other Land Use Designations

The site is not within the County's Special Management Area (SMA).
The County's zoning designation is "Open." According the Planning Department, the new park would not trigger any new zoning or land use changes since it would be defined as a "Public Use."

Lava Flow Hazard Zone

The site is within Hazard Zone 3, described as areas where 1 to 5 percent of the zone has been covered by lava since 1800, and 15 to 75 percent has been covered in the past 750 years (Wright et. al., 1992).

Figure 2: Land Use Map



2.3 County Recreational Facilities in Puna

According to Hawaii County Code, Chapter 8, Article 1, Park Dedication Code, Section 8-6, Population Density Requirements, there shall be a minimum ratio of five (5) acres of land for park and playground purposes for each one thousand persons in every district. This proposed project is contributes towards meeting that public interest standard but is not intended to satisfy the entire need for such facilities in the Puna District.

Typical types of parks managed by the County include the following:

NEIGHBORHOOD Park: typically designed to meet the needs of neighborhood. Smallest of park types.

COMMUNITY Park: typically designed for small neighborhood communities.

DISTRICT Park: typically designed to meet the needs of an entire district population capable for island wide attractions, such as Pāhoa Park and may allow for swimming pools.

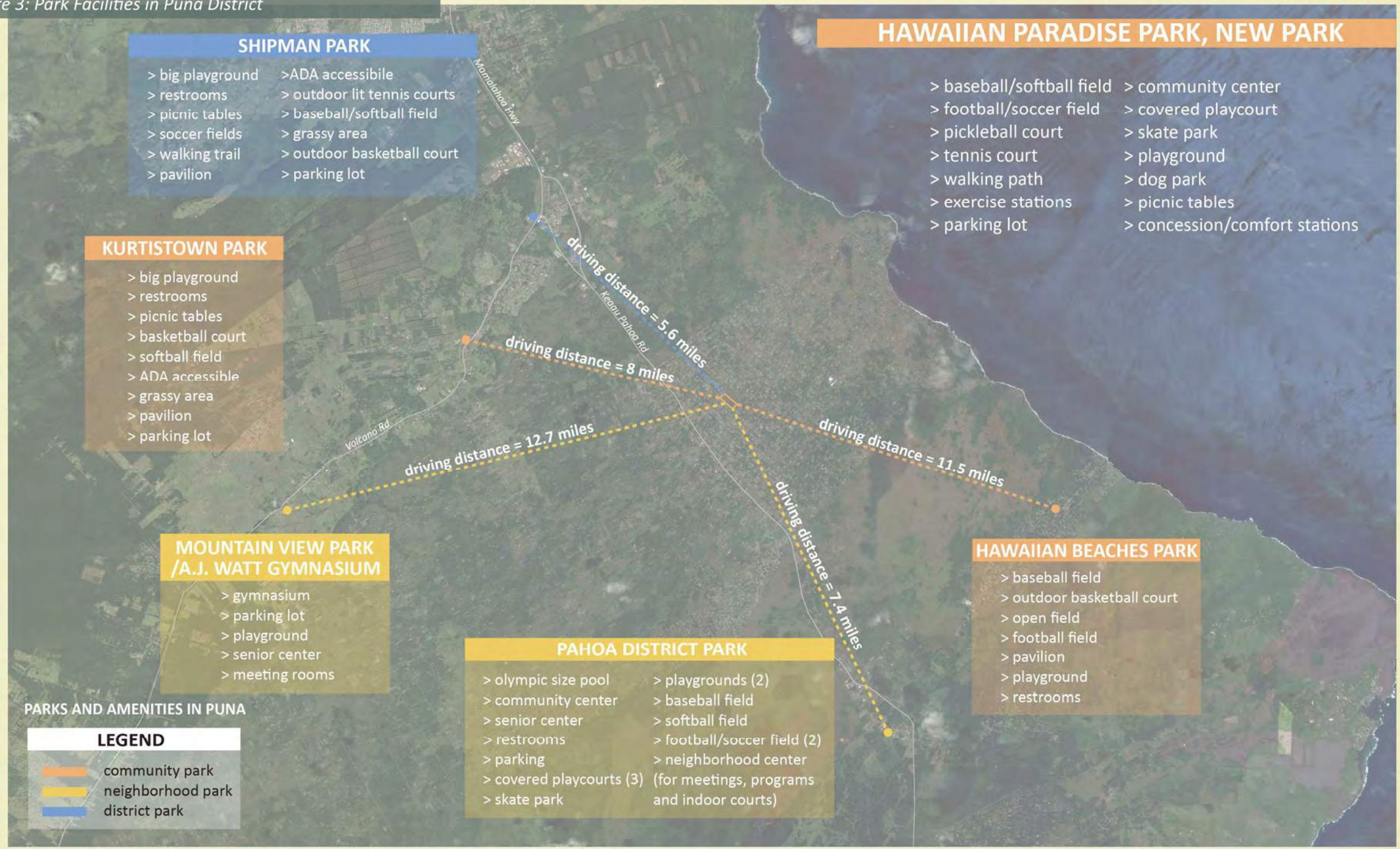
REGIONAL Park: typically designed to meet the needs of a specific region, usually a larger scale in comparison to a district park, such as Old Airport Park in Kona and Ho'olulu Complex in Hilo, may allow for swimming pools.

To the right are photos of two (2) other parks in the Puna District and on the following page is a map showing location and amenities of park facilities in Puna District.

Pāhoa Park

Shipman Park

Figure 3: Park Facilities in Puna District



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SITE ANALYSIS

Figure 4: Project Location Map

3.1 Climate and Site Placement

The climate of the Puna District varies considerably from comparatively sunny rocky shoreline to cloud-covered rainforests in upper elevations. The average annual rainfall in the general vicinity of the project area ranges between approximately 120 and 160 inches. Temperatures in this area of the Puna District usually fall between the sixties and eighties. As expected, the cooler temperatures and heavier rainfall occur in the winter and spring months (October through April) and warmer temperatures and lighter rainfall occur during the summer and fall months (May-September).

The predominant land soil type is classified as Lava flows, pahoehoe (rLW) (Sato et. al, 1973). According to the Natural Resources Conservation Service, the site consists of Keaukaha highly decomposed plant materials. The soils maps indicate this is organic material over pahoehoe lava, in a well-drained drainage class (NRCS, 2017). During design development, a soils investigation will be required.

3.2 Access

All existing major mauka-makai collector roads within Hawaiian Paradise Park (HPP) are two-lane paved roads owned by HPP. The minor crossroads are a mixture of paved and unpaved facilities also owned by HPP. The parcel is bordered by Kaloli Drive, 25th Avenue and 26th Avenue which are all paved roadways.

Vehicle access to the site can utilize potential new driveways off 25th Avenue and 26th Avenue. The Hawaiian Paradise Park Owners Association (HPPOA) has indicated a desire to provide one-way entrance off 26th Avenue and one-way exit off 25th Avenue. Access directly from Kaloli Drive is not desired or recommended. Details of ingress and egress locations will be further developed during design. Access and internal park roads will be designed for appropriate fire lane access, impacts to surrounding lots and operational impacts on surrounding intersections.

3.3 Flora

Existing vegetation appears to be native Ohia (Metrosideros polymorpha) forest with understory of Uluhe fern. Other non-native species such as Albizzia, Octopus tree, Gunpowder tree, and Waiwee (Strawberry Guava) are present. It is possible that some of the Ohia trees in the area are experiencing Rapid Ohia Death (ROD). Accordingly, care per State quarantine procedures should be taken to prevent or reduce the spread of ROD from this site.

3.4 Drainage

There are no existing drainage structures or gulches to dispose of stormwater runoff; however, the uneven nature of the topography creates natural low and high spots throughout the 20-acre parcel. Existing drainage patterns generally flow in the northerly direction. In general, runoff will flow away from buildings and will flow and infiltrate into the ground or be collected by swales, gutters along rooftops and inlets and conveyed to shallow drywells and/or detention basins for on-site disposal. The parking lot, and field runoff will be handled by a series of shallow drywells. Due to the rocky nature of the area, it is possible to use detention basins to allow water to percolate; however, further evaluation is needed as design progresses.

3.5 Archaeology

There are no known archaeological resources documented at this site. Archaeological research throughout Puna has focused primarily on the coast and areas of proposed construction relating to roadways and industrial development. Recent archaeology within the coastal zone reveals that the coast was the primary zone for habitation in both prehistoric and historic times.

3.6 Underground Lava Tubes

There is a possibility that lava tubes may be encountered in the project area. Lava tubes and lava tube caves are a notable geological features in Puna. In many cases, the presence of a lava tube is not known unless a cave roof collapses from construction activity or vegetation clearing otherwise results in the discovery of a skylight. The depth of lava tube caves often cannot be determined without detailed surveying. The Kazumura Cave is a documented lava tube cave near the project site which crosses both 25th and 26th Ave between Kaloli Drive and Paradise Drive. At more than 60 km long and 1,101 m deep the Kazumura Cave (lava tube) has been called the longest and deepest lava tube in the world and the deepest cave in the USA. While relatively close in proximity to the project site it seems unlikely that the Kazumura Cave will be affected by project-related construction given the depth of the cave below the surface (Allred, 1997).

3.7 Domestic Water

There is no domestic water service serving the project site. An extension of the municipal water supply system from the intersection of Kea'au-Pahoa Road and Kaloli Drive to the park site is recommended. The existing water system has available capacity to meet the potable water demands and the fire flow protection requirements for the proposed facilities within the Park. The municipal water supply extension provides the greatest benefit for a safe and reliable water source, adequate fire protection for the proposed site and improving fire protection for the local community as well as the lower costs when considering initial construction and on-going operational costs.

As an alternative to extending the municipal water system, the County also has the option to construct a rainwater catchment system or the option to install a rainwater catchment system, with a lesser degree of treatment, for irrigation and non-potable indoor uses along with the municipal water system extension.

3.8 Wastewater

There is no public sewer system serving the project site or Puna community. The closest public wastewater facility is along Volcano Highway, approximately 10 miles away. It is anticipated that the on-site sewage will be disposed of via sewerlines from buildings to multiple septic tank and leach field chamber systems. Preliminary calculations and grades indicate that three separate leach fields will be needed. Since these chamber systems are underground, the open field areas of the park (i.e. fields or lawn areas) will likely serve as suitable locations. One leach field is expected to serve the concession stand and comfort station building. Another leach field will service the pool building and covered play courts. The last leach field will service the community center.

Each facility will have restrooms, drinking fountains and hose bibbs. Draining and maintenance of the pool water will not be able to be disposed of in leach fields. Drinking fountains or hose bibbs that are not in the vicinity of a leach field can be drained to individual seepage pits.

3.9 Electrical and Telecommunications

Hawaii Electric Light Company (HELCO) is the sole electric utility on the island. Hawaiian Telecom (HTCO) and Charter Communications both offer broadband, cable television and telephone signals. HELCO's, HTCO's, and Charter Communication's existing facilities serving the HPP subdivision consist of aerial cables attached to joint overhead pole lines along most of the privately owned roadways. Based on current technologies, both HTCO and Charter Communications would likely provide service to this project via fiber optic cable.

An inquiry has been directed to HELCO as to whether their existing overhead distribution system has sufficient capacity to serve the proposed park but a response has not been received. The worst case scenario is that HELCO would need to upgrade its existing Hawaiian Paradise Park substation transformer and re-conductor portions of their overhead distribution system in order to support the new park. If the worst case scenario requires implementation, discussions between the County and HELCO would need to occur. On-site electric and telecommunications systems would be developed during design. Consideration for a photo-voltaic (PV) system will be made during the project design phase.

Illumination for park roadways, parking lots, walkways, playcourts and lighted fields will be provided meeting all applicable regulations.

3.10 Landscaping and Irrigation

By applying a bioregional landscape approach to the park's landscape and maintenance, the landscape's planting shall not require permanent automatic landscape irrigation. This low maintenance directive of a minimal plant palette of trees, select groundcover and mainly lawn combined with the region's abundant rainfall results in no need for a permanent automatic irrigation system for the park's planting. The area's annual rainfall should provide sufficient monthly rainfall to support the plantings once established. Temporary irrigation will be required for establishment of all planting during a recommended 180 day maintenance period.

4 COMMUNITY INVOLVEMENT

4.1 STAKEHOLDER MEETINGS
4.2 PUBLIC MEETINGS

4.1 Stakeholder Meetings

Stakeholder meetings were conducted with the following individuals or groups. Stakeholders primarily consisted of elected officials, representatives from Hawaiian Paradise Park Owners Association (HPPOA) and County Department of Parks and Recreation (DPR) Divisions. A detailed summary of each stakeholder meeting can be found in Appendix A of this document.

November 7, 2017 – Meeting with County of Hawaii Councilmembers and Hawaiian Paradise Park Owners Association (HPPOA) Representative

The purpose of this meeting was to receive input from area Councilmembers and HPPOA representatives on the project history and current needs.

November 9, 2017 – Meeting with DPR Divisions

The purpose of this meeting was to receive input from DPR's Maintenance and Recreation division on park needs.

November 20, 2017 – Meeting with the Planning Department

The meeting purpose was to receive input from County Planning Department long-range planning Division on how proposed park aligns with the Puna Community Development Plan or other known plans.

November 22, 2017 – Meeting with the DPR Elderly Assistance Division

The meeting purpose was to receive input from DPR's Elderly Activities Divisions (EAD) on possible senior activity and program needs.

4.2 Public Meetings

Engaging the Hawaiian Paradise Park (HPP) community and public was important in understanding the preferences for park and recreational facilities in this master plan process. Two (2) public meetings were held in HPP for the purpose of gathering the community's input in preparing alternatives and the final master plan. These public meetings were the primary means of engagement with the community.

The first public meeting was held on Sunday, January 7, 2018 at the Hawaiian Paradise Park Owners Association (HPPOA) Activity Center to present the vision, goals and preliminary alternative plans. A PowerPoint presentation covered the project background, master plan process, vision, goals and three (3) preliminary alternative plans.

Following the PowerPoint presentation, meeting attendees were broken up into three (3) groups and directed to one of three stations set up for break-out discussions on conceptual alternatives 1, 2 or 3. Each station had the corresponding alternative displayed on poster board along with a facilitator and note-taker. The following questions were addressed by groups at each station:

1. What opportunities do you see in this alternative?
2. What issues and constraints do you see in this alternative?
3. What other recreational amenities should be considered?

Each group was allowed approximately fifteen minutes to discuss the alternative and provide feedback on the specific station comment sheet. Each group rotated through each station once. Meeting attendees reconvened and each facilitator summarized the topics and concerns that were brought up during the break-out sessions.

A second public meeting was held on Monday, February 19, 2018 at the HPPOA Activity Center to present the preliminary master plan. A PowerPoint presentation covered the results and feedback and comments received on the three (3) conceptual alternatives presented at the first public meeting and the two preliminary master plan alternatives ("base" and "base + options") which were refined based on that input. The details on each amenity under consideration in the master plan was explained.

Following the PowerPoint presentation, a Q&A session was held to give meeting attendees the opportunity to ask questions about both preliminary master plan alternatives. A summary of the questions and comments received at both meetings is provided in Appendix A of this document.

County of Hawaii Department of Parks and Recreation

HAWAIIAN PARADISE PARK NEW PARK MASTER PLAN

The County of Hawaii Department of Parks and Recreation (DPR) is proposing to develop a master plan for a new public park within Hawaiian Paradise Park (HPP) in Keaau, Puna District. The new park would be located on a County-owned, 20-acre parcel bordered by Kaloli Drive, 25th Avenue and 26th Avenue. This park would serve the HPP subdivision to support and encourage healthy lifestyles and healthy families.

Two (2) public meetings are planned for as part of this park master planning process. The first public meeting will be held to present a proposed vision, goals, and preliminary alternative plans. A second public meeting will be held to present the preliminary master plan.

WE WANT *Your* INPUT!

» *Join Us* «

@

HAWAIIAN PARADISE PARK OWNERS ASSOCIATION (HPPOA)
ACTIVITY CENTER AT 15-1570 MAKUU DRIVE
BETWEEN 16TH & 17TH STREETS

MEETING #1
PRESENTATION OF PLAN ALTERNATIVES FOR COMMENT
JANUARY 7, 2018
3:00 PM - 6:00 PM

MEETING #2
PRESENTATION OF PRELIMINARY MASTER PLAN FOR COMMENT
FEBRUARY 19, 2018
3:00 PM - 6:00 PM

If you require special assistance in these events (i.e. interpreter, wheelchair accessibility) please contact
Jared Chang at (808) 356-1242 or jchang@ssfm.com
at least three (3) business days prior to the event.

Public meeting notice flyer (left) distributed to HPPOA, the public and stakeholders.

PowerPoint presentation by SSFM (left) and photo of the Alternative 1 break-out station from the first public meeting on held on January 7, 2018.

Members hanging out after the second public meeting on February 19, 2018 to share their ideas with Councilmember Eileen O'Hara.

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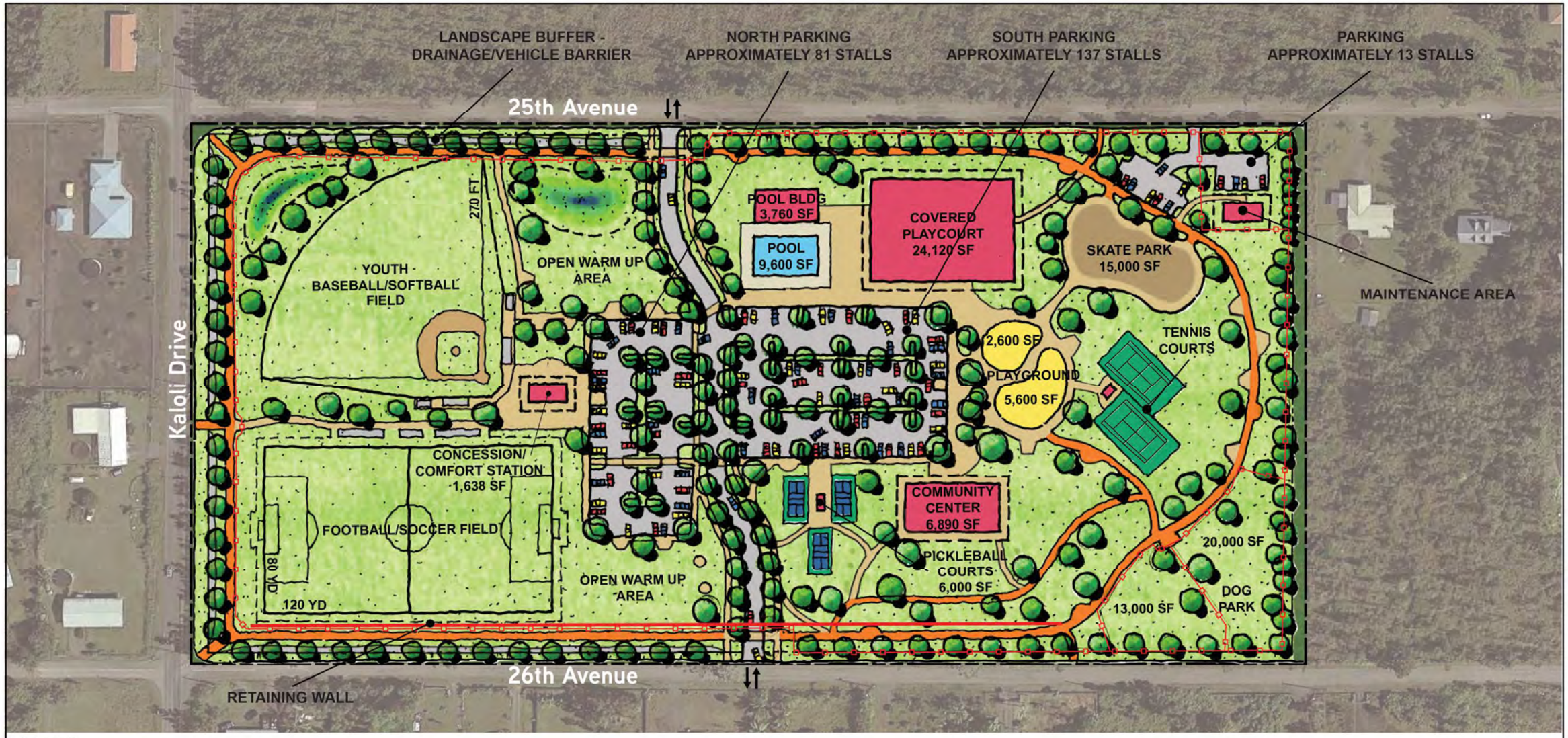
MASTER PLAN

5.1 ACTIVE PARK AREA/PLAY FIELDS
5.2 PASSIVE RECREATION AREAS
5.3 COST ESTIMATE
5.4 IMPLEMENTATION
5.5 POTENTIAL PERMITS AND APPROVALS REQUIRED

Figure 5: Final Master Plan



LEGEND:

Roads (Grey) Sidewalks (Brown) · Perimeter Path (Orange) · Other Path/ Paving (Beige) · Biofiltration Swale and Basins · Landscape Buffer Drainage/Vehicle Barrier · Buildings · Trees & Grass Area · Picnic Area · Exercise Stations · Fencing

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT
SCALE: 1 IN = 120 FT

FINAL MASTER PLAN

5.1 Active park area/Play fields

Baseball/Softball field (270 ft wide field)

FEATURES

- Dimensioned to accommodate youth and adult softball and up to pony league baseball (ages 3-23 years old)
- Bleachers near 1st and 3rd base
- Dugouts near 1st and 3rd base
- Nighttime lighting
- Scorer's booth behind backstop
- Scoreboard

DESCRIPTION

The baseball/softball field is placed on the 25th Avenue side of the park to minimize light pollution and the impact of foul balls flying into residential areas. It is sized to accommodate all ages – from pony league baseball up to adult softball. An open warm up area for baseball or softball teams is located south of the 1st base-side of the field.

A concession/comfort station is situated between the baseball/softball field and the football/soccer field so that it may serve both fields at any time. The North Parking lot is sized to accommodate sports games and practices, and is situated for easy access to both fields.

Football/Soccer field (80 x 120 yd)

FEATURES

- Dimensioned to accommodate high school football and soccer
- Nighttime lighting
- Bleachers
- Team-seating
- Scoreboard

DESCRIPTION

The football/soccer field is sized to accommodate high school football and soccer. An open warm up area for football or soccer teams is located on the parking lot-side of the field.

Tennis Court (two courts)

FEATURES

- Similar to Shipman Park
- Nighttime lighting

DESCRIPTION

A comfort station is situated between both courts for convenience.

Pickleball Courts (three courts)

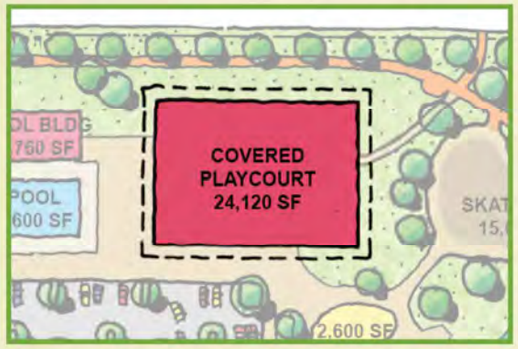
FEATURES

- For seniors
- Concession in the middle
- Close to parking lot
- Pavilion in common area

DESCRIPTION

Pickleball is a sport for all ages, and is a cross between of ping-pong, badminton and tennis. Pickleball is one of the fastest-growing sports in the country, and is popular amongst seniors. Since Hawaiian Paradise Park is a growing community with 25% of households containing individuals over 65 years old, the pickleball courts will encourage and help seniors to be active.

Covered Playcourt (24,120 SF)



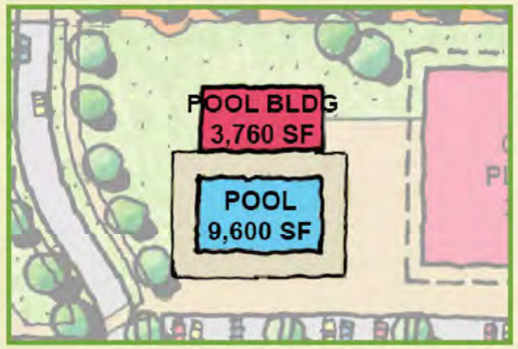
FEATURES

- Two regulation basketball/ Volleyball courts
- Rolling three-tiered bleachers
- Storage rooms
- Office for recreation staff
- Janitor closet
- Warming kitchen/concession
- Men's, women's and family restrooms
- Scoreboards, court divider

DESCRIPTION

The covered playcourt contains two regulation sized basketball and volleyball courts. Each court has a scoreboard, two team benches and one set of three-tiered bleachers, which can sit 81 people. Men's and women's restrooms have four toilet stalls and one ADA accessible stall. The covered playcourt also contains seven storage rooms and one office to be used by recreation staff. A warming kitchen is located on the pool-side of the playcourt to serve both amenities.

Pool (9,600 SF + 3,760 SF pool bldg.)



FEATURES

- 25m pool with six lanes
- 4' deep only
- Paved area between pool and Playcourt for vehicle access to pool bldg.
- Men's, women's and family restroom
- Janitor room in men's and women's restroom
- Storage room
- Total occupancy = 454

DESCRIPTION

The 25 meter pool has six lanes and is sized to accommodate all ages – from young children to seniors. Located in the pool building are men's and women's restrooms. Each restroom contains three shower stalls, one ADA accessible shower, a changing area, drying area, two toilet stalls (for women's) and two urinals (for men's), and one ADA accessible toilet stall. There is also a family restroom which contains one toilet and one ADA accessible shower on the pool-side of the playcourt to serve both amenities.

Skate Park (15,000 SF)

FEATURES

- Flat surface, street-style type

DESCRIPTION

Near the skate park is a small parking lot to discourage skaters from skating through the North and South parking lots.

Playground (2,600 SF for small kids, 5,600 SF for bigger)

FEATURES

- Separated by age groups (2-5 years old and 5-12 years old)
- Standard DPR playground equipment

DESCRIPTION

There are two playground areas located between the community center and the covered playcourt. One area is for children ages 2-5 years old, and the other is for children ages 5-12 years old. The playground is in close proximity to the parking lot so families can easily travel to and from their cars. It is also located between the community center and covered playcourt for easy access to restrooms.

5.2 Passive Recreation Areas

Picnic areas

FEATURES

- Scattered throughout park
- Connected to perimeter and paved paths
- Near trees for shading

Fencing

FEATURES

- Prevent vehicles from entering the perimeter of the park in unauthorized areas
- Use of landscape buffer in addition to fencing
- Keep people out of park after it's closed
- Safety and security

DESCRIPTION

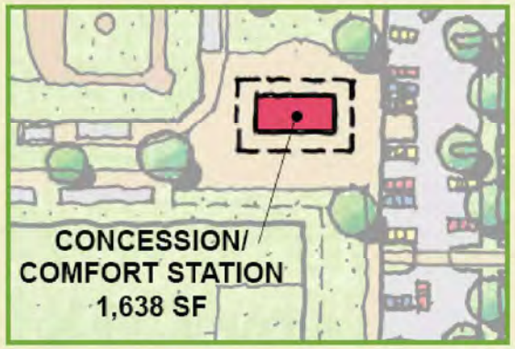
The perimeter of the park is fenced for safety and security during open park hours and after hours. The maintenance area is completely fenced off for added security for maintenance staff and their equipment.

Dog parks (13,000 SF + 20,000 SF)

FEATURES

- Separated into two areas based on size of dogs
- Dog waste stations
- Fenced/secured entrance
- ADA accessible path to dog park

Concession/comfort station



FEATURES

- Location serves both the football/ soccer field and baseball/softball field
- Close to parking
- Serving kitchen
- Restrooms

DESCRIPTION

The concession/comfort stations are located in three areas of the park; one serves the baseball/softball and football/soccer fields. The larger concession near the play fields will contain a family restroom and serving kitchen. The smaller comfort stations will contain restrooms to be used by the pickleball and tennis players. Concession/comfort stations are located near play fields and courts to allow easy access to restrooms and water fountains.

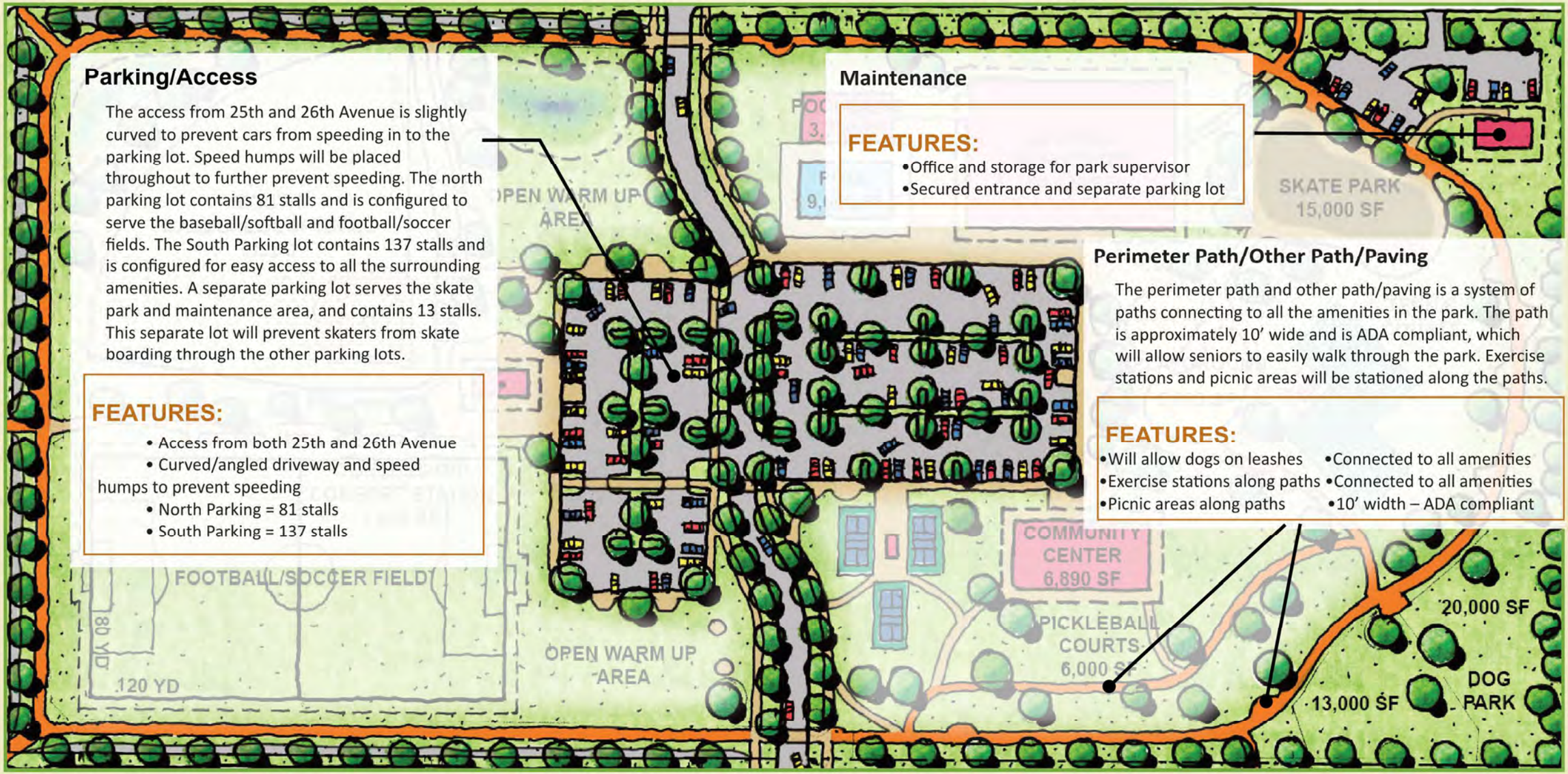
Community Center (6,890 SF)

FEATURES

- Similar to Shipman Park
- Accommodate large parties up to 200 people max
- Office space and storage rooms (for chairs and tables)
- Will be used by DPR's Elderly Activities Division for senior classes
- Has open field next to it for expansion of usable space
- Small office space for EAD
- Serving kitchen
- Kiln room
- Interior bathrooms with family restroom
- Exterior bathrooms on pickleball court side

DESCRIPTION

The community center has 4,000 SF of event space to accommodate up to 277 people. A garage door opening on the north and south sides extends the space to the plaza and lawn areas outside. There is also a senior program storage room, kiln room, and office which will serve DPR's Elderly Activities Division's programs and functions.



Parking/Access

The access from 25th and 26th Avenue is slightly curved to prevent cars from speeding in to the parking lot. Speed humps will be placed throughout to further prevent speeding. The north parking lot contains 81 stalls and is configured to serve the baseball/softball and football/soccer fields. The South Parking lot contains 137 stalls and is configured for easy access to all the surrounding amenities. A separate parking lot serves the skate park and maintenance area, and contains 13 stalls. This separate lot will prevent skaters from skate boarding through the other parking lots.

FEATURES:

- Access from both 25th and 26th Avenue
- Curved/angled driveway and speed humps to prevent speeding
- North Parking = 81 stalls
- South Parking = 137 stalls

Maintenance

FEATURES:

- Office and storage for park supervisor
- Secured entrance and separate parking lot

Perimeter Path/Other Path/Paving

The perimeter path and other path/paving is a system of paths connecting to all the amenities in the park. The path is approximately 10’ wide and is ADA compliant, which will allow seniors to easily walk through the park. Exercise stations and picnic areas will be stationed along the paths.

FEATURES:

- Will allow dogs on leashes
- Exercise stations along paths
- Picnic areas along paths
- Connected to all amenities
- Connected to all amenities
- 10’ width – ADA compliant

5.3 Cost Estimate

Potential construction cost estimates have been prepared for the projects major elements including utilities (drainage, domestic water, sewer, electrical and telecommunications); park amenities and ancillary improvements within the park. The current estimated design and construction costs associated with the new park is approximately $50,000,000. Note that park maintenance operations and costs have not been estimated at this time or for the purposes of this master plan.

5.4 Implementation

The concepts and descriptions of park amenities presented in this document is intended to set forth the Hawaiian Paradise Park New Park Master Plan. The master plan will be subject to more detailed feasibility study and refinement during design. At this time, concepts are general and intended to guide the next steps of the park planning process which will include design and entitlement actions. While not available at this time, a park construction phasing plan is anticipated to be needed due to the costs involved to construct the entire park master plan and ancillary infrastructure improvements.

5.5 Potential Permits and Approvals Required

Below is a list of permits and approvals anticipated to be needed for the project:

A. Grading Permit, County of Hawaii, Department of Public Works (including for electrical and plumbing)

B. Department of Health, Wastewater Branch, Individual Wastewater System, Approval to Construct and Occupy

C. Building Permit, County of Hawaii, Department of Public Works

D. National Pollutant Discharge Elimination System (NPDES), Discharge of Storm Water Associated with Construction Activities, Department of Health, Clean Water Branch.

E. Disability Communication and Access Board Document Review

F. Hawaii Department of Transportation, Permit to work in the State Right of Way

G. Hawaii Revised Statutes Chapter 343 Environmental Assessment

6 REFERENCES

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APPENDIX

PUBLIC AND STAKEHOLDER PARTICIPATION SUMMARY

A.1 Feedback from Stakeholder Meetings

November 7, 2017 – Meeting with County of Hawaii Councilmembers and Hawaiian Paradise Park Owners Association (HPPOA) Representative

- A Walking path is important for seniors since Pāhoa has no dedicated walking path.
- Incorporate a buffer between park and neighboring residential properties
- Consideration should be given to have a senior softball field, soccer field, football field and possible other needs by charter schools in the area.
- At a minimum the park features should include a walking path, dog park, playground, ball fields, and covered playcourt.

A.2 Consultations with County Departments

November 9, 2017 – Meeting with DPR Divisions

According to the DPR Recreation and Maintenance divisions, the following facilities and design considerations are needed and/or desired for the new park:

Baseball field – sized for all ages (up to high school, if possible) and inclusive of the following:

- Completely fenced
- Nighttime lighting
- Dugouts
- Bleachers on each side
- Scorer's booth behind backstop
- Scoreboard
- Design should also consider surrounding areas and impacts from balls hitting houses, etc.

Indoor/Outdoor Covered Play Court – should accommodate two regulation basketball/volleyball courts. Other amenities/considerations should include:

- Consider options for indoor tennis as well. The Pana'ewa court surfacing allows for this (poured-in-place rubberized flooring).
- Rolling three-tiered bleachers that will not damage court surface.
- Storage rooms similar to Pāhoa Park.
- Concession on exterior of structure.
- May house Recreation Director's office.
- Take into consideration ways to keep rain from blowing in (prevailing winds/over hangs). Issues with Pana'ewa being unusable at times due to wind-driven rain conditions.

Multipurpose Field – Should accommodate high school football and soccer. Look into separating fields if there is enough room with the remaining master plan program, otherwise use a combination field similar to Waimea District Park. Other amenities/considerations should include:

- Completely fenced
- Nighttime lighting
- Covered main bleacher (Similar to Pāhoa)
- Player seating areas (Similar to Pāhoa)
- Drinking fountains

Walking Path – Should be a minimum 10 foot wide shared use path (similar to Hilo Bayfront Trails) with nighttime lighting. Skateboarding will be prohibited. Dogs will be allowed on leashes. Dog waste stations should be provided. Also consider exercise fitness stations.

Children's Playground – If there is room, separate playground areas by age groups (2 to 5 and 5 to 12), but if not together is fine. DPR no longer installs swings with their playgrounds due to the large required safety zones and minimal uses it can accommodate. The playground perimeter needs to be clearly defined either with fencing, seat walls, or other feature.

Skateboard Park – Flat surface/ street-style type.

Tennis Courts – Consider outdoor two court system similar to Shipman Park with nighttime lighting. This can be in addition to or replace the option of accommodating indoor tennis

courts on the covered play court.

Community Center – Should be similar to Waimea Park or Kulaimano Park. The existing facility in HPP holds up to 125 people. This new community center should be able to accommodate large parties up to 200 people maximum. It should not be much larger than that since 300 person capacity triggers emergency shelter requirements. Consider orientation and initial phasing to allow for future expansion. Similar to Hilo Municipal Golf Course where the restaurant doors slide open and allow for additional outside usable space. Also need to include office space and storage room(s).

Dog Park – Dogs need to be addressed in some manner since the community feels it is important. Including a designated dog park within the HPP park should not take away recreation space from human users and also poses maintenance issues for DPR staff. There is also a question as to whether people would use it instead of the other open areas of the park including the walking paths. For the purposes of the master plan, we will not initially include a designated dog park but we will assume that dogs will be allowed in the park on leashes in designated areas and will incorporate dog waste stations accordingly. Special attention will need to be paid to delineating areas of the park where dogs are allowed so that enforcement is clear, i.e. fencing of restricted areas such as fields and playgrounds.

Office Space and Storage Rooms – Since there is no maintenance office in this area, consider adding an office and lockable storage room (shop type with office like at Shipman Park) for a possible park supervisor to be located in this park, this area is growing quickly so this is an eventual need for the area. Storage room estimated at 50x20 ft, if can be stand-alone that would be good but need to consider lost efficiency of having too many stand-alone buildings. If possible, situate this office so that visibility over the park is maximized.

Comfort Stations – Depending on master plan layout may need to include multiple facilities for sports fields, community center, etc.

Concessions – Location should take into consideration distance between the sports fields and the community center. Ideally it would serve both but the most logical location would be at the community center/covered play courts (similar to Pāhoa Park). This will likely just be a serving kitchen as certified kitchens can be a challenge.

Security – Encourage visibility from the outside-in to discourage illicit and reckless activities, homeless encampments, and crime. Design the park to maximize "eyes" on the park by neighbors. Make sure areas such as walking paths and comfort stations are well-lit and visible, incorporate fencing in ways to prevent access to unauthorized areas by the public. Consider providing an additional room in the community center to serve as a police substation (DPR to check with HPD to see if this is desired by them). In addition, the recreation director's office should have good visibility of the entire park.

Fencing – As mentioned in various sections earlier, need to prevent vehicles from entering the perimeter of the park in unauthorized areas but DPR does not want to fence the entire perimeter. While fencing would be appropriate along the south side of the property where private residences abut the park, other treatments such as earth berms or swales in combination with fencing should be employed in other areas. Focus on fencing smaller interior features such as sports fields, playgrounds, etc.

Plumbing and electrical fixtures would be consistent with DPR standards for durability, ease of maintenance and replacement. Likely need to have septic system for wastewater. Likely need to domestic water connection to county system since demand may be too great for catchment water system. Will need water fountains.

Lights - Incorporate lights for the whole park in later phases, but keep placeholders in design and the master plan. Zone lighting controls so that each area can be controlled separately.

MTA Park and Ride – Suggest that this be located off site on a separate adjacent parcel. DPR would not be responsible for parked cars. Having a bus stop at or near the park is good.

Landscaping

- Add some trees for shade but not line the whole park. Lots of people use pop up tents anyway for shade. Don't "block" view of park from outside.
- Irrigation not needed.
- No steep grades, hard to maintain. IV: 34 maximum
- Soil preparation – need at least 8-12 inches of good base soil. Depending on where soil comes from you may or may not have sleeping grass (i.e. problematic weeds)

issues in the future. Design plans should consider soil settlement also, since this is an issue for other parks in this area.

- May not be specified at this level of planning, but consider type of grassing to be used for his area. Carpet and centipede grass does well.

Architecture

- Make sure character is homogeneous
- Utilitarian
- Easy to maintain
- Energy efficient
- Natural lighting during daytime with supplemental lighting for cloudy days
- Multi-staged lights
- Color scheme will be up to the community
- Consider ways to keep out pigs as they will destroy grassing.

November 20, 2017 – Meeting with the Planning Department

The Planning Department offered the following suggestions for the park:

- Plan for transit accommodations within the Regional Town Center whether that is on the park site or adjacent site. A park-and-ride has been in the discussion before. This supports the goal of reducing traffic in the area.
- Design for three (3) park frontages and design the park so that it fits within the regional town center context in the future.
- Consider other neighboring subdivisions specifically Orchidland when planning the park.

November 22, 2017 – Meeting with the DPR Elderly Assistance Division

The DPR Elderly Assistance Division offered the following suggestions for the park:

- For the walking path, consider multiple distances. A mile might be too long for a walking path for seniors, try to create shorter runs but more importantly think about ADA and grades.
- Flat runs are desirable for seniors. Note the Pāhoa walking path doesn't go all the way around and is not flat. Machado Acres Park (off Keone St.) in South Hilo is a good example because it is mostly flat and has different path options for shorter or longer walks ("figure 8" design). At Machado, users are allowed to walk with their dogs on a leash as long as they clean up. There are no specific dog waste stations there.
- One good idea is to have covered rest areas along the walking path and possibly double it up with a bus stop. Bus stops should be covered.
- Papa'aloa is probably the smallest space EAD uses at about 80 persons capacity. Desired in HPP is probably a 150 or 200 person capacity design. The highest occupancy events are usually community rentals for parties like graduations. If ear marked as a "community center" it has to be available to the public for rental, so that needs to be considered.
- When looking at occupancy requirements for the building code, can assume non-fixed chairs/seating.
- Recommend providing an open area outside that can be expanded into as usable space. This helps keep the building square footage lower and promotes outdoor activities, which is good for the senior programs.
- Would be good if the community center can be used for public meetings as well as elections/polling places.
- Ainaloa has a good community facility attached to the park (Ainaloa Long House).
- Main thing is that everything is ADA accessible and has enough storage spaces to accommodate county users along with building users. Some users may include after school programs, Tutu and Me early education, schools, etc. Being able to store tables and chairs is one of the primary needs.
- Typically senior programs are held in the morning (up until about noon), then the space can be dedicated to youth and after school programs as needed.
- Storage is very important. Need three separate locked areas. This allows for County specific storage needs as well as other parties that rent or occupy the facility frequently.
- Would be nice to have an office for EAD, but if space is limited an area off to the side with a desk may be sufficient.
- Should also have a kitchen available. Doesn't have to be full commercial kitchen.
- If allowed to run some programs out of HPP, EAD would be interested and may need to staff the program.

- EAD has been flexible with facility spaces available to them. Example is the former Pāhoa fire station where they needed to relocate when lava flows were approaching, then returned when the lava threat diminished. Since it is a federally funded program that must keep it going, even if it means shuffling around.
- There are other emergency shelters in the district so this park doesn't necessarily need to be designed for that. Kea'au High School is one. However, there may be uses for the park to house people during times of emergency.

A.3 Public Meeting No. 1

A public meeting was held on Sunday, January 7, 2018 at the Hawaiian Paradise Park Owners Association Activity Center to present the vision, goals and preliminary alternative plans.

David Tarnas (MCSI) opened the meeting by introducing the project team and recognizing special attendees (Councilwoman Eileen O'Hara and DPR Deputy Director Maurice Messina). Jared Chang (SSFM) presented the project background, master plan process, vision, goals and preliminary alternative plans.

Following the PowerPoint presentation, meeting attendees were broken up into three (3) groups and directed to one of three stations (for conceptual alternatives 1, 2 or 3) set up for break-out discussions. Each station had the corresponding alternative displayed on poster board along with a facilitator and note-taker. The following questions were addressed by groups at each station:

1. What opportunities do you see in this alternative?
2. What issues and constraints do you see in this alternative?
3. What other recreational amenities should be considered?

Each group was allowed approximately fifteen minutes to discuss the alternative and provide feedback on the station comment sheet. Groups rotated through each station once.

Meeting attendees reconvened and each facilitator summarized the topics/concerns

PowerPoint presentation by SSFM

Alternative 1 Station

Alternative 2 Station

Alternative 3 Station

Figure 1: Draft Alternative 1 Conceptual Plan

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT

DRAFT ALTERNATIVE 1 FOR PUBLIC COMMENT (JANUARY 2018)
"CENTRAL PARKING" CONCEPT

Figure 2: Draft Alternative 2 Conceptual Plan

LEGEND:

Roads (Grey)
Sidewalks (Brown)

Walking Path
(Orange)

Biofiltration Swale
and Basins

Buildings

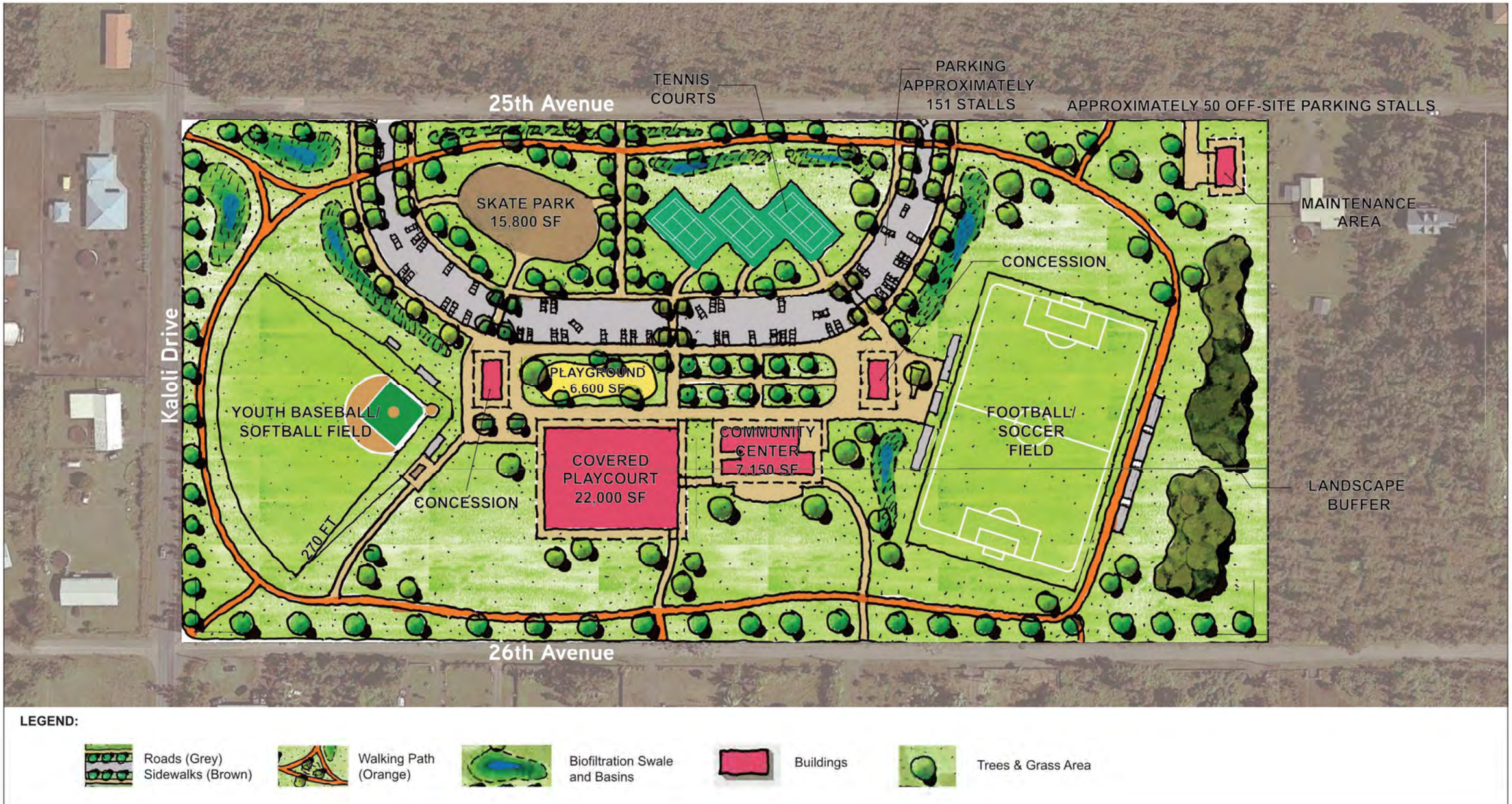
Trees & Grass Area

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT

DRAFT ALTERNATIVE 2 FOR PUBLIC COMMENT (JANUARY 2018)
"ROUNDABOUT" CONCEPT

Figure 3: Draft Alternative 3 Conceptual Plan



COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT

DRAFT ALTERNATIVE 3 FOR PUBLIC COMMENT (JANUARY 2018)
"LOOPED PARKING" CONCEPT

The following comments were made on the General Comment Forms and Alternative Comment sheets that were passed out during the meeting. These comments consist of those that applied to all three alternatives, and then further separated into comments made on each specific alternative. Comments that were submitted are provided below and are italicized.

General Comments by Category and Number of Responses

- *Want a fenced off-leash dog park that was originally proposed in the HPP survey*
- *Need a swimming pool (for seniors, water aerobics classes, etc.)*
- *Include community gardens*
- *More amenities and exercise equipment for seniors*
- *Fencing around the park for security*
- *Include sand volleyball courts*
- *Exercise stations along walking path*
- *More bathroom locations*
- *Include picnic areas with BBQ stations*
- *Certified commercial kitchen in the community center*

Amongst the comments received, a dog park was highly requested and mentioned; it appeared on the General Comment Form and all the Alternative Comment Sheets. Many feedback emails were also sent to Jared following the Public Information Meeting to request a dog park be added to the Master Plan.

A swimming pool was also highly requested by the public; it appeared on the General Comment Form, all of the Alternative Comment Sheets, and was also mentioned in emails sent to Jared.

Other issues and requests that were made throughout all the comment sheets were to add more amenities and exercise equipment for seniors to use, reduce the amount of tennis courts and/or baseball fields to add a sand volleyball court, add exercise stations along the walking path, include picnic/BBQ pavilions, fence the perimeter of the park, and add more bathrooms throughout the park.

The following comments appeared multiple times on the Alternative Comment Sheets and station notes.

Alternative 1 Comments

- *Has the most parking stalls*
- *Like the idea of two-way egress/ingress*
- *Include bike stands*
- *Central parking minimizes the amount of cars and limits walking pedestrians*
- *Playground location is far from the parking lot*

Alternative 2 Comments

- *Parking area creates easy access to each activity area*
- *Least parking of the alternatives*
- *Like the access from 25th and 26th*
- *Enlarge the skate park*
- *Reduce to one baseball/softball field*
- *Like the centrally located playground and community center*

Alternative 3 Comments

- *Parking design eliminates car traffic and noise on 26th*
- *Looped parking puts a lot of traffic on 25th, plus additional traffic flow from pro posed commercial center*
- *Less parking, inadequate for multiple team sports/tournaments going on at once*
- *There may be issues with access only on 25th*

The number of parking stalls and vehicle access from 25th and 26th were the main points of interest on all three alternatives. Comments concerning the proximity of the parking lot to play fields, the community center, skate park, and the playground were also of concern to the public.

Secondary to parking and vehicle access was the issue with the amount of play fields and exercise stations each alternative had. A majority of the comments made on play fields were to reduce the amount (if more than one was indicated) of baseball/ softball fields or tennis courts in order to allow room for a pool, dog park or sand volleyball court. There were also many requests to add exercise stations along the walking path and near play fields.

PowerPoint presentation by SSFM

Meeting attendees reviewing the "base" and "base + options" master plan alternatives

A.4 Public Meeting No. 2

A second public meeting was held on Monday, February 19, 2018 at the Hawaiian Paradise Park Owners Association Activity Center to present the preliminary master plan.

David Tarnas (MCSI) opened the meeting by introducing the project team and recognizing special attendees (Councilwoman Eileen O'Hara, DPR Director Roxcie Waltjen, and DPR Deputy Director Maurice Messina). Jared Chang (SSFM) presented the pros and cons and the feedback and comments received on the three (3) conceptual alternatives that were presented at the first Public Meeting held on January 7, 2018.

The two preliminary master plan alternatives ("base" and "base + options") were presented and details on each amenity to be included was explained. The presentation ended at approximately 4:00 PM.

Following the PowerPoint presentation, a Q&A session was held to give meeting attendees the opportunity to ask questions about both preliminary master plan alternatives. A summary of the questions and comments received can be found below.

Figure 4: Preliminary Master Plan (Base)

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT
SCALE: 1 IN = 120 FT

PRELIMINARY MASTER PLAN (BASE)

Figure 5: Preliminary Master Plan (Base+Options)

LEGEND:

Roads (Grey) Sidewalks (Brown) · Walking Path (Orange) · Biofiltration Swale and Basins · Buildings · Trees & Grass Area · Picnic Area · Seating Area · Exercise Stations · Fencing

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT
SCALE: 1 IN = 120 FT

PRELIMINARY MASTER PLAN (BASE + OPTIONS)

The following comments were made during the Q&A session and on the General Comment Forms, and covered the project in general. These comments consist of those that applied to the two alternatives, and then further separated into comments made on each specific alternative. Comments that were submitted are provided below and are italicized.

Which preliminary master plan elements are most important to you?

- *Dog park*
- *Pool*
- *Pickleball courts*
- *Sand volleyball courts*
- *Skate park*
- *Restrooms*
- *Open space/picnic areas*
- *Walking path that incorporates exercise stations*
- *Community center*

Amongst the comments received, a dog park was mentioned the most in response to this question. Feedback emails were also sent to Jared following the Public Information Meeting where it was mentioned that they preferred the base + options alternative because it included the dog park.

A swimming pool was also highly mentioned in response to this question and also appeared in the feedback emails.

Is there anything else you would like to share with us?

- *I think the plan as described is fantastic. Please keep all elements as discussed on base + options.*
- *Need restrooms on each side of the park. Add restrooms by the dog park.*
- *Include water fountains. Need those at the dog park also.*
- *Tennis courts don't seem to be necessary and can be included in a later phase.*
- *Pool could be included in a later phase.*
- *Pickleball? Out of all the people at this meeting only one (1) couple raised their hands that they had ever played pickleball.*

In general, most of the responses to this question indicated that the base + options preliminary master plan was favored over the base preliminary master plan, with comments on minor additions/subtractions of amenities and features. Comments on the traffic along Kaloli, 25th and 26th, and security and lighting of the park were also frequently mentioned in response to this question.

Meeting attendees sharing thoughts and ideas after meeting

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B

APPENDIX
PRELIMINARY ENGINEERING REPORTS

CONTENTS

1.0 Civil Engineering

1.1 INTRODUCTION

1.1.1 DESIGN STANDARDS

1. “Water System Standards”, Department of Water Supply (DWS), County of Hawai‘i, 2002
2. “Storm Drainage Standard”, Department of Public Works (DPW), County of Hawai‘i, October, 1970
3. Hawai‘i Administrative Rules, Title 11 Department of Health, Chapter 62 Wastewater Systems
4. “Topographic Survey” by Imata and Associates
5. “Standard Details for Public Works Construction”; Department of Public Works, September 1984, referred to as “Standard Details”
6. “Standard Specifications for Public Works Construction”; Department of Public Works, September 1986, referred to as “Standard Specifications”
7. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design; Department of Justice, September 15, 2010
8. Hawai‘i County Ordinances, Chapter 25, Division 5 - Off-Street Parking and Loading
9. “A Policy on Geometric Design of Highways and Streets”, American Association of State Highway and Transportation Officials (AASHTO), 2011, 6th Edition

1.1.2 EXISTING CONDITIONS

The site is located on a 20-acre parcel situated approximately 3,500 feet Northeast of Kea‘au-Pāhoa Road (Highway 130), the main north-south roadway serving the Puna community. The site is bounded by 25th Avenue to the northeast (toward Makai), Kaloli Avenue to the Northwest, 26th Avenue to the southwest (toward mauka) and residential properties to the southeast.

The site is gently sloped and consists of an elevation difference of approximately 48 feet within 1,500 feet, or 3% slope. Localized slopes within the site are generally steep in some areas with mounds and dips and slopes in a south to north direction.

1.2 DRAINAGE

County of Hawai‘i Storm Drainage Standard will apply to this project. Rainfall Intensity Plate Maps from the drainage standards were used to calculate rainfall intensities. These intensities were then used to estimate peak flows for a 10-year and 50-year return period event for both the existing and proposed conditions.

The Rational Method was used to calculate peak flows, based on a 1-hour rainfall duration with rainfall intensities of 4.5 inches/hour and 5.8 inches/hour, respectively (as per Plate 1 and 2 of the storm drainage standards). Times of concentration were estimated for each drainage area, based on the individual overland slopes and lengths (Plate 3 of the storm drainage standards).

1.2.1 EXISTING

Land use is currently undeveloped with areas of natural forest of brush and ‘ōhi‘a trees. There are no existing drainage structures or gulches to dispose of stormwater runoff; however, the uneven nature of the topography creates natural low and high spots throughout the 20-acre parcel. Existing drainage patterns generally flow in the northerly direction. The existing site has been delineated into several drainage areas (see Figure 1). The drainage areas and estimated peak flow rates produced by the 1-in 10-year and 1-in 50-year design storms at each area have been presented in Table 1.

As mentioned in the previous section, the parcel is bordered on three sides by paved roadways. The slope of these roads is generally a crowned condition resulting half of the roadway pavement draining toward the parcel property line. Site observations and interviews with HPP residents concluded that roadside runoff and/or ponding have not historical been an issue. Offsite roadway improvements are not part of the scope of work of this masterplan. However, in the future, once the need for improvements are determined the pavement runoff will need to addressed through the use of curbs, swales, drywells, or other drainage infrastructure to ensure no negative impacts to the park parcel. The topography on the southeast edge of the site (residential border) does not appear to have any drainage ways that enter the property based what is shown on the topographic information available.

Figure 1: Pre-Development Drainage Condition

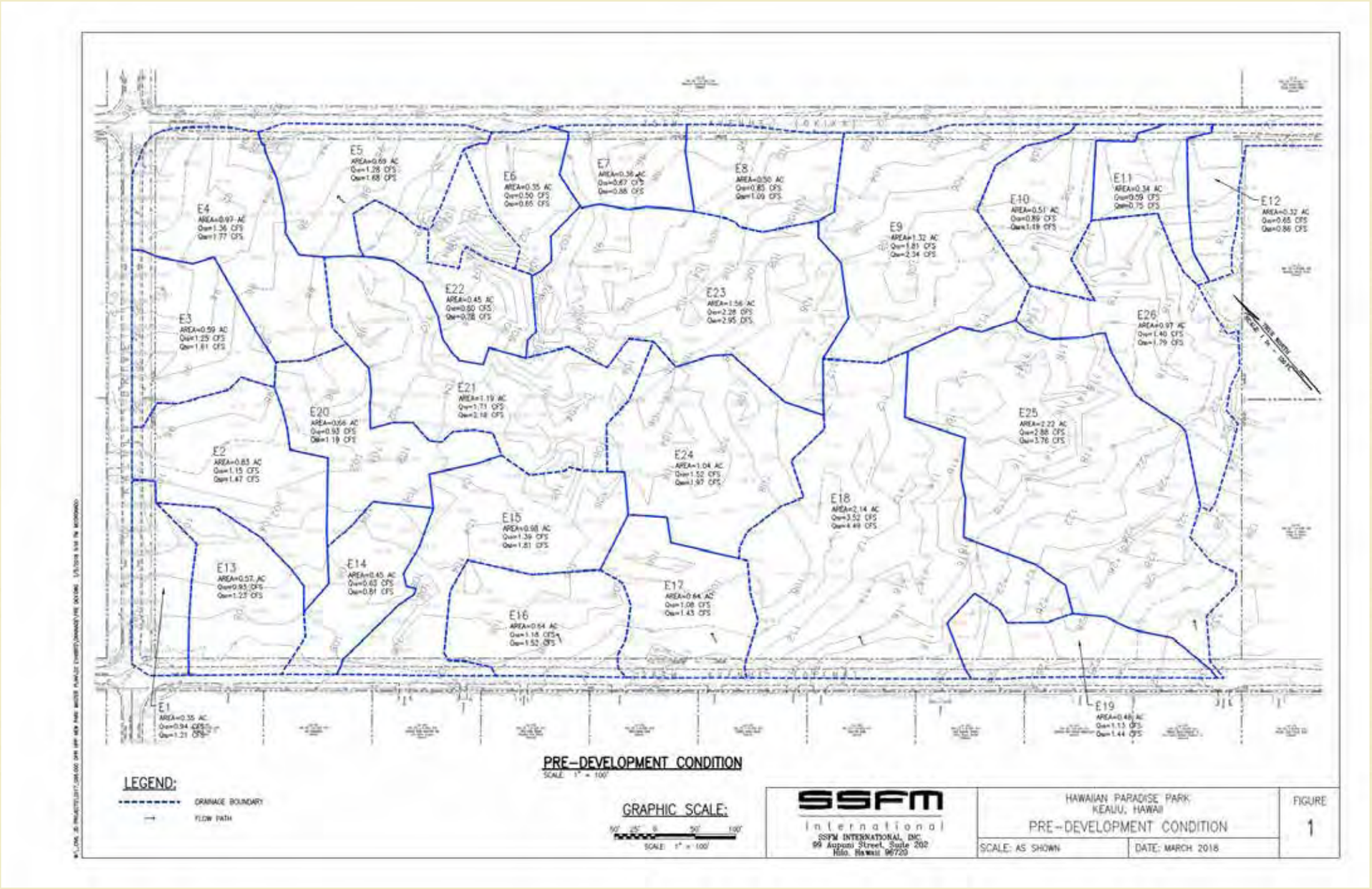


Table 1: Summary of Existing Flow Rates

Drainage Basin	Area (ac)	Peak Flow Q_{10} (cfs)	Peak Flow Q_{50} (cfs)
E1	0.35	0.94	1.21
E2	0.83	1.15	1.47
E3	0.59	1.25	1.61
E4	0.97	1.36	1.77
E5	0.69	1.28	1.68
E6	0.35	0.50	0.65
E7	0.36	0.67	0.88
E8	0.50	0.85	1.09
E9	1.32	1.81	2.34
E10	0.51	0.89	1.19
E11	0.34	0.59	0.75
E12	0.32	0.65	0.86
E13	0.57	0.93	1.23
E14	0.45	0.63	0.81
E15	0.98	1.39	1.81
E16	0.64	1.18	1.52
E17	0.64	1.08	1.43
E18	2.14	3.52	4.49
E19	0.48	1.13	1.44
E20	0.66	0.93	1.19
E21	1.19	1.71	2.18
E22	0.45	0.60	0.78
E23	1.56	2.28	2.95
E24	1.04	1.52	1.97
E25	2.22	2.88	3.76
E26	0.97	1.40	1.79
TOTAL	**21.14**	**33.10**	**42.84**

1.2.2 PROPOSED

In general, runoff will flow away from buildings and will flow and infiltrate into the ground or be collected by swales, gutters along rooftops and inlets and conveyed to shallow drywells and/or detention basins for onsite disposal. It is assumed that shallow drywells have the capacity to dispose of two cubic feet per second (2 cfs) of stormwater runoff. During final design, the use of deep drywells, with a capacity to dispose of six cubic feet per second (6 cfs) of storm water runoff, will be evaluated. Percolation tests will be performed during the design and construction phases to confirm disposal rates.

The proposed drainage conditions are shown in Figure 2. The drainage areas have been delineated to reflect the conceptual proposed grading. Table 2 presents a summary of the proposed drainage areas and the estimated flow rates from the 1-in 10-year and 1-in 50-year storms under the proposed drainage conditions.
The Park development will utilize roof drains and downspouts to handle runoff from roof areas. The downspouts will connect to underground drainlines which will pipe to new drywells. Drainage areas P21, P22 and P23 are over the shallow drywell 2 cfs capacity; however, the overflow could be handled by the detention basin in the northern portion of the site, at the corner of Kaloli Drive and 25th Avenue. Drainage Area P35 represents offsite drainage and flow that could possibly be handled by an offsite swale.

The preliminary master plan includes two detention basins: one at the corner of Kaloli Drive and 25th Avenue (Detention Basin 1), and the other at the 25th Avenue entrance to the Park (Detention Basin 2). Each detention basin bottom will include shallow or deep drywells to supplement the basin drainage.

Preliminary detention basin sizing calculations have been performed and for conservative purposes, assumed no percolation or infiltration into the ground, or under a 100% clogged scenario. Calculations indicate that Detention Basin 1 be approximately 8,200 cubic feet in volume. This would mean a drainage basin of 2,800 square feet, 3 feet deep. Drainage Basin 2 is approximately 31,000 cubic feet in volume, or 15,500 square feet, 3 feet deep. Both detention basins will have minimum 6:1 side slopes for safety reasons.

During the more detailed planning and design of the project, engineers will determine the necessary water quality standards and which Best Management Practices (BMPs) would be most effective for this project.

Figure 1: Post-Development Drainage Condition

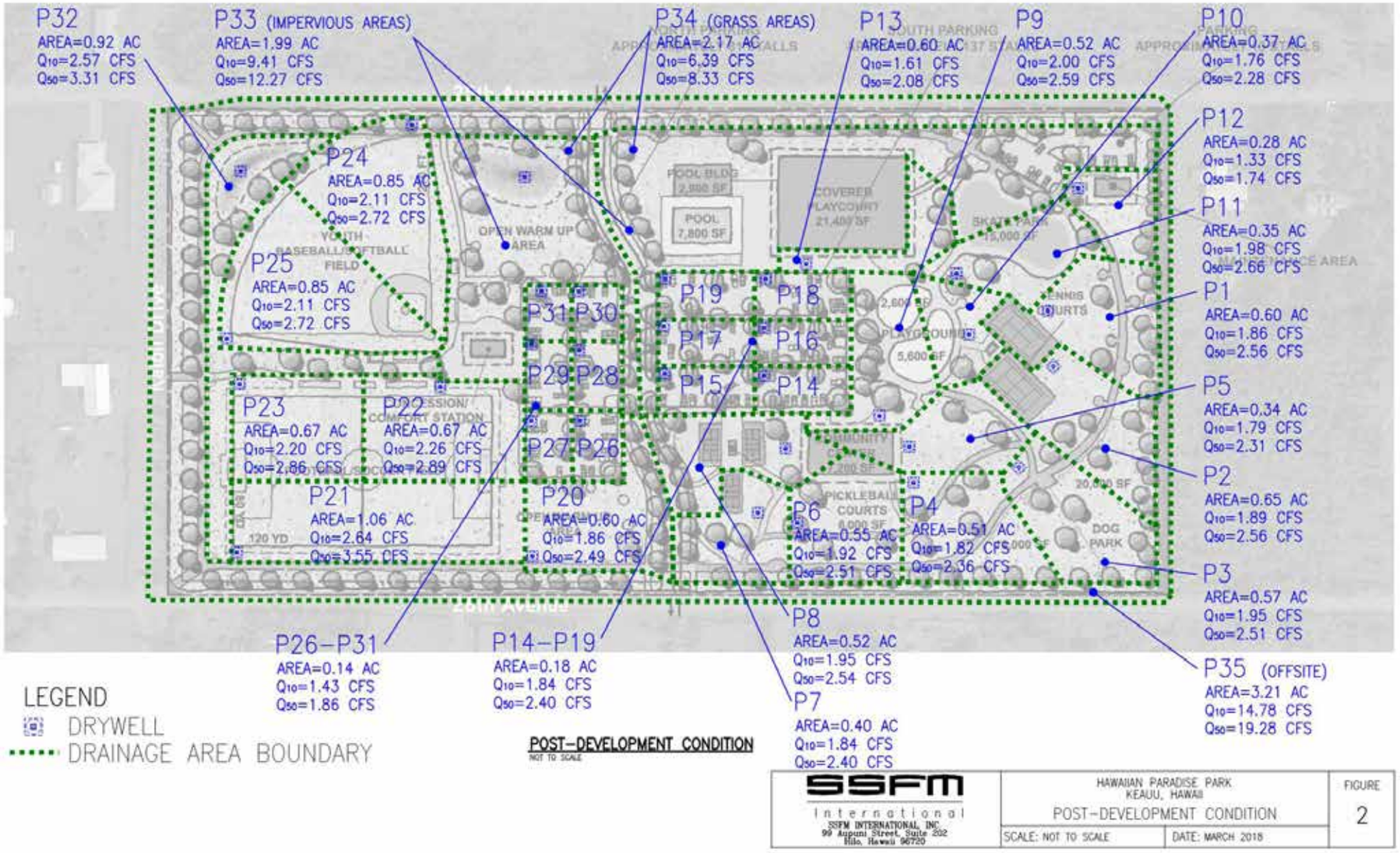


Table 2: Summary of Proposed Flow Rates

Drainage Basin	Area (ac)	Peak Flow Q_{10} (cfs)	Peak Flow Q_{50} (cfs)
P1	0.60	1.86	2.56
P2	0.65	1.89	2.56
P3	0.57	1.95	2.51
P4	0.51	1.82	2.36
P5	0.34	1.79	2.31
P6	0.55	1.92	2.51
P7	0.40	1.84	2.40
P8	0.52	1.95	2.54
P9	0.52	2.00	2.59
P10	0.37	1.76	2.28
P11	0.35	1.98	2.66
P12	0.28	1.33	1.74
P13	0.60	1.61	2.08
P14	0.18	1.84	2.40
P15	0.18	1.84	2.40
P16	0.18	1.84	2.40
P17	0.18	1.84	2.40
P18	0.18	1.84	2.40
P19	0.18	1.84	2.40
P20	0.60	1.86	1.97
P21	1.06	2.64	3.55
P22	0.67	2.26	2.89
P23	0.67	2.20	2.86
P24	0.85	2.11	2.72
P25	0.85	2.11	2.72
P26	0.14	1.43	1.86
P27	0.14	1.43	1.86
P28	0.14	1.43	1.86

Table 2: Summary of Proposed Flow Rates

P29	0.14	1.43	1.86
P30	0.14	1.43	1.86
P31	0.14	1.43	1.86
P32	0.92	2.57	3.31
P33	1.99	16.30	21.26
P34	2.17	9.94	12.96
P35	3.21	14.78	19.28
TOTAL	**21.14**	**33.10**	**42.84**

1.3 GRADING

The schematic grading plan follows the general criteria:

- Sports fields and lawn areas are graded to 1-2% for drainage purposes
- Parking lots are graded 1-5% for drainage purposes, except at ADA stalls where slopes are at maximum 1.25%
- Playcourts (except the covered playcourt) are graded to 1-2% for drainage purposes
- The dog park is graded to a maximum 10%. Due to its location on the site and the topography of the area, the dog park is sloped to be able to work with the other elements and grades of the park
- Slopes between buildings or areas where foot traffic is expected are limited to either 10% (grass) or 5% (paved) or less
- Walkways are ADA compliant (less than 1.5% longitudinally, less than 7.5% for ramps)
- All other areas are graded to 3:1 or less for maintenance and mowing purposes

An effort to balance earthwork quantities of cut and fill is expected to minimize the cost of purchasing offsite borrow material and disposing of excess excavated material at an off-site location. Preliminary grading indicates that there is a surplus of excavation (55,000 cubic yards) over embankment needed (30,000 cubic yards). Since the grading plan is still preliminary, efforts to further balance the earthwork will occur during final design. Grading operations shall be in conformance with Chapter 10 of the County of Hawai‘i County Code.

A retaining wall is anticipated as part of the conceptual design. The retaining wall location is between 26th Avenue and the football/soccer field for the length of the field. Since park areas in general tend to be flat compared to the existing topography, there is an elevation difference between the higher existing 26th Avenue and the lower elevation of the field area. The location is preliminary and shall be further evaluated during final design. The wall varies in height from 4 feet to 8 feet.

More detailed soils investigations for grading and retaining wall design will be performed as planning of the project proceeds.

1.4 ROADWAYS AND WALKWAYS

1.4.1 ROADWAYS AND PAVEMENT DESIGN – OFF-SITE

All existing major mauka-makai collector roads within Hawaiian Paradise Park (Shower Drive, Kaloli Drive, Paradise Drive, and Maku‘u Drive) are paved, privately-owned (by HPP) two-lane roads. The minor crossroads, also two-lane and privately-owned by HPP, are a mixture of paved and unpaved areas within the subdivision. 25th Avenue and 26th Avenue are paved within the project area. The existing speed limit along Kaloli Drive is 35 mph and 25 mph along 25th Avenue and 26th Avenue.

Since the project will generate additional traffic on the existing roadways in the vicinity of the project site, a Traffic Impact Assessment Report (TIAR) will be prepared for this project during the environmental planning stage, which will outline the requirements and impacts of the park and improvements possibly needed to the surrounding roadways and intersections.

1.4.2 ROADWAYS AND PAVEMENT DESIGN – ON-SITE

Under this project, it is assumed that roadways and parking lot pavement structure will be based on the County of Hawai‘i Standard Details. However, as part of the geotechnical investigation that will be performed during design development it is recommended that a pavement justification report for both on-site and off-site roadway and parking areas be conducted to verify adequacy.

1.4.3 WALKWAY AREAS

The exterior/perimeter walkway that borders the park property shall be 10 feet wide minimum. Interior walkways between park elements (e.g. parking lot, buildings fields, etc.) shall be 5 feet wide minimum.

1.4.4 SITE ACCESS

Site access will be via 25th Avenue and 26th Avenue. Access along Kaloli Street will not be allowed. Sight distance at these access points shall comply with the American Association of State Highway and Transportation Officials (AASHTO) Stopping Sight Distance Requirements. Per AASHTO intersection sight distance requirements, sight distance is a minimum 280’ from a stop-controlled minor road. Adjustments factors shall be applied for vertical grades.

1.5 UTILITIES

1.5.1 WATER
See water PER.

1.5.2 WASTEWATER
There is no public sewer system serving the Hawaiian Paradise Park subdivision or Puna community. The closest public wastewater facility is along Volcano Highway, approximately 10 miles away.

It is anticipated that the onsite sewage will be disposed of via sewerlines from buildings to multiple septic tank and leach field chamber systems. Preliminary calculations and grades indicate that three separate leach fields are needed. For purposes of initial analysis, each leach field system will have a minimum 2,000 gallon septic tank and a chamber system approximately 30' x 80' in size. Since these chamber systems are underground, the open field areas of the park (i.e. fields or lawn areas) will be used for placement. Figure 3 illustrates the potential location of the leach field systems as discussed below.

One leach field will service the western portion of the park in the vicinity of the baseball and football/soccer fields. The concession stand and comfort station building is the main generator of wastewater for this leach field. In addition, hose bibbs and drinking fountains, depending on placement, will connect to the leach field. Due to the need for gravity flow for the system, the location of this leach field is ideal between the western parking lot and 25th Avenue.

Another leach field will service the pool building and covered play courts. Each facility will have restrooms, drinking fountains and hose bibbs. Draining and maintenance of the pool water will not be able to be disposed of in the leach field. Location of this leach field is between the pool facilities and the vehicle driveway.

The last leach field will service the community center, which includes restrooms, drinking fountains and hose bibbs. Location of the leach field will be in the open lawn area of the community center or between the community center and tennis courts.

Drinking fountains or hose bibbs that are not in the vicinity of a leach field can be drained to individual seepage pits.

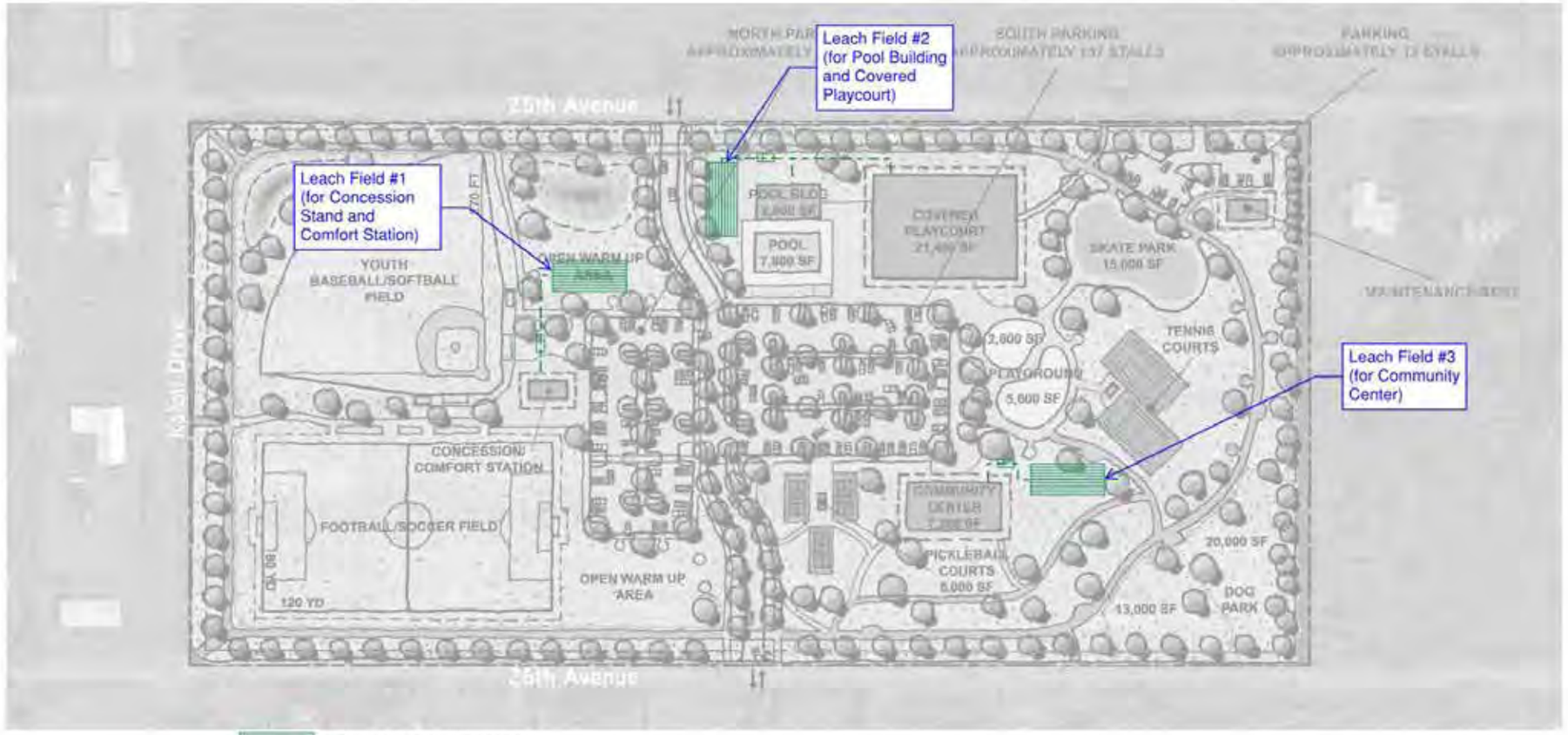
Sewer system design shall comply with Department of Health Wastewater System Standards. Pool drainage shall comply with Department of Health Rules for Public Swimming Pools.

1.5.3 ELECTRICAL
See electrical PER.

1.6 ENGINEERING PERMITS & APPROVALS
Below is a list of permits it is anticipated are needed during design

- Grading Permit, County of Hawaii, Department of Public Works
- Department of Health, Wastewater Branch, Individual Wastewater System, Approval to Construct and Occupy
- Building Permit, County of Hawaii, Department of Public Works
- National Pollutant Discharge Elimination System (NPDES), Discharge of Storm Water Associated with Construction Activities, Department of Health, Clean Water Branch. It is anticipated that an Individual NPDES is needed as the marine area in the project area is in Class AA waters, per the latest Water Quality Standards Map.
- Disability Communication and Access Board Document Review

Figure 3: Proposed Leach Field Locations



LEACH FIELD CHAMBERS

SEPTIC TANK

PROPOSED LEACH FIELD LOCATIONS

NOT TO SCALE

SSFM International SSFM INTERNATIONAL, INC. 99 Aupuni Street, Suite 202 Hilo, Hawaii 96720	HAWAIIAN PARADISE PARK KEAUU, HAWAII LEACH FIELD LOCATIONS SCALE: NOT TO SCALE — DATE: MARCH 2018	FIGURE 3

2.0 WATER SERVICING

2.1 INTRODUCTION

The enclosed report presents a summary of the options reviewed for providing potable and non-potable water sources in support of the Master Plan Development for the new Park Master Plan within Hawaiian Paradise Park. The project site is located within TMK 1-5-039:267, which is bordered by Kaloli Drive to the north, 26th Avenue to the west and 25th Avenue to the east, within the Hawaiian Paradise Park subdivision. Copies of the current concept plans for the park are included in the Appendix as Exhibits A1 and A2.

The scope of this study is to perform an assessment of the following:

- Existing capacity and availability of municipal water in the vicinity of the park, and the design/construction effort required to convey the required supply of water to the park site for the projected ultimate demand of the park and, separately for the possible future expansion of municipal water distribution required to supply the Hawaiian Paradise Park subdivision.
- To assess the requirements for creating on-site storage and collection systems for potable and non-potable supply for consumption, restrooms, maintenance, irrigation, fire protection and other needs to be used either in conjunction with or in place of a municipal water supply.

The purpose of this study to determine preliminary costs and effort required to supply water for the park from various sources including expansion of the municipal water system to service the park; an on-site system of rainwater collection and storage for potable and non-potable uses; or a combination of municipal water for potable uses and rainwater collection/storage system for non-potable uses.

2.2 BACKGROUND INFORMATION

The County of Hawaii, Department of Parks and Recreation, has engaged SSFM International to develop a preliminary Master Plan for the park site. Although the master plan has not yet been finalized, it is anticipated that the park will include community recreation facilities such as:

- Multi-Purpose Soccer and Football Field
- Baseball/Softball field
- Community Center
- Covered play courts
- Children's Playground
- Maintenance Area
- Comfort Stations
- Concession Stands
- Tennis Courts
- Pickleball court
- Swimming pool

The project site is currently not serviced with a municipal water supply. As outlined above, potential options for meeting the demands of the park include an extension of the municipal water supply system to the project site, as well as development of an on-site rainwater collection system, or potentiality a combination of the two sources.

2.3 ANALYSIS

2.3.1 WATER DEMAND ESTIMATES

Domestic Demand
To determine an estimate of the water demands within the park, a number of criteria were reviewed. These include the County of Hawaii, Department of Water Supply (DWS) criteria as presented within the 2002 Water Systems Standard, and also the 2003 International Plumbing Code.

The County of Hawaii DWS standards were reviewed to estimate the average daily demand and determine the required fire flow based on the proposed land use and park designation. The following presents a summary of the DWS criteria and estimated flow rates for the proposed park, using the DWS criteria.

Table 3: ESTIMATED WATER DEMANDS WITH DWS CRITERIA

Zoning Designation	Average Daily Demand	Park Area	Average Day Demand	Maximum Day Demand	Peak Hour Demand
Schools, Parks	4000 gal/acre	20 acres	80,000 gal/day	120,000 gal/day	278 gpm

Although not specifically stated within the DWS criteria, it is our understanding that the estimated demand per acre for Schools and Parks includes a component for irrigation demands, and not strictly for potable water demands. To provide a separate estimate of the potable water component we have also included a summary of the County of Maui DWS criteria for Commercial/Residential Mix, which is based on the building area. Of note, the County of Hawaii DWS criteria does not include a unit flow rate based on floor area, thus the County of Maui criteria was used for comparison purposes. The following table presents a summary of the estimated potable water component using the design rate of 140 gal/1000 ft2 as per County of Maui criteria for Commercial/Residential Mix.

Table 4: ESTIMATED POTABLE WATER DEMAND USING FLOOR AREA

Building/Facility	Area (Ft^2)	Average Day Demand	Maximum Day Demand	Peak Hour Demand
Comfort Station	2400	336 gal/day	504 gal/day	1.17 gpm
Concession	2400	336 gal/day	504 gal/day	1.17 gpm
Community	7200	1008 gal/day	1512 gal/day	3.50 gpm
Maintenance	1250	175 gal/day	263 gal/day	0.61 gpm
Total		1855 gal/day	2783 gal/day	6.44 gpm

For comparison purposes, we have also prepared an estimate of the potable water demand based on a preliminary estimate of the fixture unit count and the International Plumbing Code (2003). The calculation sheets for the preliminary fixture unit counts are included in the Appendix, with a summary presented in the table below.

Table 5: SUMMARY OF PEAK DEMAND BASED ON ESTIMATED FIXTURE UNIT COUNTS

Facility/Location	Fixture Unit Count	Peak Flow Rate	Peak Demand
HPP Park -West	47.6	50 gpm	1500 gal/day
HPP -Pool/Court	45.4	48 gpm	1440 gal/day
HPP – Community Center	42.6	47 gpm	1410 gal/day
Total		**145 gpm**	**4350 gal/day**

Irrigation Demands

To include a separate component for the irrigation demand, we have estimated the amount of irrigation based on an average daily application rate of 3/10 inch over the areas to be irrigated. The irrigated areas are likely to vary depending upon the selected master plan, however we have based the extent of irrigated areas and average daily demands as presented in Table 6 below. In estimating the peak flow rate, we have assumed that the irrigation system would be operated over a 6-hour period.

Table 6: SUMMARY OF ESTIMATED DAILY IRRIGATION VOLUME

Facility	Area (ft^2)	Depth of Irrigation (ft)	Irrigation Volume (ft3)	Irrigation Volume (gal)	Peak Flow Rate (gpm)
Ball field	57,000	0.025	1425	10,660	30
Soccer Field	100,000	0.025	2500	18,701	52
Miscellaneous	87,120	0.025	2178	16,293	45
Total				**45,654 gal/day**	**127 gpm**

Combined Domestic and Irrigation Demands
The following table presents a summary of the estimated flow rates, based on the various criteria and options as presented in the above sections. The County of Hawaii, DWS demand multiplier of 1.5 has been applied to convert average day demand rates to maximum day demand rates, where applicable.

Table 7: COMPARISON OF WATER DEMAND ESTIMATES

	DWS Criteria			IPC and Irrigated Area Criteria		
	Total	Potable	Non-Potable	Potable	Irrigation	Total
Average Day	80,000	1743	78,257	2900	45,654	**48,554**
Maximum Day	120,000	2615	117,385	4350	68,481	**72,831**
Peak Hour	278	6.05	272	145	190	**335**

For the purposes of the concept design, the enclosed analysis has been based on the demand rates and volumes from the IPC and estimated irrigation rates as presented in the above table. Based on our review, these demand estimates would be more reflective for the new park development plan at Hawaiian Paradise Park. The increased potable water demands during peak hour may be more reflective of periodic events with heavy park usage, and a moderate reduction in total water demand is considered more appropriate for the climatic conditions near HPP with increased precipitation and corresponding reduction in irrigation demand.

Fire Flow Demand
The DWS standards do not contain a specific fire flow requirement for Parks or Community Centers as are anticipated within the proposed HPP Park. For the purposes of this study, the Land Use designation as Schools, Neighborhood Business, Small Shopping Centers, Hotels and High Rise Apartments within Table 100-19 of the DWS Water Systems Standards manual was selected as the applicable criteria. Under this designation, the required fire flow criteria is presented in the following table. Further coordination with the Hawaii Fire Department is recommended, as the planning and design process continues to evolve.

Table 8: SUMMARY OF FIRE FLOW REQUIREMENTS

Land Use	Fire Flow Rate	Required Duration	Volume	Hydrant Spacing
Schools, Neighborhood Business, Small Shopping Centers, Hotels and High Rise	2000 gpm	2 hours	240,000 gal	300 ft
Single Family (> 10,000 ft² lot size)	500 gpm	2	60,000 gal	600 ft

2.3.2 WATER SUPPLY OPTIONS

Extension of Municipal System

As noted above, the project site is not currently serviced by the Department of Water Supply (DWS) distribution system. The DWS has a 12-inch diameter watermain along Keaau-Pahoa Road (Highway 130), and also along Paradise Drive up to the existing volunteer fire station, at 20th Avenue. The nearest connection point to the existing water supply system for the HPP Park would be at the intersection of Kaloli Drive and Keaau-Pahoa Road.

In discussions with DWS representatives, they have indicated that there is currently availability and capacity within the existing 12-inch water line on Keaau-Pahoa Road to service the proposed park development. Permit approval from the Department of Transportation- Highways Divisin would be required for the watermain crossing, and the watermain along Kaloli Drive would need to be protected within a DWS right-of-way.

The DWS was not able to provide data on the available flow rates and residual pressures at the proposed point of connection. Flow testing of the existing hydrants, near the intersection of Keaau-Pahoa Road is recommended and the analysis can be verified once the results of the flow tests are available. For conceptual design purposes, the analysis of the proposed expansion has been estimated based on operating pressures in the range of 60 psi near the proposed connection point.

In order to provide municipal water to the proposed park, the system expansion would include the installation of a 12-inch diameter watermain on Kaloli Drive (approximately 4300

ft) and the installation of 1200 ft of 12-inch watermain on 25th Avenue, fronting the park site. The proposed expansion was modelled using the EPANET water model to estimate the available capacity, pressure losses, and maximum velocity.

The proposed watermain extensions are shown on Figure 4, and the results of the analysis are presented within the attached Appendix. Based on the preliminary analysis, the expansion of the municipal water system would be able to meet the peak hour demands of 335 gpm, with residual pressures in the range of 87 psi. Under fire flow demands of 2000 gpm, it is anticipated that the residual pressure would be in range of 56 psi, which meets the minimum pressure requirements of 20 psi in the DWS standards.

In addition to modeling the estimated water demands for the Park, the enclosed analysis also includes an estimate of the available capacity to service the nearby residential demands of the Hawaiian Paradise Park neighborhood. Based on the DWS standards, the maximum permissible velocity, without fire flow is 6 ft/s. With a 12-inch diameter pipe, and a peak velocity of 6 ft/s, this equates to a peak flow rate of 2,115 gpm. With a demand rate of 335 gpm for the Park, this leaves a remaining capacity of 1,780 gpm available for residential demand.

As outlined in the DWS design criteria, the Average Day Demand rate under the DWS Single Family Zoning Designation, is 400 gal/unit. With a demand factor of 5.0 x Average Day, this translates to a peak hour flow rate of 1.38gpm per residential unit. With an available capacity of 1,780 gpm the 12-inch diameter watermain, would be able to support approximately 1,290 single family units. Of note, the existing water-main on Keaau-Pahoa Road is also a 12-inch diameter line, and presently services a number of homes along Keaau-Pahoa Road. The total number of serviceable properties therefore will be reduced, depending upon the number of units currently serviced by the existing 12-inch waterline on Keaau-Pahoa Road. This should be confirmed during future design phases as the number of serviced units and maximum velocity begins to approach the maximum permissible values.

On-Site Catchment

As an alternative to an extension of the municipal water supply system, the Department of Parks and Recreation would also like to explore the feasibility of an on-site rainwater catchment system or a combination of municipal water supply and on-site catchment to meet the water requirements for the new park. The following section presents a summary of the water supply potential for a catchment system, based on the concept development plans for the Park.

There are a number of rain gages located in the vicinity of the project site. The nearest gage to the north is located approximately 4.9 miles north of the project site (Gage #513872). To the south, there is a rain gage located at 4.3 miles south-east of the project site (Gage #517457). Figure 5 depicts the rain gage locations relative to the project location.

Figure 4: Proposed DWS Water System Extension

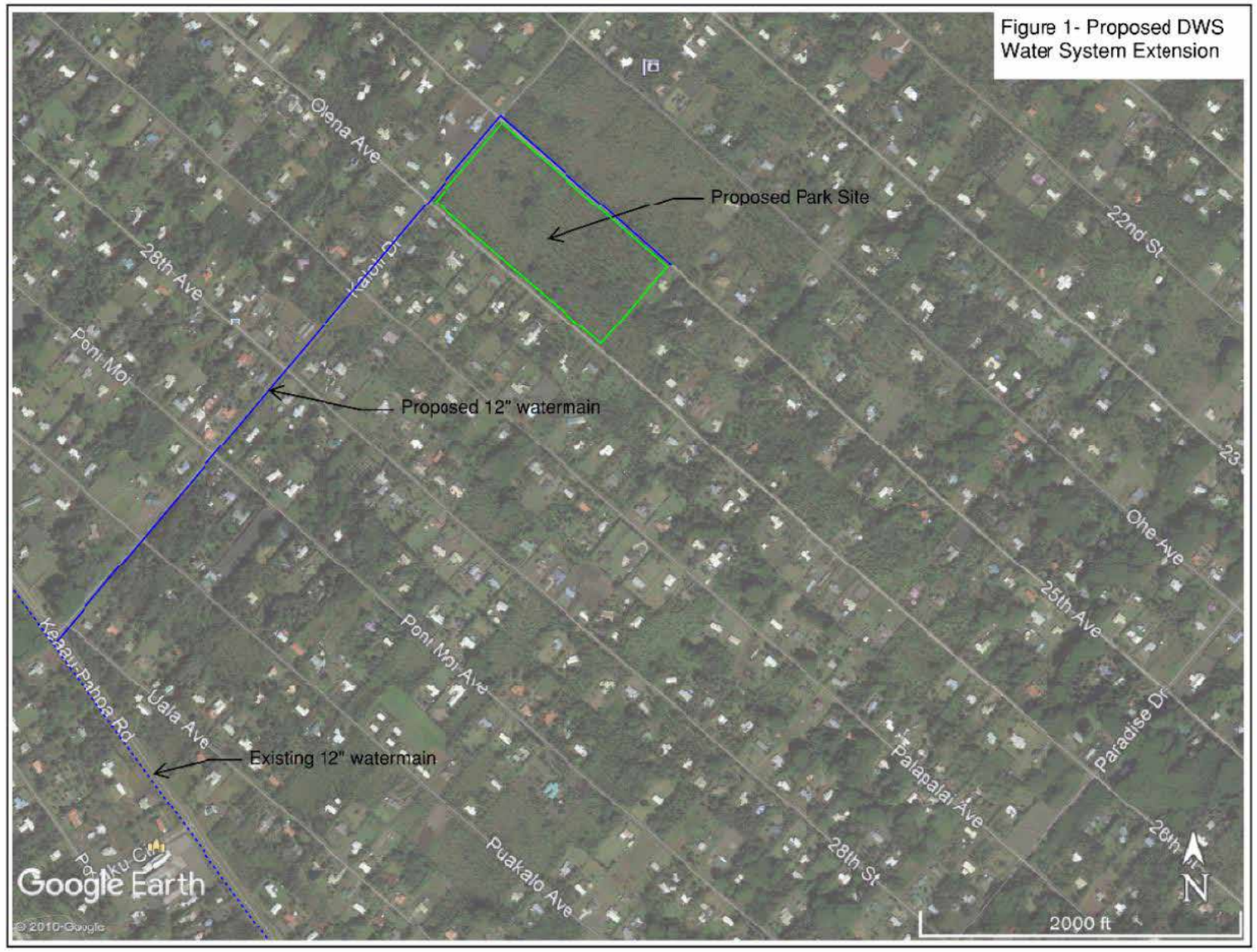


Figure 5: Existing Rain Gage Locations

Figure 6 shows the average daily precipitation (7-day running average) for the gage to the north of the project and Figure 7 shows the average daily precipitation for the gage located to the south of the project, near Pahoa. The rain gage near Keaau indicates an average daily precipitation in the range of 0.45 inches. The rain gage near Pahoa indicates an average daily precipitation slightly less than the Keaau rain gage, but still within the range of 0.4 inches per day. Therefore, for the enclosed catchment analysis we have used an average daily precipitation of 0.4 inches.

Figure 6: Average Daily Precipitation, Rainfall Gage 513872, Keaau

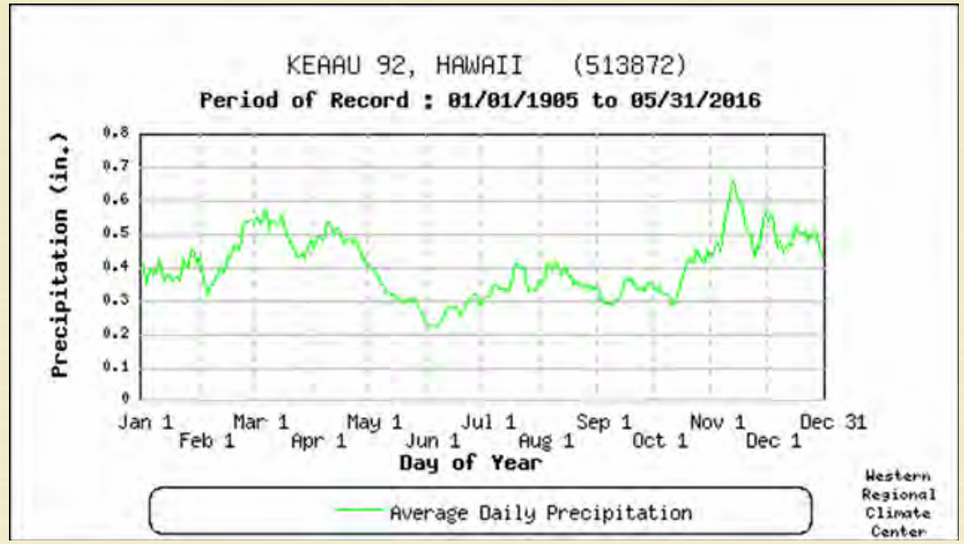
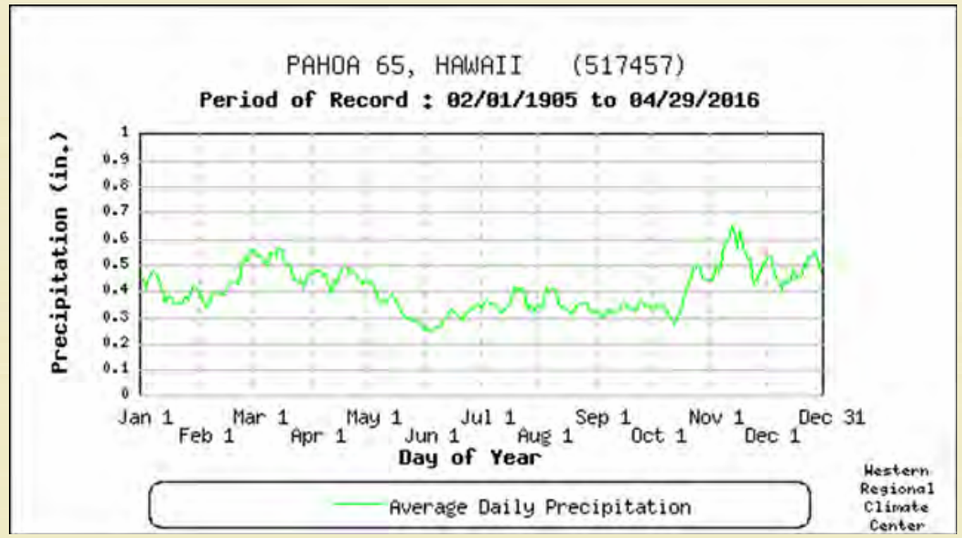


Figure 7: Average Daily Precipitation, Rainfall Gage 517457, Pahoa



The total roof area is likely to vary depending upon the selected development plan. For the purposes of the enclosed analysis, the available catchment area is based on the roof areas as shown in Table 9 below.

Table 9: ESTIMATE OF DAILY RAINWATER CATCHMENT VOLUME

Facility	Roof Area (ft^2)	Rainfall Depth (in)	Catchment (gal)	Losses (gal)	Net Volume (gal)
Covered Playcourt	21,000	0.4	5240	520	4720
Comfort Station	2400	0.4	600	60	540
Concession Stand	2400	0.4	600	60	540
Community Center	7200	0.4	1800	180	1620
Total	33,000		8240	820	7420

Based on the above table, the catchment system would be able yield an average of 7,400 gal/day, and over a one-week period would provide approximately 52,000 gal. The above rainwater catchment estimates include a 10% allowance for losses within the various components of the catchment systems. While this catchment volume would not meet the total irrigation demands for the playfields as estimated above, it may be used to supplement some smaller landscape features, or serve as an additional indoor water source.

2.3.3 WATER SOURCE CONSIDERATIONS

Municipal Water Supply

An extension of the municipal water supply system provides a number of advantages, compared to an on-site catchment system. Primarily, the advantages are related to the public safety issues and water quality standards that are associated with a public water supply system. The existing DWS water supply system utilizes proven ground-water sources, with certified operators to ensure that the supply, treatment, and delivery of potable water is in compliance with the Safe Drinking Water Regulations.

In addition, the DWS system is able to meet the domestic water demands and the required fire flow demands without the addition of on-site storage tanks or pumping facilities. The installation of additional fire hydrants along Kaloli Drive and 25th Avenue will also improve fire protection for the HPP area, with the installation of new and more accessible fire hydrants within the existing neighborhood. In addition to improved fire protection within the local community, the extension of the municipal water supply system will also provide a benefit to existing homes along Kaloli Drive, should they wish to connect to the municipal water system.

The disadvantage of the municipal water supply extension may include a reliance on the public water supply system and potential water restrictions that may be in place in the event that there is a water shortage or consumption restrictions are imposed. In addition, the Park would be responsible for the costs of water used on site, including potable water demand, and irrigation if the municipal system is used for irrigating the play fields.

As noted above, the extension of the municipal water system would include a connection to the existing waterline on Keaau-Pahoa Road at Kaloli Drive, and installation of a new water line along Kaloli Drive to the park site.

For the water supply options as presented above, we have prepared preliminary construction costs estimates to aid in assessing and comparing the available alternatives. The major items of work and preliminary costs associated with the municipal water supply extension have been summarized in the following table.

Table 10: ESTIMATED CONSTRUCTION COSTS, MUNICIPAL WATER SUPPLY

Item Description	Unit	Quantity	Unit Rate	Extension
Connect to Existing 12"	ea	1	$10,000	$10,000
12" Gate valves	ea	6	$5,000	$30,000
12" Watermain	lf	5500	$65	$357,500
Fire Hydrants	ea	10	$6,000	$60,000
Road Restoration (5ft wide)	yd^2	3060	$250	$765,000
Chlorination and Testing	ea	1	$15,000	$15,000
Traffic Control	LS	1	$75,000	$75,000
Subtotal				$1,312,500
Engineering				$131,250
Contingency (25%)				$328,125
Estimated Total				**$1,771,875**

In addition to the construction cost estimates, we have included an estimate for on-going operations and maintenance costs that would be associated with the various options. Within the option to connect to the municipal water supply system, the operational requirements and responsibility for water supply and treatment are largely with the DWS. As such, the costs and charges associated with the operations and maintenance are transferred into the purchase costs for the water. The calculations related to the water fees and charges are presented in the Appendix, and include $165,000 in Facilities Charges, plus an estimated monthly cost in the range of $2,060. It should be noted that the irrigation amount in each of the reviewed alternatives was limited to a maximum of 129,000 gal/month, to match the net amount that would be available using the catchment system as presented above.

This allowed for an equivalent cost comparison between the various options, even though the DWS connection would be able to provide more irrigation, but with an increased cost for water purchase.

The one-time charges and estimated monthly costs for the DWS water supply were converted to a Present Value amount to allow for a cost comparison between the various alternatives. The Present Value analysis was carried out using an annual 4% interest rate and a term of 20 years. The resulting Present Value using the DWS municipal water supply option is estimated to be $500,740 as outlined in the attached Appendix.

Based on the above, the total Present Value including the estimated construction costs and on-going operations and maintenance costs for the above option are estimated to be $2,272,615.

Rainwater Catchment System

Development of an on-site catchment system will require significant infrastructure investment, particularly if the intent is to provide potable water within the Park. The basic components of the system are anticipated to include:

- Collection piping
- Raw water storage tank
- Filtration equipment
- Disinfection equipment
- Treated water storage tank
- Distribution pump and pressure tank
- Firefighting storage tank
- Fire pump with backup drive

Since the new water source would provide potable water to a fairly extensive public population, it is possible that the water system would be designated as a Regulated Public Water System by the Department of Health, Safe Drinking Water Branch. As a Public Water System, the County may be required to provide a qualified Licensed Operator of the water system and ensure continued compliance with current regulations, including treatment, monitoring and sampling requirements.

The costs and risks associated with operating and maintaining the Public Water System can be significant, particularly considering the variability in the catchment raw water quality and parameters. The table below presents a summary of the main components, based on conceptual review, however the suitability of the treatment equipment cannot be verified until water samples are available for testing and validating with the proposed equipment. The minimum treatment options for potable indoor use are anticipated to include equipment such as;

- Pre-filtration and screening
- Cartridge filtration – 3 to 5 micron sediment filters, followed by 3 micron activated carbon filters
- Cartridge filtration – 1 micron Absolute filters
- Disinfection with chlorine to provide a residual of 0.2ppm

The major items of work and preliminary costs associated with the rainwater catchment system have been summarized in the following table.

Table 11: CONSTRUCTION COST ESTIMATE, CATCHMENT WATER SYSTEM (INDOOR POTABLE)

Item Description	Unit	Quantity	Unit Rate	Extension
Site Collection Piping	lf	2500	$50	$125,000
Raw Water Storage Tank	gal	50,000	$4.50	$225,000
Raw Water Pumps	LS	1	$200,000	$200,000
Water Treatment Building	LS	1	$50,000	$50,000
3 - Micron Pre-filters	LS	1	$20,000	$20,000
Activated Carbon Filters	LS	1	$25,000	$25,000
1- Micron Absolute Filters	LS	1	$35,000	$35,000
Chlorination System	LS	1	$45,000	$45,000
Treated Water Storage Tank	gal	10,000	$6.00	$60,000
Treated Water Pumping System	LS	1	$350,000	$350,000
Metering and On-line Monitoring	LS	1	$55,000	$55,000
Electrical/Controls	LS	1	$125,000	$125,000
Fire Storage Tank	gal	240,000	$3	$780,000
Fire Pump (2000gpm)	LS	1	$125,000	$125,000
Subtotal				$2,220,000
Engineering				$266,400
Contingency (25%)				$555,000
Estimated Total				**$3,041,400**

Similar to the municipal water supply option, we have included an allowance for on-going operations and maintenance costs that would be associated with the rain-water catchment options. Within the option to use the rainwater catchment system for potable water supply, the operational requirements and responsibility for water supply and treatment remain with the Department of Parks and Recreation (DPR). As such, the costs associated with the operations and maintenance of the treatment and distribution system also remain with the DPR. The estimated effort and costs related to the water supply system are presented in the Appendix, and include an estimated monthly cost in the range of $6,260.

The estimated monthly costs for the rainwater catchment system were converted to a Present Value amount to allow for a cost comparison between the various alternatives. The Present Value analysis was carried out using an annual 4% interest rate and a term of 20 years. The resulting Present Value using the on-site rainwater catchment option is estimated to be $1,020,500 as outlined in the attached Appendix.

Based on the above, the total Present Value including the estimated construction costs and on-going operations and maintenance costs for the above option are estimated to be $4,061,900.

Combined DWS Supply and Rainwater Catchment System
As an option to providing potable water with the on-site catchment system, the County may also consider using the on-site catchment source for non-potable water uses such as localized landscape and irrigated features and non-potable indoor uses such as flushing toilets and urinals. Water quality and its impact on public health is a primary concern with rainwater harvesting. Rainwater used for residential irrigation (small scale applications) does not typically require treatment. Larger, commercial applications and non-potable indoor uses require treatment but the type of use and raw water quality will determine the extent of treatment.

The benefits of providing a rainwater re-use system include;

- Providing an inexpensive source of water
- Augments drinking water supplies
- Reduces stormwater runoff and pollution
- Helps reduce peak summer demands

Within the HPP Park, the treatment requirements for using harvested rainwater will likely require some level of screening, and filtration to prevent particles and debris from traveling through the plumbing systems, as well as disinfection with Ultraviolet light (UV) or chlorination because of bacterial concerns.

The minimum treatment options for non-potable indoor use are anticipated to include equipment such as;

- Pre-filtration and screening
- Cartridge filtration – 5 to 10 micron sediment filter
- Disinfection with chorine to provide residual of 0.2ppm

The major items of work and preliminary costs associated with the rainwater catchment system have been summarized in the following table. It should be noted that the cost estimates do not include on-site piping or distribution of the water supply, as these are expected to be similar within each water supply option.

Table 11: CONSTRUCTION COST ESTIMATE, CATCHMENT WATER SYSTEM (INDOOR POTABLE)

Item Description	Unit	Quantity	Unit Rate	Extension
Site Collection Piping	lf	2500	$50	$125,000
Raw Water Storage Tank	gal	50,000	$4.50	$225,000
Raw Water Pumps	LS	1	$200,000	$200,000
Water Treatment Building	LS	1	$50,000	$50,000
3 - Micron Pre-filters	LS	1	$20,000	$20,000
Activated Carbon Filters	LS	1	$25,000	$25,000
1- Micron Absolute Filters	LS	1	$35,000	$35,000
Chlorination System	LS	1	$45,000	$45,000
Treated Water Storage Tank	gal	10,000	$6.00	$60,000
Treated Water Pumping System	LS	1	$350,000	$350,000
Metering and On-line Monitoring	LS	1	$55,000	$55,000
Electrical/Controls	LS	1	$125,000	$125,000
Fire Storage Tank	gal	240,000	$3	$780,000
Fire Pump (2000gpm)	LS	1	$125,000	$125,000
Subtotal				$2,220,000
Engineering				$266,400
Contingency (25%)				$555,000
Estimated Total				**$3,041,400**

Similar to the above water supply options, we have included an estimate for on-going operations and maintenance costs that would be associated with the combined municipal water supply and rainwater catchment option. Within the option to use the rain-water catchment system for water supply, the operational requirements and responsibility for water supply and treatment remain with the Department of Parks and Recreation (DPR). In considering the reduced level of treatment with the non-potable water supply, we have reduced the estimated level of effort and costs associated with operating and maintaining the rainwater collection system.

The estimated effort and costs related to the water supply system are presented in the Appendix, and include a combination of DWS charges for potable water supply and fire protection, plus an estimate of the operational costs for the rainwater catchment system. The costs include $27,500 in DWS Facilities Charges, and an estimated monthly cost in the range of $1,200 for potable water, plus an estimated monthly cost in the range of $2,750 for the operating the non-potable water system.

The estimated monthly costs for the rainwater catchment system were converted to a Present Value amount to allow for a cost comparison between the various alternatives. The Present Value analysis was carried out using an annual 4% interest rate and a term of 20 years. The resulting Present Value using the combined DWS municipal water supply and rainwater catchment system is estimated to be $670,940 as outlined in the attached Appendix.

Based on the above, the total Present Value including the estimated construction costs for the combined municipal system and rainwater catchment supply, plus the on-going operations and maintenance costs for the combined system are estimated to be $4,038,865.

2.4 CONCLUSION

As presented above, the County of Hawaii, Department of Parks and Recreation has several options available to provide a water source at the proposed recreation facility within Hawaiian Paradise Park.

The option to supply the new Park with an extension of the municipal water supply system is expected to include a connection to the existing system at the intersection of Keaau-Pahoa Road and Kaloli Drive and the installation of approximately 5500ft of 12-inch waterline. The

existing water system has available capacity to meet the potable water demands and the fire flow protection requirements for the proposed facilities within the Park. The concept-level estimates for the proposed waterline extension are estimated to be in the range of $ 1.77M. The Present Value analysis to include the initial construction costs plus the ongoing operations and maintenance costs is estimated to be $2.27M.

As an alternative to extending the municipal water system, the County also has the option to construct a rainwater catchment system. The project area receives a significant amount of rainfall, on a consistent basis, and is in a position to capitalize on the available precipitation amounts. The costs associated with collection and treatment of the catchment water however are substantial. In addition, if the water is to be treated to a potable water designation, the County will be required to provide a qualified and Licensed Operator, in conformance with the safe Drinking Water regulations. Based on the conceptual review as presented above, the construction costs for the rainwater catchment, storage and treatment systems are estimated to be in the range of $3.04M. The Present Value analysis to include the initial construction costs plus the ongoing operations and maintenance costs is estimated to be $4.06M.

The County also has the option to install a rainwater catchment system, with a lesser degree of treatment, for irrigation and non-potable indoor uses. This option, as presented above, includes a combination of the municipal water system extension for potable water and fire protection, plus a rainwater catchment system for non-potable uses. This option would reduce the amount of municipal water consumption on-site and help reduce the peak summer demands; however the additional capital costs for the catchment, treatment and pumping are significant. The concept level estimate for the non-potable catchment system is estimated to be in the range of $1.60M, and combined with the municipal water system extension, the total costs would be in the range of $3.37M. The Present Value analysis to include the initial construction costs plus the ongoing operations and maintenance costs is estimated to be $4.04M.

In considering the above alternatives, it is recommended that the Department of Parks and Recreation pursue the option to extend the municipal water supply system and service the planned recreational facilities with a County of Hawaii Department of Water Supply water source. The municipal water supply extension provides the greatest benefit for a safe and reliable water source, adequate fire protection for the proposed site and improving fire protection for the local community as well as the lower costs when considering initial construction and on-going operational costs.

3.0 ELECTRICAL SYSTEM

3.1 EXISTING CONDITIONS

The sole electric utility serving the Hawaii Island is Hawaii Electric Light Company (HELCO) which operates and is regulated under its tariff approved by the State Public Utilities Commission (PUC). Similarly, Hawaiian Telecom (HTCO) operates and is regulated under a tariff approved by the PUC and was the sole provider of telecommunications services until the advent of cable television. Subsequently, Charter Communications (Charter fka Oceanic Time Warner Cable), which is not regulated by the State PUC but is a franchisee of the Department of Commerce and Consumer Affairs (DCCA), has become a competitor to HTCO and, similar to HTCO, can offer broadband, cable television and telephone signals.

Under rights initiated during the Kingdom of Hawaii, in HELCO's case, and during the government of the Territory of Hawaii, in HTCO's case, the infrastructure of both these companies may occupy public rights-of-ways. If the utility companies are requested to provide service to multiple customers utilizing private rights-of-ways, grants of easement must be conveyed by the private property owners to allow the utility companies the right to access, install and maintain their facilities. The overhead facilities are typically jointly owned by the members of the joint pole committee which, on Hawaii Island consists of HELCO, HTCO, the County of Hawaii and the State Department of Transportation. Although Charter, under Hawaii Revised Statute Article 440, is treated similarly to a public utility, Charter must enter into a leasing agreement with HTCO to attach to overhead, joint pole facilities or apply to HELCO for permission to attach to poles where HTCO does not have joint ownership.

HELCO's, HTCO's, and Charter's existing facilities serving the Hawaiian Paradise Park Subdivision consist of aerial cables attached to joint overhead pole lines along most of the privately owned roadways.

3.2 PROJECTED ELECTRICAL POWER AND TELECOMMUNICATIONS DEMANDS

The total anticipated electrical connected load is 500 kVA and the anticipated peak demand load is 300 kVA and is based on the projected loads at full build-out of the new park.

Based on current technologies, both HTCO and Charter would likely provide service to this project via fiber optic cable pairs which would be terminated at hub equipment. The County would determine whether service from one or both telecommunications companies are required for the Park facilities.

3.3 IMPACTS AND MITIGATION

An inquiry has been directed to HELCO as to whether their existing overhead distribution system has sufficient capacity to serve the proposed park but a response has not been received. The worst case scenario is that HELCO would need to upgrade its existing Hawaiian Paradise Park substation transformer, currently rated at 7.5 MVA, and re-conductor portions of their overhead distribution system in order to support the Park load. If the worst case scenario requires implementation, discussions between the County and HELCO would need to be held to determine whether the County would bear any cost for these off-site improvements.

Both HTCO and Charter have indicated that they would be able to provide service to the proposed new park, if necessary, by reinforcing their existing aerial facilities with additional fiber optic strands.

3.4 PROPOSED ELECTRICAL AND TELECOMMUNICATIONS SYSTEM

Off-site Electrical:
This is currently indeterminate. See the first paragraph of 3.3 Impacts and Mitigation

On-site Electrical and Telecommunications:
The on-site electric and telecommunications systems would consist of concrete encased, PVC conduits, typically installed within a common trench and located, where feasible, under the park roadways and walkways, where feasible. Handholes would be placed periodically to serve as pulling points for the utility cables and to connect to HELCO distribution transformers for service to the Park buildings and outdoor facilities. The anticipated duct complement for the main infrastructure would consist of 2-4" conduits for HELCO, a 4" conduit each for HTCO and Charter.
In addition to HELCO transformer pads within the Park, HTCO and Charter may request hub equipment sites which are approximately 8' x 8' in size.

Area Lighting:
Illumination for Park roadways, parking lots, walkways, playcourts and lighted fields will be designed to meet Illuminating Engineering Society (IES) RP- 6 Sports and Recreational Lighting criteria. Luminaires selected will be specified to conform to the Hawaii County Code Chapter 14, Article 9 Outdoor Lighting and be designed to minimize glare and provide illumination levels in conformance with the above stated criteria.

3.5 ALTERNATE ENERGY

Currently there are three (3) programs that allow for an alternate energy system, in this case the system under consideration is a photovoltaic or PV system, to be connected to a facility or building that also has a HELCO electric service: 1) the Standard Interconnect Agreement; 2) the Customer Grid Supply + (CGS+) program; and 3) the Smart Export program. It should be noted that for the latter two programs, both offer some compensation, roughly 30% of the actual cost of electricity, for the surplus electricity generated by the PV system but both programs also have maximum subscription capacities, which by the time the project is designed and constructed, may be reached. Other programs that were previously offered such as Net Energy Metering and Feed-in Tariff are fully subscribed and not accepting new applications. A fourth option is the off-grid option under which the PV system would be the sole source of power to the building or facility.

Standard Interconnect Agreement (SIA):
The SIA is required for all alternate energy facilities that are proposed to be interconnected with HELCO's system, regardless of any complementary programs such as CGS+ or Smart Export that may be executed in parallel with this agreement. As part of the agreement, technical data about the proposed components of the alternate energy facility are submitted for review and approval by HELCO.

Under the SIA, the maximum size of the PV system is limited to the anticipated maximum daytime peak demand load of the building or facility so that very little if any power is fed back into HELCO's system. HELCO pays no compensation for any power that might inadvertently be fed onto their system.

Customer Grid Supply + (CGS+) Program:
In addition to completing the SIA, the CGS+ would allow for excess power from the PV system to be fed back onto HELCO's system during the day for which HELCO would credit the customer roughly 10.55 cents per kilowatt-hour (kWhr). In order to qualify for this program, HELCO would require advanced technology inverters and a communication connection so that HELCO could curtail the inflow of power from the PV system, if required.

Smart Export Program:
In addition to completing the SIA, Smart Export would allow for excess power from the PV system to be fed back onto HELCO's system for compensation only between 4 P.M. (1600) and 9:00 AM (0900). If power from the PV system is fed back onto HELCO's system after 9:00 AM and before 4:00 P.M. there is no compensation. This program requires, therefore, the installation of battery storage with the intention that between the hours of 9:00 A.M. and 4:00 P.M., the PV system would be used to re-charge the batteries and off-set power consumption by the building or facility. In the late afternoon, the charged batteries would be used to off-set power consumption and, if spare power is available, export to HELCO's system. The compensation offered for under this program is 11 cents per kWhr.

Off-Grid:
Since the Park facilities would be open at night and field lighting and parking lot lighting is being included in the master plan, the PV system in an off-grid application would need to include battery storage and would need to be sized to support the peak nighttime demand load. If inclement weather limits the ability of the PV system to charge the storage batteries during the day, most if not all of the Park facilities would not be usable at night.

Roof-Top Only PV System (based on Master Plan Buildings):
At full build-out, there will be approximately 51,000 square feet (sf) of gross roof space. The net roof space available for PV system installation is more likely to be 80% of this or approximately 40,000 sf. which would, at 250 kW per acre, accommodate a 230 kW PV system. The budget cost for such a system, without battery storage, would be $600,000. A 230 kW lithium-ion battery storage system would add approximately $2,860,000 to the budget.

Net-Zero PV System:
To off-set the entire anticipated 300 kVA peak demand load, which will likely occur at night

when the field, parking lot and walkway lighting will be in use, a total of 54,000 sf is required for the Net-Zero PV system. The budget cost for a Net Zero system, without battery storage, would be $750,000. A 300 kW lithium-ion battery storage system would add approximately $3,750,000 to the budget.

Daytime Off-Set PV System:
To off-set the daytime peak demand load which is anticipated to be 125 kW and includes the covered playcourt, community center, pool building and concession stand, the budget cost for a 125 kW PV system would be $320,000.

4.0 LANDSCAPE

4.1 INTRODUCTION

4.1.1 PROJECT DESCRIPTION AND OVERALL LANDSCAPE DESIGN

The HPP New Park is envisioned as a neighborhood park designed to serve the recreational needs of the diverse population of Hawaiian Paradise Park and the surrounding area, a region with a notable lack of services including recreation facilities. The twenty acre site located on Kaloli Drive between 25th and 26th Avenue is situated in a residential neighborhood of agricultural zoned one acre lots on its western, southern and eastern boundaries. On its northern boundary across 25th Avenue there is another twenty acre site intended for commercial development.

Through a series of community meetings, a range of recreational activities were identified and prioritized by community members and the County of Hawaii Parks & Recreation department staff. Guidance was provided by department staff to house programs, activities, administrative and operational needs.

Active recreation elements include a youth baseball/softball field; a football/ soccer field; covered play courts; a swimming pool; a skateboard park; playground for children ages 0-5 years and 5-12 years; tennis and pickle ball courts and exercise stations on a pedestrian path circuit. A community center with offices, meeting rooms and storage is also included for community services. Passive recreation needs are provided for by plaza spaces, picnic locations, a dog park, pedestrian paths and open lawn areas. Other supporting facilities include public parking with access roads, concession and comfort stations and a maintenance building and yard.

These various program elements are sited to maximize the proximity and r elationships between compatible activities and minimize less compatible activities and avoid conflicts. For example, the central parking scheme with curved access road brings both vehicles and pedestrians onto the site at safe controlled speeds then allows them easy and direct access including for the disabled to the desired activities. Pedestrian and vehicular circulation are clearly delineated to create safe interaction and multiple routes through the park. The park design also responds to the surrounding context of existing residences and the future potential of commercial development across 25th Avenue. The more active and higher volume activities such as football/soccer, youth baseball and softball are located on the Kaloli Drive end of the park. As one moves from that eastern end to the west side, the park's activities become less active, lower in volume and more passive. The pedestrian entrances, covered play courts, swimming pool complex and the skate park on the 25th Avenue frontage anticipate and invite people to move freely between the park and the future commercial development site. A strong landscape buffer along the east end of the park minimizes impact on the adjacent home(s) next door while along the Kaloli Drive and the western ends of the 25th and 26th Avenue frontages a landscape buffer deters vehicles from parking on the road shoulders and could potentially serve a bio-filtration purpose.

Storm water runoff will be handled by sensitive grading and drainage through a system of drywells and grassed detention basins and swales throughout the landscape. To the greatest degree possible the generation and conveyance of storm water runoff from ball fields, lawn areas and paved surfaces will be minimized and infiltrated into the landscape at grassed swales, retention/bio-filtration basins and drywells. Sub-surface drainage for parking lots, athletic fields and other areas should be evaluated in future design development in conjunction with geotechnical investigation. These storm water best management practices will be sized to accommodate the local area's precipitation and will be integrated into park grading and overall aesthetic character.

4.1.2 REFERENCE DOCUMENTS

1. Plants for Tropical Landscapes, Rauch, F., & Weissich, P., University of Hawai'i Press, 2000.
2. The Watersmart Garden, Rauch, F., & Weissich, P., University of Hawai'i Press, 2014.
3. A Native Hawaiian Garden. Culliney, J. L., and Koebee, B. P., University of Hawaii Press, 1999.
4. Hawai`i's Native Plants, Bohm, B. A., Mutual Publishing, 2004
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6. Plants and Flowers of Hawai`i, Sohmer, S. H., Gustufson, R., University of Hawaii Press, 1989.
7. In Gardens of Hawai'i, Marie C. Neal , Bishop Museum Press, 1965 Giambelluca TW, Chen Q, Frazier AG, Price JP, Chen Y-L, Chu P-S, Eischeid J., and Delparte, D. 2011.
8. The Rainfall Atlas of Hawai'i. http://rainfall.geography.hawaii.edu

4.1.3 CODES AND STANDARDS

1. Hawaii County Code Chapter 25 Zoning Code Landscape Requirements
2. Hawaii County Planning Department Rules of Practice and Procedure; Rule 17 Landscaping Requirements
3. Puna Community Development Plan, Chapter 3.5 Parks and Recreation

4.2 LANDSCAPE DESIGN

4.2.1 IRRIGATION SYSTEM

By applying a bioregional landscape approach to the park's landscape and maintenance, the landscape's planting shall not require permanent automatic landscape irrigation. The Park's Department low maintenance directive of a minimal plant palette of trees, select groundcover and mainly lawn combined with the region's abundant rainfall results in no need for a permanent automatic irrigation system for the park's planting. The area's annual rainfall should provide sufficient monthly rainfall to support the plantings once established. Mean annual rainfall of the area is approximately 138 inches with monthly precipitation ranging from 9 inches in June, the driest month to a high of 16.5 inches in November.

Temporary irrigation will be required for establishment of all planting during a recommended 180 day maintenance period. Upon the approval of the established landscape the contractor will turn over the maintenance to the Parks Department.

4.2.2 LANDSCAPE PLANTING

Perimeter Zone

The park site is fronted by existing streets – Kaloli Drive on the west or mauka edge, 25th Avenue on the north and 26th Avenue on the south. The remaining east edge borders the adjacent residential agricultural zoned lot. This perimeter area along the existing roads contains an unpaved shoulder from the existing road edges to the outer edge of the paved perimeter path which circumscribes the park on the three street frontages. Part of this perimeter zone outside of the Park parcel is in the road right-of-way and is NOT included as part of the Park project. However, this edge and any street improvements should be coordinated with the design of the park to integrate curbs or not, vehicle deterrents and landscape – to maximize the park design with the surrounding streetscape and potential future commercial center.

The current park design includes a landscape buffer strip that serves as a vehicle deterrent to prevent vehicles from parking along portions of the street frontages. This portion of the perimeter includes the area between the park parcel boundary and outer edge of the paved perimeter path along the Kaloli Drive, and the western ends of the 25th and 26th Avenue frontages. This perimeter zone contains a line of regularly spaced street trees that frame the park and an understory of approximately one half lawn and one half crushed on-site lava rock used as a xeriscape vehicle barrier. This lava rock groundcover layer will range from 4 inches to 16 inches in diameter laid on top of a landscape weed fabric. The lava rock treatment can potentially serve as a bio-filtration device if designed as part of a swale. Another option would be to have this rock treatment on a berm to enhance the vehicular deterrent and pedestrian separation function. The line of trees will consist of two to three-different species for biodiversity, pest and disease resilience; and will be limbed up to provide clear views into and out from the park for visual surveillance and security. These trees will provide physical and psychological separation between the street and perimeter path while shading the perimeter path. The perimeter zones along the eastern ends of 25th and 26th Avenues south of the park access roads will consist of the regularly spaced trees and lawn understory only. Planting along the east edge of the park will consist of more irregularly spaced groupings of trees and shrubs to visually screen the park from the adjacent residential lot.

Parking Lot Planting

The planting within central parking area will consist of the required trees per Hawaii County Code chapter 25 and Rule 17 Landscaping Requirements for buffering, screening, moderating visual impacts and microclimate of expansive parking lots by providing shade, air quality, storm water runoff management and carbon sequestration. The ground plane under trees and within interior parking islands and medians will consists of a combination of lawn, paving, gravel mulch and, to a lesser degree, shrubs and groundcover.

It is important to note that in the parking lot especially within the interior islands and medians, trees should be provided with the greatest amount of soil volume possible to ensure the trees long term health and viability and to avoid root damage to paving and curbs. In these limited spaces, trees are surrounded by pavement, temperature build up, glare and higher volumes of storm water runoff with contaminants and thus are subject to significant stress. In this relatively young geologic area, dense basalt "Blue Rock" is often shallow and can be impermeable. Specifications will typically call for the "Blue Rock"

subgrade to be ripped and thus fractured, topped with a transition layer of crushed rock with fines and then planting soil mix placed atop that. A minimum of 3 feet depth of planting soil mix is recommended in these interior planter areas (medians and islands) to provide adequate soil volumes for the trees' roots. The soil volumes in these areas will be as continuous as possible according to best urban forestry practices. It is important to note that the recommended planting soil depths are a critical component of an integrated system with the underlying ripped, crushed, graded and compacted lava rock subgrade. This system of subgrade, planting soil and planting ensures subsurface drainage, filtration of storm water runoff, health of the landscape planting and all the associated ecological services that planting provides while also helping to minimize damage to paving, curbs and other hardscape infrastructure. Providing these soil volumes also help minimize the potential for pavement damage by tree roots by encouraging deeper rooting. Trees will be selected for less aggressive root growth, ability to thrive in these urban conditions, pest and disease resistance. Additionally, root barriers will be installed to avoid pavement damage.

Turf Grass Zone

The majority of the park will consist of turf grass as the predominant landscape surface. Turf grass is one of the few plant species capable of withstanding active play and heavy foot traffic. However it is also among the most water consumptive, high maintenance and nutrient needy plant species used in the built environment. To ensure the health of turf grass it is critical to provide for sufficient volume of healthy soil to ensure the turf grass roots are deep rooted to draw required nutrients and water particularly important during drier drought conditions. Again, the site's subgrade will be ripped, crushed, graded and compacted lava rock. Accordingly, a minimum 12 inches compacted depth of planting soil mix for all turf grass planting is recommended. While costing more initially, by providing this depth of soil versus the more typical 4 to 6 inches of soil depth the turf grass will be more resilient to dry periods and likely to cost less in maintenance and lawn restoration/replacement in the long term. And since no permanent irrigation is planned this will be even more important.

At the baseball/softball and football/soccer fields the planting soil mix will be a sandy planting soil mix to ensure proper drainage to support the high intensity athletic use. The remainder of the turf grass areas will have a well-drained loamy/cinder planting soil mix.

Selection of appropriate warm-season species/cultivar/varieties of turf grass is critical to ensure that the lawn will serve its intended function as a durable recreational ground surface. The grass specie(s) ideally will be easy and quick to establish; adaptable to shade (as trees grow and buildings cast their shadows); somewhat salt tolerant (the park is inland but still relatively close to the coastal zone); drought tolerant (especially since no permanent irrigation is planned); low maintenance; and durable. The grass species needs to be both resistant to high intensity use (especially the athletic play fields) and quick to recover from that wear. Lower maintenance lawn is a prime consideration to the Parks department staff. Lawn grass species that can go longer periods of time between mowing; require less nitrogen fertilizer, thatching, aeration, top dressing and other turf management practices; and are less prone to pests and disease shall be selected. Single species or blends of grass seed/stolon may be selected. Several grass species that meet these requirements are listed in the following plant palette.

A variety of trees are strategically located throughout this turf grass zone to create space, accentuate entries, delineate park zones and circulation routes, and human comfort by providing shade and aesthetic character. Planting of shrubs and groundcover have been kept at a minimum to comply with the park's department's maintenance ability and capacity.

Bioswale/Storm Water Retention Zone

Throughout the park storm water runoff will be ideally be captured, minimally conveyed, filtered and infiltrated back into the earth. Refer to the civil section for more details on this storm water management approach. Most of these functions will occur within the park landscape through swales, berms, retention and detention basins. With the exception of possible storm water facilities (i.e. swales and detention basins) clad in lava rock ground-cover the majority of the storm water management facilities will occur in turf grass areas for ease of maintenance by Park's staff. Turf grass will slow the movement of storm water and partially filter sediment. Trees throughout the park will also serve to help management storm water by dissipating energy of heavy rain, reducing soil erosion as well as reducing runoff through evapotranspiration.

For all landscape planting, it is assumed that planting soil mixes will be imported to the site

as it is not anticipated that there are significant on-site soil to be stockpiled after clearing and grubbing. These imported planting soil mixes shall be analyzed at a qualified soil laboratory and recommendations for soil amendments including but not limited to lime, major, minor and micronutrients, and organic matter shall be incorporated before installation. Mulching with wood chips and/or gravel will be required for all tree and shrub/groundcover planting areas.

Proposed Plant Palette

The landscape plant palette for HPP New Park consists of appropriate native Hawaiian and other species adapted to the Puna region. Native Hawaiian plants are plants that migrated to Hawaii by natural processes such as wind, transported by birds or by riding ocean currents. These plants are considered indigenous, native to Hawaii and other places they are established in. Over time these indigenous plants evolve and adapt becoming distinct from their original ancestors. Such plants are considered endemic to Hawaii, meaning they are unique to Hawaii and found no-where else. Indigenous and endemic plants require less water, fertilizer, herbicides, and pesticides to remain healthy in our local environs as they have evolved here. The following plant palette consisting of mostly indigenous and endemic plants contributes to restoring an authentic landscape character and regional sense of place. And, it will also be much less costly for the Park's department and interested community volunteers to maintain in comparison to conventional tropical ornamental landscapes.

The following recommended plants are labeled (I) for indigenous, (E) for endemic or (P) for Polynesian-introduced species.

Large Trees

True Kamani (P)	Calophyllum inophyllum
Narra	Pterocarpus indicus
Neem	Azadirachta indica
Pak Lan	Michelia x alba
Gold tree	Tabebuia donnell-smithii
Royal Poinciana	Delonix regia

Medium Trees

False Olive	Elaeodendron orientale
Hala (I), (P)	Pandanus tectorius
Kou (I), (P)	Cordia subcordata
Kukui (P)	Aleurites moluccana
Lonomea (E)	Sapindus oahuensis
Milo (P)	Thepesia populnea
ʻŌhiʻa Lehua (E)	Metrosideros polymorpha
Singapore Plumeria	Plumeria obtuse
Tulipwood	Harpullia pendula

Small Trees

Dwarf Hau (I)	Hibiscus tiliaceus
Hao (E)	Rauvolfia sandwicensis
White Tecoma	Tabebuia berteroi

Palms

Loulu Palm (E)	Pritchardia spp.

Large/Medium Shrubs

ʻAʻaliʻI (I)	Dodonaea viscosa
Alaheʻe (I)	Psydrax odorata
Kokiʻo (E)	Hibiscus kokio ʼSt. Johnianusʼ
Kokiʻo ʻula (E)	Hibiscus clayi
Naio (I)	Myoporum sandwicense
Nānū (E)	Gardenia brighamii
Naupaka (I)	Scaevola sericea
Kokiʻo keʻokeʻo (E)	Hibiscus arnottianus
Ti (P)	Cordyline fruticosa

Groundcovers

ʻĀkia (E) bi	Wikstroemia uva-ursi
ʻAkoko (E)	Chamaesyce celasroides
Kupukupu Fern (I)	Nephrolepis cordifolia
Naio papa (I)	Myoporum sandwicense

Nanea (I)	Vigna marina
Oʻahu Sedge (E)	Carex wahuensis
Pōhinahina (I)	Vitex rotundifolia
ʻUkiʻuki (I)	Dianella sandwicensis
ʻŪlei (I)	Osteomeles anthyllidifolia

Grasses

Bermudagrass Cynodon Dactylon (common and improved selections)	
Seashore Paspalum	Paspalum vaginatum
St. Augustinegrass	Stenotaphrum secumdatum
Centipedegrass	Eremochloa ophiuroides
Carpetgrass	Axonopus affinis

4.2.3 SITE FURNISHINGS

Figure 8: Site Furnishing Examples

5.0 Architectural

5.1 Preliminary Code Analysis

Community Center
Occupancy Group = A3, (IBC 2006 section 302)
Construction Type = II-B without sprinklers
Stories = 2, (IBC 55', Zoning 45').
Allowable Area = 9,500 square feet, (IBC 2006 Table 503)
Area Modification = Aa = 9,500 + 7,125 + 9,500 = 36,125 square feet, were I_f = .75 and all buildings are setback 60' from all other buildings and 30' from the property lines.

Occupant Load, (IBC 2006 table 1004.1.1)
Assembly without fixed seating, Unconcentrated = 1/15 square feet of net area.
15 x 299 occupants = 4,485 square feet.
67' x 67' = 4,485 gross square feet.
Assembly without fixed seating, Concentrated = 1/7 square feet of net area.
7 x 299 occupants = 2,093 square feet.
46' x 46' = 2,093 gross square feet.
(The square footage does not include Accessory Uses, storage, restrooms or offices.)
(We need more information on the requirements for Emergency Shelters).
(Suggest we request County Building and Fire input on acceptable load factor).

Automatic Sprinkler System:
Not required in A3 occupancy if building is less than 12,000 square feet, or the occupant load is less than 300, or if floor level is at exit discharge level.

Manual Alarm:
Not required for less than 300 occupants.

Parking:
For Meeting Facilities = 1/75 square feet.
4,485sf/75 = 60 spaces. (5 bicycle spaces = 1 parking space).
30% can be compact spaces.
(3) Handicapped parking spaces required.
Loading space not required when less than 5,000 square feet of building area.

Covered Playcourt
Occupancy Group = A4, (IBC 2006 section 302)

Construction Type = II-B with sprinklers
Stories = 2, (IBC 55', Zoning 45').
Allowable Area = 9,500 square feet, (IBC 2006 Table 503)
Area Modification = Aa = 9,500 + 7,125 + 9,500 = 36,125 square feet, were I_f = .75 and all buildings are setback 60' from all other buildings and 30' from the property lines.
Sprinkler System Increase = 3 x 9,500sf = 28,500 square feet.

Occupant Load, (IBC 2006 table 1004.1.1)
Assembly with Fixed Seating, Unconcentrated = 1/15 square feet of net area.
15 x 1,133 occupants = 17,000 square feet.
130' x 130' = 17,000 gross square feet.
Assembly without fixed seating, Concentrated = 1/7 square feet of net area.
7 x 2,428 occupants = 17,000 square feet.
(The square footage does not include Accessory Uses, storage, restrooms or offices.)
(Suggest we request County Building and Fire input on acceptable load factor)
(We need to know bleacher capacity. Requires 18" of bench length per person).

Automatic Sprinkler System:
Is required in A4 occupancy if the building is over than 12,000 square feet, or the occupant load is over than 300. (IBC 2006 section 903.2.1.4)

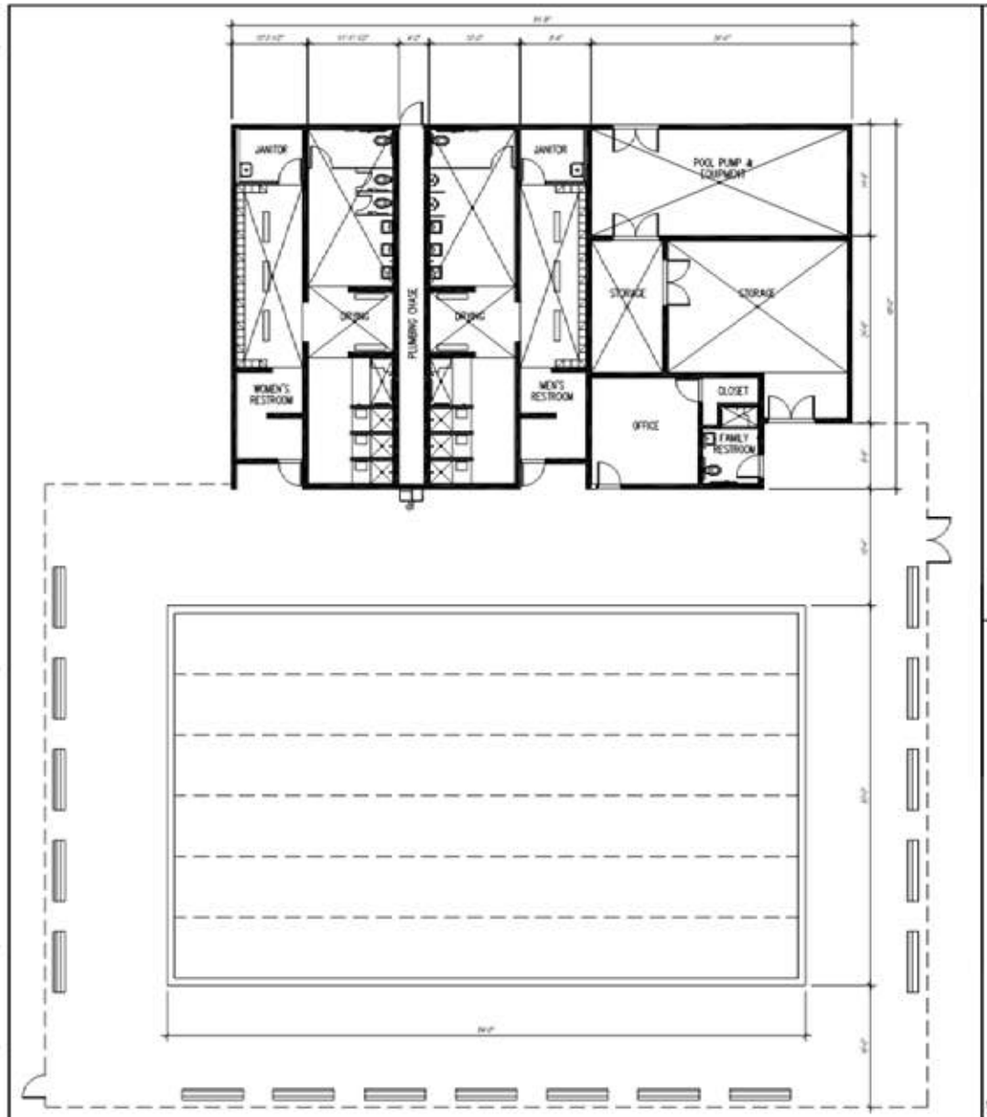
Manual Alarm:
Is required for more than 300 occupants. (IBC 2006 section 907.2.1)

Parking:
For "Park Area" to be determined by the Director, per zoning 25-4-51, (17).
For Major Outdoor Recreation Facility = 1/200 square feet of gross area plus 3 per court.
17,000sf/200 = 85 + 6 spaces = 91 spaces. (5 bicycle spaces = 1 parking space).
30% can be compact spaces.

(4) Handicapped parking spaces required.
Loading space required when more than 5,000 square feet of building area.
(2) Loading spaces required

NOTES
Assumed Maximum Occupancy = less than 300 for Community Hall to not trigger Emergency Shelter requirements.
Assume covered play courts 100’ x 100’ plus bleacher and Accessory areas. = +10,000 + 7,000 = 17,000 square feet.
Assumed (2) volleyball, (2) tennis courts and (2) basketball courts in covered structure.
Combined Parking count = 60 + 91 = 151 + Director’s count for “Park Area”. (Zoning 25-4-51), approximately a 60’ x 680’ parking area for 151 spaces. Plus (2) Loading Zones, (1) 12’x50’ and (1) 10’x22’.

Plot Date: March 12, 2018



3 POOL BUILDING FLOOR PLAN
SCALE: 1/8" = 1'-0"

1 CONCESSION & COMFORT STATION FLOOR PLAN
SCALE: 1/8" = 1'-0"

2 COMMUNITY BUILDING FLOOR PLAN
SCALE: 1/8" = 1'-0"

NORTH
SCALE IN FEET

FLEMING & Associates, LLC
537 MANOHO STREET
HILO, HAWAII

CONSULTANT:

HPP NEW PARK MASTER PLAN

KALOLOI AVENUE
KEAAU, HAWAII 96749
(3) 1-5-039:267

REVISIONS:

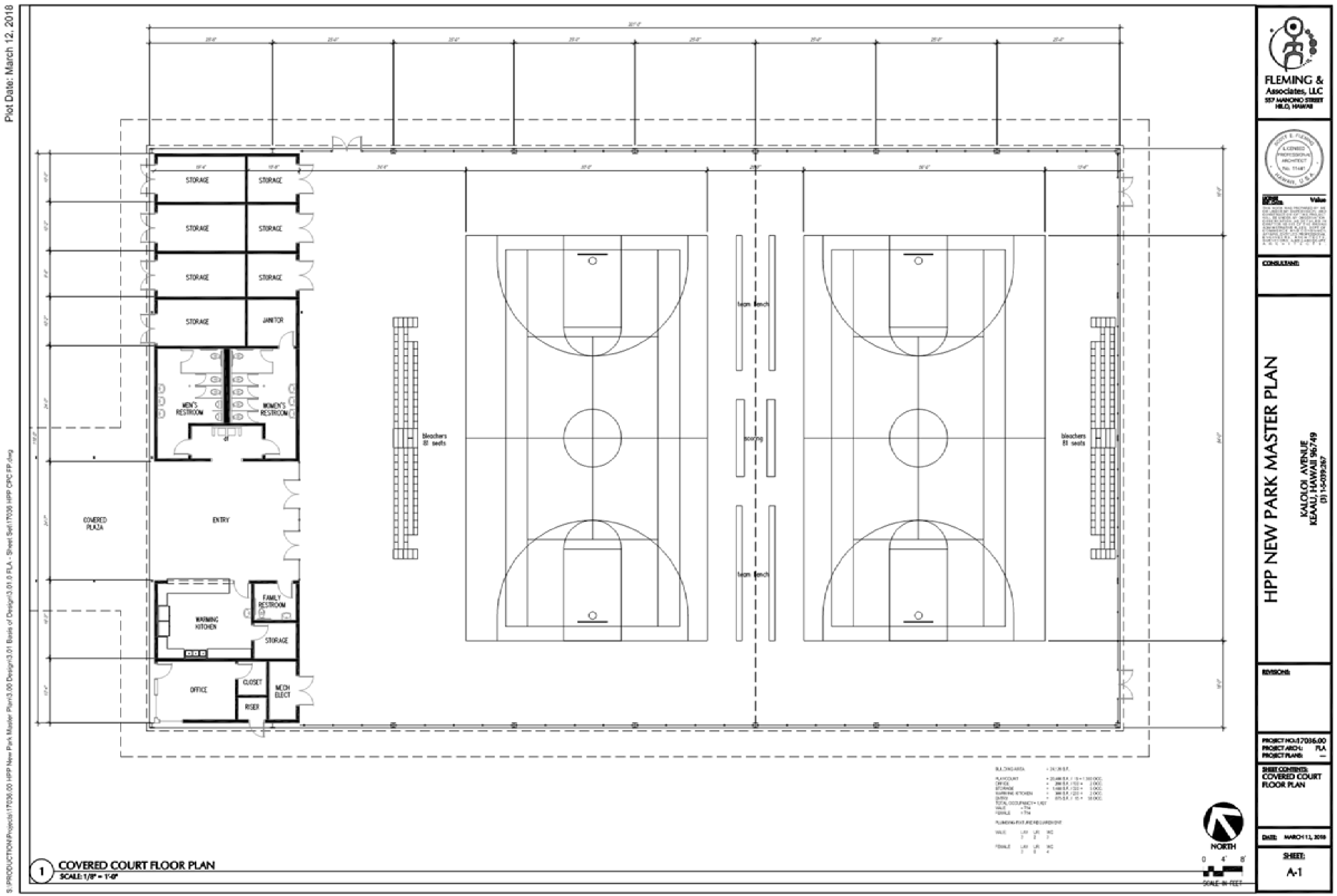
PROJECT NO: 17036.00
PROJECT ARCH: FLA
PROJECT PLANS: —

SHEET CONTENTS:
HPP CONCESSIONS, COMMUNITY & POOL BUILDING FLOOR PLAN

DATE: MARCH 12, 2018

SHEET:
A - 2

S:\PRODUCTION\Projects\17036.00 HPP New Park Master Plan\3.00 Design\3.01 Basis of Design\3.01.0 PLA - Sheet Set\17036 HPP CONCESSIONS.dwg


Plot Date: March 12, 2018
STORAGE
JANITOR
MEN'S RESTROOM
WOMEN'S RESTROOM
COVERED PLAZA
ENTRY
WARMING KITCHEN
FAMILY RESTROOM
OFFICE
CLOSET
RISER
MECH ELECT
bleachers 81 seats
team bench
scoring
1 COVERED COURT FLOOR PLAN
SCALE: 1/8" = 1'-0"
NORTH
SCALE IN FEET
FLEMING & Associates, LLC
557 MANONO STREET
HILO, HAWAII
CONSULTANT:
HPP NEW PARK MASTER PLAN
KALOLOI AVENUE
KEAAU, HAWAII 96749
REVISIONS:
PROJECT NO.: 17036.00
PROJECT ARCH.: FLA
PROJECT PLANS: —
SHEET CONTENTS:
COVERED COURT FLOOR PLAN
DATE: MARCH 12, 2018
SHEET:
A-1

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT
SCALE: 1 IN = 120 FT

PRELIMINARY ALTERNATIVE
DRAFT v1

Exhibit A1

APPENDIX A: WATER SERVICING EXHIBITS AND CALCULATIONS

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT
SCALE: 1 IN = 120 FT

PRELIMINARY ALTERNATIVE
DRAFT v1

Exhibit A1

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT
SCALE: 1 IN = 120 FT

PRELIMINARY ALTERNATIVE
DRAFT v1

Exhibit A2

FIXTURE UNIT SUMMARY			
HPP PARK - WEST			
TMK: 1-5-039:267 COUNTY OF HAWAII, DEPARTMENT OF PARKS AND RECREATION			
FIXTURE TYPE	NO. OF FIXTURES	F.U. PER FIXTURE	TOTAL F.U.
General Public Use			
Water Closet, Flush Valve	7	3.5	24.5
Urinal	2	2.8	5.6
Lavatory	6	1	6
Drinking Fountain	6	0.5	3
Service Sink/Mop Sink	1	3	3
Hose Bibb	1	2.5	2.5
Hose Bibb, each additional	3	1	3
		TOTAL	47.6

PEAK FLOW REQUIREMENTS FOR NEW WATER METER

	Fixture Units (FU)	Gallons Per Minute (GPM)	Gallons Per Day (GPD)
Domestic - Peak Public Demand	47.6	50	1500

FIXTURE UNIT SUMMARY			
HPP PARK - POOL/COURT			
TMK: 1-5-039:267 COUNTY OF HAWAII, DEPARTMENT OF PARKS AND RECREATION			
FIXTURE TYPE	NO. OF FIXTURES	F.U. PER FIXTURE	TOTAL F.U.
General Public Use			
Water Closet, Flush Valve	7	3.5	24.5
Urinal	3	2.8	8.4
Lavatory	8	1	8
Drinking Fountain	4	0.5	2
Service Sink/Mop Sink	1	3	
Hose Bibb	1	2.5	2.5
Hose Bibb, each additional		1	0
		TOTAL	45.4

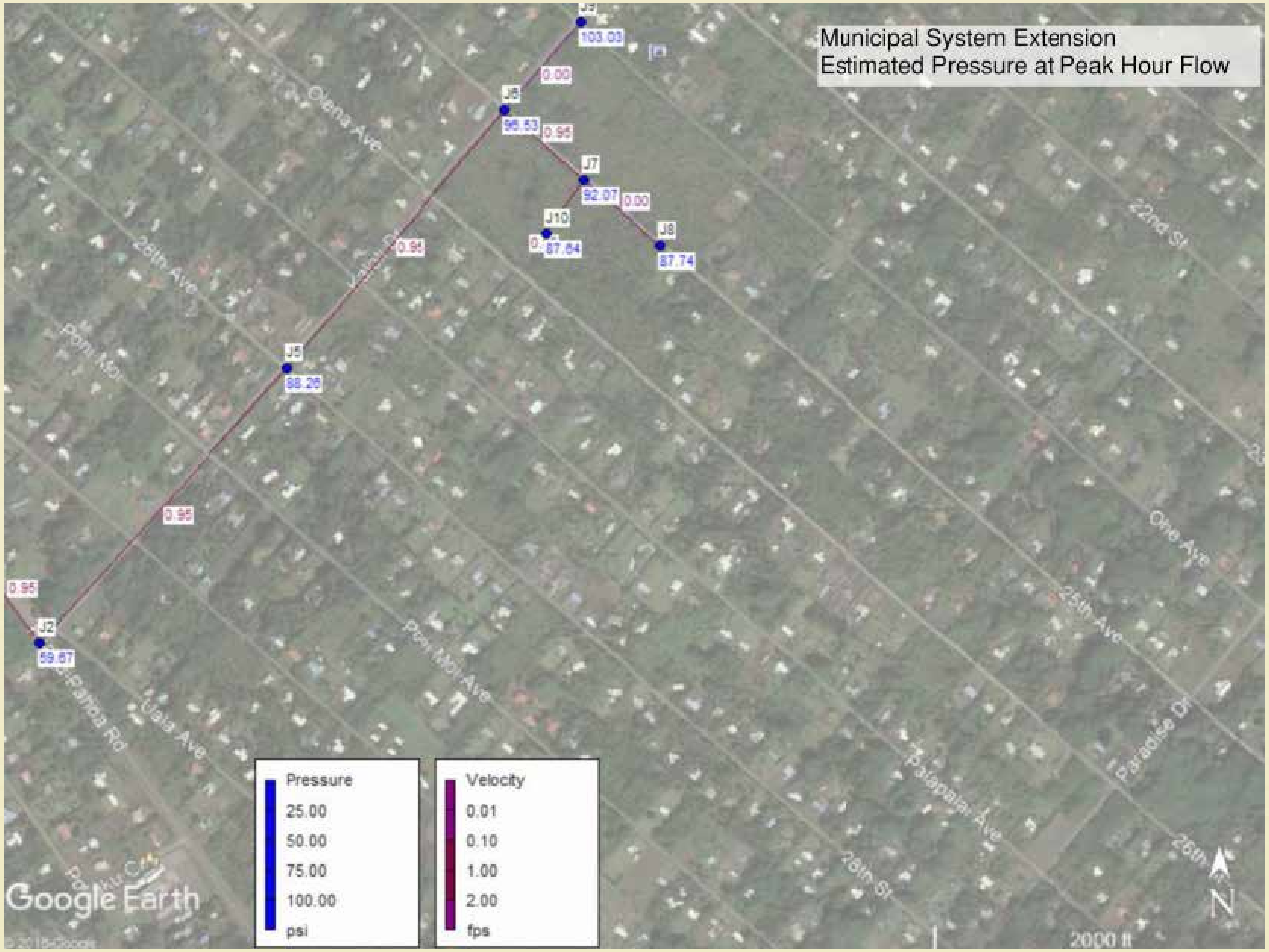
PEAK FLOW REQUIREMENTS FOR NEW WATER METER

	Fixture Units (FU)	Gallons Per Minute (GPM)	Gallons Per Day (GPD)
Domestic - Peak Public Demand	45.4	48	1440

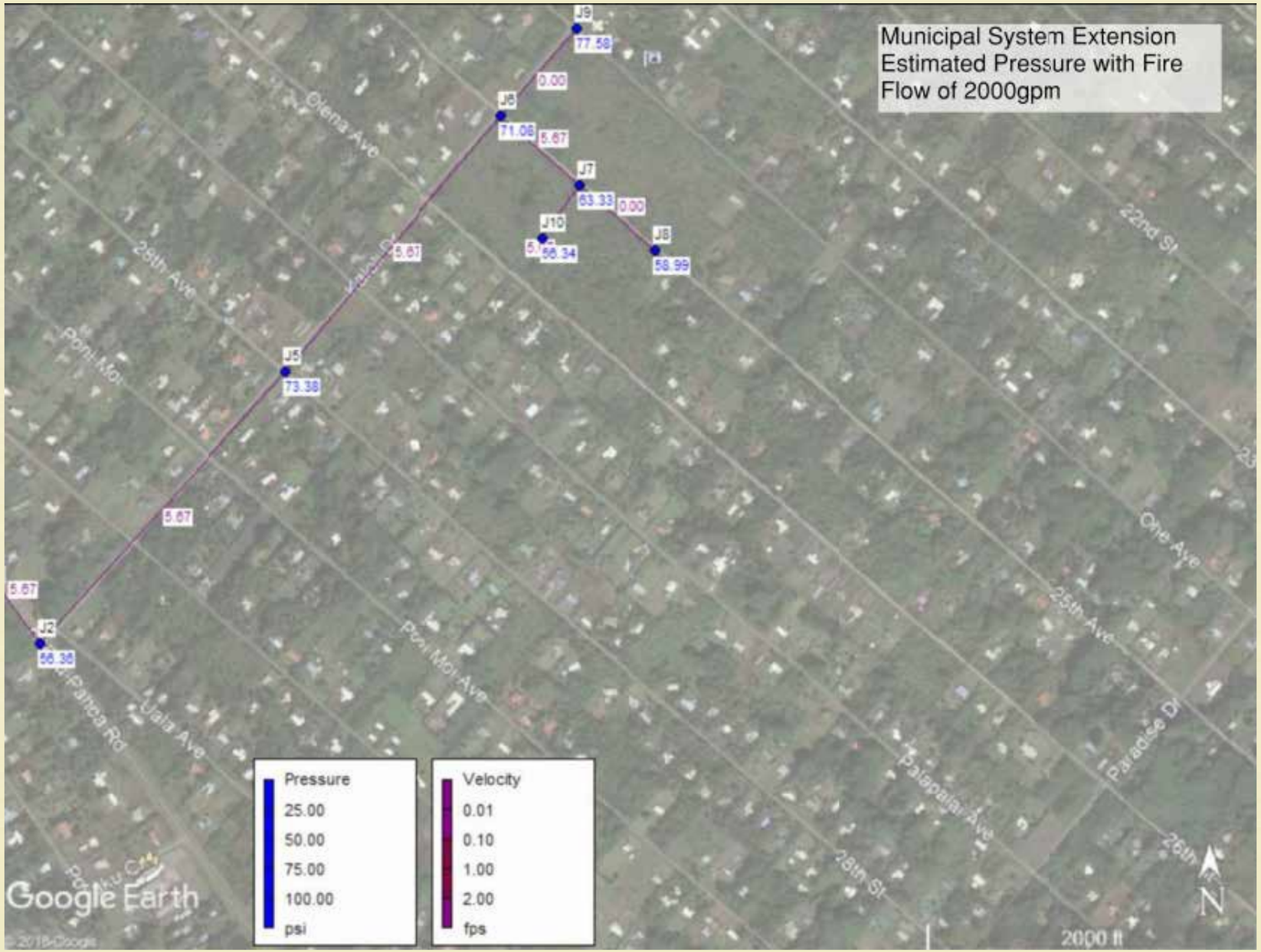
FIXTURE UNIT SUMMARY			
HPP PARK - COMMUNITY CENTER			
TMK: 1-5-039:267 COUNTY OF HAWAII, DEPARTMENT OF PARKS AND RECREATION			
FIXTURE TYPE	NO. OF FIXTURES	F.U. PER FIXTURE	TOTAL F.U.
General Public Use			
Water Closet, Flush Valve	7	3.5	24.5
Urinal	2	2.8	5.6
Lavatory	8	1	8
Drinking Fountain	2	0.5	1
Service Sink/Mop Sink	1	3	
Hose Bibb	1	2.5	2.5
Hose Bibb, each additional	1	1	1
		TOTAL	42.6

PEAK FLOW REQUIREMENTS FOR NEW WATER METER

	Fixture Units (FU)	Gallons Per Minute (GPM)	Gallons Per Day (GPD)
Domestic - Peak Public Demand	42.6	47	1410



Municipal System Extension
Estimated Pressure at Peak Hour Flow
J9
103.03
0.00
J6
96.53
0.95
J7
92.07
0.00
J10
87.64
J8
87.74
0.95
J5
88.26
0.95
0.95
J2
69.67
Olena Ave
28th Ave
Poni Moi
Poni Moi Ave
Uala Ave
22nd St
One Ave
25th Ave
Paradise Dr
Palapalai Ave
28th St
Pressure
25.00
50.00
75.00
100.00
psi
Velocity
0.01
0.10
1.00
2.00
fps
2000 ft
N
Google Earth


Municipal System Extension
Estimated Pressure with Fire
Flow of 2000gpm
J9
77.58
0.00
J6
71.06
5.67
J7
63.33
0.00
J10
56.34
J8
58.99
5.67
J5
73.38
5.67
5.67
J2
66.36
Pressure
25.00
50.00
75.00
100.00
psi
Velocity
0.01
0.10
1.00
2.00
fps
Google Earth
2000 ft
N
Oiena Ave
26th Ave
Poni Moi
Poni Moi Ave
Uaia Ave
Papaloa Rd
22nd St
One Ave
25th Ave
Paradise Dr
Palapalai Ave
28th St
26th

Hawaiian Paradise Park

Estimate of Water Costs
Connection to Municipal Water Supply Option

	Potable	Irrigation	Total
Average Day (gal)	2,900	4,300	7,200
Monthly Total (gal)	87,000	129,000	216,000

Note: Irrigation amount reduced to reflect estimate collection volume with a Rainwater Catchment system, for comparison purposes.

Description			One-Time Cost	Montly Costs
A. Montly Standby Charges				
Potable (1.5")				$ 80.00
Irrigation (4")				$ 377.00
B. General Use Rates (Potable Meter)				
Block 1 (5000 gal)	5	$ 0.92		$ 4.60
Block 2 (5001-400,000)	82	$ 2.01		$ 164.82
General Use Rates (Irrigation Meter)				
Block 1 (5000 gal)	5	$ 0.92		$ 4.60
Block 2 (5001-4,700,000gal)	124	$ 2.01		$ 249.24
D. Fire Protection Monthly Standby Charges				
6" Private Fire Line				$ 119.00
E. Fire Line or Fire Service Meters - Monthly Standby Charges				
6" Private Fire Line				$ 675.00
G. Facilities Charges				
1.5" Potable Meter			$ 27,500.00	
4" Irrigation Meter			$ 137,500.00	
J. Power Cost Charges				
Monthly Demand	216,000			
Unit Rate (per 1000 gal)	$ 1.73			
Cost				$ 373.68
K. Energy CIP Charges				
Monthly Demand	216,000			
Unit Rate (per 1000 gal)	$ 0.05			
Cost				$ 10.80
Total Estimated Charges			**$ 165,000.00**	**$ 2,058.74**

Present Value of Costs with 4% interest, 20 year term

One-time Charges	$ 165,000
Monthly Costs	$ 335,740
Total Present Value	**$ 500,740**

Hawaiian Paradise Park

Estimate of Water Costs
Rainwater Collection Option

	Potable	Irrigation	Total
Average Day (gal)	2,900	4,300	7,200
Monthly Total (gal)	87,000	129,000	216,000

Note: Irrigation amount reduced to reflect estimate collection volume.

Description			**Montly Costs**
Hawaiian Electric Charges			$ 23.50
Green Infrastructure Fee			$ 6.25
Pumping Costs			
Volume Pumped (Potable)	87,000		
Power Cost (per Kw-hr)	0.294		
Head (ft)	120		
Pump Efficiency	0.75		
Motor Efficiency	0.85		
Cost Per 1000 gal	$ 0.17		
Monthly Cost			$ 15.17
Volume Pumped (Irrigation)	129,000		
Power Cost (per Kw-hr)	0.294		
Head (ft)	120		
Pump Efficiency	0.75		
Motor Efficiency	0.85		
Cost Per 1000 gal	$ 0.17		
Monthly Cost			$ 22.49
Total Estimated Electrical costs			**$ 67.40**

Estimate of Operating and Maintenance Costs

Description		Units	Unit Rate	Quantity	Materials	Labour	Total Monthly
Site Visits (assume 16hrs /wk)		Hrs	$ 50.00	64		$ 3,200.00	$ 3,200.00
5 Micron Filters (assume 1 per month)		EA	$ 365.00	1	$ 365.00	$ 50.00	$ 415.00
Chlorine Solution		Wk	$ 40.00	4	$ 160.00		$ 160.00
1 Micron Absolute Filters (assume 2 per month)		EA	$ 950.00	2	$ 1,900.00	$ 100.00	$ 2,000.00
Water Testing		EA	$ 100.00	4		$ 400.00	$ 400.00
	Ave Monthly Cost				$ 2,425.00	$ 3,750.00	**$ 6,175.00**

Total Estimated Montly Costs **$ 6,257.57**

Present Value of Costs with 4% interest, 20 year term

One-time Charges	$ -
Monthly Costs	$ 1,020,490
Total Present Value	**$ 1,020,490**

Hawaiian Paradise Park

Estimate of Water Costs
Combination of Municipal System and Rainwater Collection Option

1) Connection to Municipal Water Supply (Potable)

	Potable	Irrigation	Total
Average Day (gal)	2,900	0	2,900
Monthly Total (gal)	87,000	0	87,000

Description			One-Time Cost	Montly Costs
A. Montly Standby Charges				
Potable (1.5")				$ 80.00
Irrigation (4")				$ -
B. General Use Rates (Potable Meter)				
Block 1 (5000 gal)	5	$ 0.92		$ 4.60
Block 2 (5001-400,000)	82	$ 2.01		$ 164.82
General Use Rates (Irrigation Meter)				
Block 1 (5000 gal)	0	$ 0.92		$ -
Block 2 (5001-4,700,000gal)	0	$ 2.01		$ -
D. Fire Protection Monthly Standby Charges				
6" Private Fire Line				$ 119.00
E. Fire Line or Fire Service Meters - Monthly Standby Charges				
6" Private Fire Line				$ 675.00
G. Facilities Charges				
1.5" Potable Meter			$ 27,500.00	
4" Irrigation Meter			$ -	
J. Power Cost Charges				
Monthly Demand	87,000			
Unit Rate (per 1000 gal)	$ 1.73			
Cost				$ 150.51
K. Energy CIP Charges				
Monthly Demand	87,000			
Unit Rate (per 1000 gal)	$ 0.05			
Cost				$ 4.35
Total Estimated Charges			**$ 27,500.00**	**$ 1,198.28**

Present Value of Costs with 4% interest, 20 year term

One-time Charges	$ 27,500
Monthly Costs	$ 195,420
Total Present Value	**$ 222,920**

Combined Present Value Amount **$ 670,940**

2) Rainwater Collection System (Non potable)

	Potable	Irrigation	Total
Average Day (gal)	0	4,300	4,300
Monthly Total (gal)	0	129,000	129,000

Note: Irrigation amount reduced to reflect estimate collection volume with a Rainwater Catchment system, for comparison purposes.

Description			Montly Costs
Hawaiian Electric Charges			$ 23.50
Green Infrastructure Fee			$ 6.25
Pumping Costs			
Volume Pumped (Potable)	0		
Power Cost (per Kw-hr)	0.294		
Head (ft)	120		
Pump Efficiency	0.75		
Motor Efficiency	0.85		
Cost Per 1000 gal	$ 0.17		
Monthly Cost			$ -
Volume Pumped (Irrigation)	129,000		
Power Cost (per Kw-hr)	0.294		
Head (ft)	120		
Pump Efficiency	0.75		
Motor Efficiency	0.85		
Cost Per 1000 gal	$ 0.17		
Monthly Cost			$ 22.49
Total Estimated Electrical costs			**$ 52.24**

Estimate of Operating and Maintenance Costs

Description		Units	Unit Rate	Quantity	Materials	Labour	Total Monthly
Site Visits (assume 10hrs /wk)		Hrs	$ 50.00	40		$ 2,000.00	$ 2,000.00
5 Micron Filters (assume 1 per month)		EA	$ 365.00	1	$ 365.00	$ 50.00	$ 415.00
Chlorine Solution		Wk	$ 20.00	4	$ 80.00		$ 80.00
Water Testing		EA	$ 100.00	2		$ 200.00	$ 200.00
	Ave Monthly Cost				$ 445.00	$ 2,250.00	**$ 2,695.00**

Total Estimated Montly Costs **$ 2,747.24**

Present Value of Costs with 4% interest, 20 year term

One-time Charges	$ -
Monthly Costs	$ 448,020
Total Present Value	**$ 448,020**

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APPENDIX B

County Resolution Number 184-97

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COUNTY OF HAWAII STATE OF HAWAII

RESOLUTION NO. 184-97

A RESOLUTION ADOPTING THE HAWAIIAN PARADISE PARK COMMUNITY MASTER PLAN (MARCH 1997) AS A PLANNING GUIDE FOR THE COUNTY OF HAWAII

WHEREAS, the General Plan for the County of Hawaii states as a land use policy that "The County shall develop, in cooperation with community residents, community development or regional plans for all of the districts or combination of district and shall periodically review and amend these documents as necessary or as mandated"; and

WHEREAS, the Council recognizes the Hawaiian Paradise Park Subdivision as an area of major future population growth which encompasses approximately 10,000 acres of land, comprising over 8,800 building lots, and where a major portion of the subdivision extends from the Pahoa Government Road to the shoreline; and

WHEREAS, in 1993, the Community Action Committee of Paradise Hui Hanalike Corporation (members of the community and community association of Hawaiian Paradise Park) embarked on the formulation of the *Hawaiian Paradise Park Community Master Plan* after organizing extensive meetings and workshops/presentations; and

WHEREAS, after comprehensive community input and planning analysis of the *Hawaiian Paradise Park Community Master Plan*, a final draft of the *Hawaiian Paradise Park Community Master Plan* received acceptance from the majority of the Board of Directors, the general membership of the community association, and the community at large; and

WHEREAS, the *Hawaiian Paradise Park Community Master Plan*, intended to serve as a planning guide, reflects the desire of the residents to maintain the subdivision's high level of home ownership, to expand agricultural and other economic opportunities, and to preserve its rural environment while incorporating public and private services within its boundaries; and

WHEREAS, the Council finds that the community-based *Hawaiian Paradise Park Community Master Plan* would assist the County of Hawaii in its decision-making regarding the development of the Hawaiian Paradise Park Subdivision.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE COUNTY OF HAWAII that it adopts the *Hawaiian Paradise Park Community Master Plan*, dated March 1997, as a planning guide for the future growth and development of the Hawaiian Paradise Park Subdivision that can be utilized by the County in coordination with other existing planning documents.

BE IT FURTHER RESOLVED that the Council directs the Planning Director of the County of Hawaii to initiate feasibility studies that consider proposed amendments to the General Plan to complement the *Hawaiian Paradise Park Community Master Plan.*

BE IT FURTHER RESOLVED that the *Hawaiian Paradise Park Community Master Plan* be utilized as a model for other communities and subdivisions in the development of their community-based master plan.

BE IT FURTHER RESOLVED that the Clerk of the County of Hawaii transmit copies of this resolution to Mayor Stephen K. Yamashiro, Planning Director Virginia Goldstein, Planning Commission Chairman Kevin Balog, Chief Engineer Donna F. Kiyosaki, Department of Water Supply Manager Milton Pavao, Finance Director Harry Takahashi, and Department of Parks and Recreation Director George Yoshida.

Dated at Hilo, Hawaii this 19th day of November, 1997.

INTRODUCED BY:

COUNCIL MEMBER, COUNTY OF HAWAII

COUNTY COUNCIL
County of Hawaii
Hilo, Hawaii

I hereby certify that the foregoing RESOLUTION was by the vote indicated to the right hereof adopted by the COUNCIL of the County of Hawaii on November 19, 1997.

ATTEST:

COUNTY CLERK **CHAIRMAN & PRESIDING OFFICER**

ROLL CALL VOTE

	AYES	NOES	ABS	EX
ARAKAKI	X			
CHUNG	X			
LEITHEAD-TODD	X			
RAY	X			
REYNOLDS	X			
SANTANGELO	X			
SMITH	X			
TYLER	X			
YAGONG	X			
	9	0	0	0

Reference C-267.04

RESOLUTION NO. 184 97

APPENDIX C

County Resolution Number 284-15

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COUNTY OF HAWAI'I STATE OF HAWAI'I

RESOLUTION NO. 284 15

A RESOLUTION ADOPTING THE 2015 HAWAIIAN PARADISE PARK COMMUNITY MASTER PLAN.

WHEREAS, in 1993 the Community Action Committee of Paradise Hui Hanalike Corporation (members of the community and community association of Hawaiian Paradise Park) created the Hawaiian Paradise Park Community Master Plan; and

WHEREAS, the Council of the County of Hawai'i approved Resolution No. 184-97, which adopted the Master Plan as a planning guide for the future growth and development of the Hawaiian Paradise Park subdivision; and

WHEREAS, the Hawaiian Paradise Park Community Action Committee, created in 2014 by the Hawaiian Paradise Park Owners Association Board of Directors, has created an updated Master Plan; and

WHEREAS, the Hawaiian Paradise Park Owners Association Board of Directors presents the Master Plan as provided in the attached Exhibit "A" as an update to the 1997 Master Plan; now, therefore,

BE IT RESOLVED BY THE COUNCIL OF THE COUNTY OF HAWAI'I that the Hawaiian Paradise Park Community Master Plan, dated May 26, 2015, as provided in the attached Exhibit "A," is adopted as the successor to the Master Plan adopted by Resolution No. 184-97 and may be utilized by the County, in coordination with other planning documents, for assessing future growth and development of the Hawaiian Paradise Park subdivision.

EXHIBIT 1

BE IT FINALLY RESOLVED that the County Clerk shall transmit a copy of this resolution to the Honorable Mayor William P. Kenoi, Planning Director Duane Kanuha, Public Works Director Warren Lee, Department of Water Supply Manager Keith Okamoto, Finance Director Deanna Sako, Department of Parks and Recreation Director Clayton Honma, and Mass Transit Administrator Tiffany Kai.

Dated at Kona, Hawai'i, this 20th day of October, 2015.

INTRODUCED BY:

Gregory Ilagan (B/R)

COUNCIL MEMBER, COUNTY OF HAWAI'I

COUNTY COUNCIL
County of Hawai'i
Hilo, Hawai'i

I hereby certify that the foregoing RESOLUTION was by the vote indicated to the right hereof adopted by the COUNCIL of the County of Hawai'i on October 20, 2015.

ATTEST:

COUNTY CLERK

CHAIRPERSON & PRESIDING OFFICER

ROLL CALL VOTE

	AYES	NOES	ABS	EX
CHUNG	X			
DAVID	X			
EOFF	X			
ILAGAN	X			
KANUHA	X			
ONISHI	X			
PALEKA	X			
POINDEXTER	X			
WILLE	X			
	9	0	0	0

Reference: C-472/PC-27

RESOLUTION NO. 284 15

EXHIBIT A

HAWAIIAN PARADISE PARK

COMMUNITY MASTER PLAN

2015 Data Amendments to 1997 Master Plan

26 May 2015

A VISION FOR OUR COMMUNITY

Prepared by the

2015 Community Action Committee

of

Hawaiian Paradise Park Owners Association

TABLE OF CONTENTS

SECTION 1

1.1 HISTORY – HAWAIIAN PARADISE PARK COMMUNITY ACTION COMMITTEE PLANS

In October of 1993 Paradise Hui Hanalike Corporation, the Community Association of Hawaiian Paradise Park (HPP), authorized its Community Action Committee (CAC) to sponsor a community plan development seminar. The mission of this seminar was to create a vision and a map/plan of HPP as a mature community. The final plan, dated March 1997, was submitted both to the Paradise Hui Hanalike and the County of Hawai'i in April of 1997. In April/May of 2005, the Hawaiian Paradise Park Owners Association (HPPOA) Board authorized the formation of a Master Plan Review Committee. The Committee began meeting on June 1, 2005, and produced a plan which was submitted to the County but not officially incorporated into the County Development Plan (CDP). (See Appendix E for previous plans)

Since the last plan to be officially recognized by Hawai'i County government is the 1997 plan, in February of 2014, the latest CAC was formed under the HPPOA Board of Directors as a membership committee and has been working on the updated Community Plan based on a 2014 Survey of our association members. The HPP CAC 2015 is a volunteer group of homeowners that is meeting to make recommendations for updates to the Hawai'i County General Plan and Puna Community Development Plan (PCDP).

1.2 PURPOSE, GOALS, AND OBJECTIVES

In 1997 and 2005, the CACs established a goal and related specific objectives for the HPP Community Master Plan which are still appropriate for today. The intent of the 2015 CAC is to update our CDP in an effort to create a vision for the future from the ground up; to meet the needs and desires of the residents of our community; to manage growth; to build our community, internally and externally, through communication and partnerships with government.

Another purpose of the HPP Community Master Plan is to serve as an implementation tool and guide for the next revision of the General Plan of the County of Hawai'i and the PCDP. It is not intended to pose additional developmental controls but rather to guide land use actions by both the public and private sectors. It is not a regulatory measure but a guideline for making future land use decisions. It is important that HPP has a voice when it comes to planning, finances, capital improvements, and infrastructure on the district, county, state, and federal levels

The overriding goal is to work with the community to develop a plan for a rural and fast growing subdivision that encompasses recreational and cultural desires; upgrades the infrastructure; provides social and public services; and creates regional/village/and neighborhood centers. This plan will include recommendations for small commercial enterprises, light industry, recreational opportunities, parks, roads, utilities, public support services, social services, and schools in a functional, attractive, and financially feasible natural environment. In the future the HPP CAC will also plan in concert with county government for appropriate shoreline uses, public facilities, and commercial and county infrastructure to be developed over the coming years.

OBJECTIVES:

Regional Town/Village/Neighborhood Centers: To work on the development of Regional/Town/Village Centers listed in the PCDP incorporating the results of the 2014 HPP Survey.

Land use: To develop a plan for an integrated community which by interim amendments shall be presented to the County Planning Department and PCDP. These Master Plans will phase-in the required infrastructure over time and provide for a mix of land uses.

Schools: To establish educational facilities for a large and growing young population.

Roads: To improve existing roads and accommodate all modes of travel. To support paving roads and eliminate Department of Health's concerns over fugitive dust. To work with the County on providing emergency roads, speed controls, and lighting for the safety of all citizens and support the PCDP Road connectivity initiative. To support the expansion of public transportation and reliable transportation options for special populations.

Recreational: To develop recreational facilities that meet the range of needs arising from future potential of 30,000+ residents and visitors. Develop trails and pathways for pedestrians and bicycles. Develop parks, sports center, sports fields, theater, library, after school center, senior center, dog park, skateboard park, tennis courts, etc.

Housing: To accommodate a growing residential population which may include private, State/County, non-profit or other housing developers for specialized housing and centers for veterans, disabled, special needs population, and senior citizens.

Commercial: To develop commercial services which mirror those presently in the Pahoa and Keaau regional Town Centers.

Infrastructure: To upgrade water, sanitation, telecommunications systems, transportation, electrical, and road safety features.

Conservation: To protect the natural resources from damage and exploitation, retain green spaces, control invasive species, and encourage alternative energy sources.

Archaeology/Cultural Resources: To investigate and protect historical sites.

Support Services: To establish social and health care services and improve access to those services.

Public safety: To support police, fire department, paramedics, Neighborhood Watch/PAKA, CERT, Red Cross, and Civil Defense teams. Work with Civil Defense on effective use of warning and communication systems such as tsunami sirens and radio transmissions.

1.3 GENERAL PLAN OF THE COUNTY OF HAWAI'I, PUNA COMMUNITY DEVELOPMENT PLAN, AND HPP COMMUNITY MASTER PLAN http://www.Hawaiicountycdp.info/

The Hawai'i General Plan, established by the County of Hawai'i in 2005, is the guiding document for long term development planning. It covers infrastructure improvements, safety of the population, transportation, urban design, along with preservation of natural resources. For Hawai'i Island, different districts, such as Kona, South Kohala, Hilo, etc. develop their own particular plans so the Hawai'i General Plan becomes the coordinator amongst the district plans. HPP's CDP agrees with the PCDP which sets the goals and policies for the Puna District and includes plans from Pahoa, Keaau, and subdivisions within the District.

SECTION 2

2.1 AREA DESCRIPTION

HPP is the second largest private subdivision in the United States consisting of approximately twelves square miles. This subdivision is located 15 miles southeast of Hilo and contains 8,835 lots. The subdivision fronts State Highway 130 and stretches four miles to the Pacific Ocean. It is 3.5 miles wide. Approximately 1.5 miles of Highway 130 pass through the subdivision beginning at its northwest border.

2.2 SUMMARY OF IMPORTANT CHARACTERISTICS

Climate: Tropical climate with average annual rainfall of 126 inches and average annual temperature ranging from 61 to 82 degrees. There are two significant climatic variations within the area. The Coastal area is generally hotter, sunnier, and drier. The mid to top of the park range from 200-500 feet above sea level, is a little cooler with more rain. Topography: Elevation ranges from sea level to 500 feet with average slopes from 0 to 10 percent.

Geology and Soils: Largely 'a'a and pahoehoe lava flows with an occasionally thin organic soil covering.

Flora and Fauna: The subdivision supports a diverse collection of tropical plants, both indigenous and introduced.

Birds: There are a wide variety of birds including the protected the Hawai'ian pueo, nenes, and the hawk.

Invasive Species: Invasive species are plants and animals, introduced by humans to Hawai'i, which spread at an alarming rate causing damage and posing a grave threat to Hawai'i's economy, environment, and the lifestyle of the people. The following is a list of invasive species in HPP listed by common names rather than their scientific names: little red fire ants, mongeese, cane toads, rodents (rats and mice), coquis frogs, nettle caterpillars, greenhouse frogs, Madagascar geckos, albizia trees, Miconia Kahili ginger, strawberry guavas, Himalayan

Raspberries, gorse, banana poka, ivy gourd, fireweed, autograph trees, and plume poppies. Additional information on invasive species can be found on the University of Hawai'i site at www.ctahr.Hawai'i.edu/haraa/HPCAInvasiveSpecies092311_rev%20(NXPowerLite%20pptx).pdf

Water Resources: There is limited county water available with most of it located near Highway 130. Primary source of water for residents is water catchment. Wells have been drilled in the subdivision with a March 18, 2015 report to HPPOA by Robert Whittier and Daniel Chang of the Department of Health indicating that well water is safe. The aquifer is at sea level.

Shoreline: The shoreline consists of rocky basalt lava cliffs ranging from 6 to 25 feet in height. There are no county designated sand beaches or safe water entry areas within the boundaries of the subdivision.

Archaeological Resources: Within the subdivision exist some archeological sites attributed to an ancient Hawaiian settlement. A report was produced by Archaeologist Paul H. Rosendahl in 1985. Further investigation has been requested by the State Historic Preservation's Sean Naleimaile, Hawai'i-Assistant Archaeologist, who can be reached at (808) 933-7651 or at Sean.P.Naleimaile@Hawai'i.gov. Due to the fact that laws pertaining to historical property have changed over the past ten years it is possible a new assessment may be necessary for HPP. (See Appendix D)

Visual Resources: Within the boundaries of the subdivisions there are many areas where Mauna Kea, Mauna Loa, and the ocean may be viewed. The visual impression one gets when driving the main roads within the boundaries is that of tree lined thoroughfares leading to the ocean. When driving the connecting roads, one views a wide range of properties and homes.

Natural Hazards: HPP is located in USGS Lava Zone 3. There is the potential for earthquakes, wind storms, flooding, tsunamis, hurricanes, floods, lava tubes, and sinkholes.

2.3 LAND USE

Existing Land Use: The HPP subdivision is composed primarily of one acre parcels zoned for agricultural use. Although zoned agricultural, the most significant use of land has been for

residential purposes. The residential use of land is the primary cause of the rapid growth in population. In response to this large increase in population schools, businesses, churches, and many other services have developed.

Land Ownership: Of the nearly 10,000 acres of land in the subdivision, the majority are owned by individual lot owners. There are 131 miles of roadways. Other owners of property are the County of Hawai'i, Watumull Properties and HPPOA which holds approximately 160 acres, the largest single landowner. See map Appendix C

Land Use Regulations: State Land use is 100 percent Agricultural with County Zoning Ag 1.

2.4 DESCRIPTION OF COUNTY RESOURCES RELATING TO HPP

Access and Transportation: The main access to HPP from Hilo is by traveling State Highway 11 and then turning southeast on State Highway 130. All roads within HPP are private subdivision roads providing access to lots within the subdivision with the one exception being Government Beach Road of which ten feet is owned by the county but maintained by HPP. The private subdivision roads, during times of natural disaster, have been opened to all the community in partnership with Hawai'i County Civil Defense, the Hawai'i County Department of Transportation, and the United States Military. The bus route is limited but efforts are made to expand the service. (Appendix for maps)

Civil Defense: Disaster alert towers are located throughout the lower portion of the subdivision. HPP has a Community Emergency Response Team.

County Park: Two small undeveloped county parks exist on shoreline lots within the subdivision.

Fire Services: The County Fire Department provides fire protection services through a fire station near the center of the subdivision.

Humane Society: The Humane Society provides roundups of loose dogs at the request of Neighborhood Watch in specifically identified areas of the subdivision. These dogs along with other loose animals are taken to the Keaau location of the Humane Society.

Library: Currently, library services are provided by libraries located in Keaau and Pahoa on school property.

Mail Services: Two United States Post Offices exist at Regional Town Centers located in Pahoa and Keaau. Both post offices provide postal services and offer limited mail boxes for rental. Within the subdivision of HPP 2,435 cluster postal boxes are located in groupings on main access artery roads located on Maku'u, Paradise, Kaloli, and Shower Drives. Additional mail services are provided by UPS/Fed Ex. See map of mailbox locations in Appendix C.

Medical: Local clinics are in Keaau and Pahoa, both roughly located 10-14 miles away. Hilo Medical Center, 22 miles distant, is the nearest hospital service.

Neighborhood Watch: The subdivision has an active Neighborhood Watch which works closely with Hawai'i County Community policing.

Police Services: Police services are provided by the Hawai'i County Police Department from substations located in Keaau and Pahoa, each located approximately 10 miles from the north and south entrances to the subdivision.

School districts: Currently, there are two school districts in the HPP subdivision which are split by Paradise Drive with Keaau servicing those students on the northwest side of Paradise Drive and Pahoa servicing those students on the southeast side of Paradise Drive.

2.5 UTILITIES

Electrical Power: HELCO provides electrical service to the majority of lots. HELCO is responsible for maintenance of these lines. Alternative energy is a growing source of power.

Sanitation: Wastewater is disposed via cesspool and septic systems.

Telephone Service: Landline telephone service is provided by Hawaiian Telephone and Oceanic Time Warner Cable and cellular providers include AT&T, Verizon, and US Cellular.

TV and Internet services: Services vary depending on location.

Water: All lots abutting Highway 130 have access to County water. The County water lines extend down Paradise Drive to the fire station on 21st Avenue.

2.6 HISTORY OF SUBDIVISION

Before HPP was created, the original land owned by Shipman was used for cattle grazing. HPP had its origin in the 1950's as a result of a collaboration of business interests. The developers, David Watumull and his partners, had, as their goal, the objective of making money. This was at a time when environmental concerns had yet to be raised and there was little regard for infrastructure such as roads, water, sanitation, health, and commercial services. The emphasis from the late fifties to the early seventies was on lot sales with an average price per lot of $800. Ads in California sold 2,000 lots sight unseen. In the 1960s roads were only red cinder. In 1972 Paradise Park Hui Hanalike was formed by the residents as a voluntary non-profit corporation. In 1977 a legal settlement required the paving of Paradise and Maku'u. In addition, roads in increment 2 and (7) 20 acre parcels were deeded to the association. One parcel was designated for office, activity center, and maintenance facility and six parcels are deed restricted for park and school use. Road crew and community association committees were set up as separate entities. In 1984 the Hawai'i Supreme Court decision mandated road maintenance fees for all lots abutting HPP roads with the county exempted from any obligation in perpetuity. In 2001 the road group and community group merge and the name changed to Hawaiian Paradise Park Owners Association (HPPOA). The Bylaws were approved by the court and owners. The last revision of HPPOA Bylaws was in 2010. The Bylaws provide for a nine member volunteer Board of Directors. A number of committees have operated over the years as residents have taken it upon themselves to improve the community. Two of the latest are the Albizia and the Emergency Action Committee in response to Hurricane Iselle.

2.7 HOUSING AND POPULATION

Population of HPP in the 2000 census was 6948. Population of HPP in the 2010 census was 11,404, an increase of 61% and which represents one fourth of the population of the entire Puna

District. Optimal growth at build out was estimated to be approximately 30,000. However, due to the lava flow and possibility of multiple housing in town centers, the percentage of growth could vary greatly either up or down. (See Appendix C).

SECTION 3

3.1 PLANNING PROCESS

The planning process for the HPP Community Master Plan by the CAC is inclusive and from the ground up with continuous solicitation of volunteers. This kind of open, community-based planning process should facilitate the approval of this CDP, inclusion into the County General Plan, and implementation by all parties involved. Thus, the planning process has included:

Initial meeting held February 2014 with the distribution of previous HPP Community Master Plans and a brief history of the Hawai'i Planning Department and HPP.

Meetings with appropriate county parties to include a County of Hawai'i Planning Department Planner and Puna Districts 4 and 5 Councilmen to discuss plan development.

Goals of Community Development Plan established: to update the future vision within the community; research resources and means to accomplish the task; and to act as the coordinating group with the establishment of implementation teams. Appendices are to be used with the Plan to note special surveys and reports that affect the Plan.

Review of resources to use in the preparation of our CDP to align with the PCDP. Review of other Hawai'i island CDPs and search for prior specialized plans such as Path, Park, and Albizia that would impact the plan. Research the possibility of monies from grants, bonds, state, federal, county sources so that HPP can move forward

Creation of various tools such as 1) a business directory derived from a business survey to establish what is available presently, 2) an owner's survey to solicit input from the community to ensure the community determines needs and desires rather than a committee, 3) power point presentations for HPP membership meetings in June, 2014 and February 2015 to present the plan and to update it, and 4) creation of digital maps (wells, developed lots, mail boxes, bus line, roads paved and unpaved, town center areas, etc.)

On May 20, 2015, the CAC submitted the HPP CDP for final review by the HPP Board of Directors and it was approved. It was submitted to the Hawai'i County Planning Department before June 6, 2015 for review prior to submitting the document to the Hawaii County Council.

3.2 FUTURE – IMPLEMENTATION/ACTION PLAN

Use the data collected and vision plan to formulate how to best implement the future of HPP's CDP.

Develop an action format based on Volcano's CDP with action statements consisting of relative priority – a brief description of the projected action – the process required – estimated time – a proposed schedule – persons involved – the source of funds – current status – statements explaining consequences if action not implemented.

Establish specialized committees to proceed with the implementation process and finances of the plan's projects (parks, water, invasive species, zoning, commercial development, marketing, etc.)

CAC core: 1) to remain in a supervisory role to coordinate the plan and subcommittees, 2) update the plan annually, 3) encourage input on issues from the community and solicitation of volunteers, 4) provide reports at HPP BOD and membership meetings, and 5) attend PCDP Action Committee meeting.

3.3 PLANNING THEMES AND CHARACTERISTICS

The planning process for the HPP Community Master Plan was shaped by a number of major themes, characteristics, and concerns/opportunities. These may be summarized as follows:

HPP is the second largest population center on the Big Island. Because of the major population growth there is a need for infrastructure improvements such as town centers. Goal is to manage the already existing growth so that it supports the community.

Important that we respect the values and priorities of HPP community. Encourage wide community involvement so that plan is reflective of the residents' desires/needs rather than driven from the top down. Maintain a balance with competing priorities and objectives; community and individual desires; and development while maintaining the rural aspects of the community.

The Plan shall be developed in consultation with the State and County agencies, property owners, community leaders, and the general public. Maintain transparency to foster trust so that all feel free to have a voice in the community's future. Disseminate information using as many modes of communication as possible.

Land Use Plans and Infrastructure Plans for this area should be specific enough to provide a framework and a guidelines for infrastructure planning, yet broad enough to allow for maximum property and market flexibility.

Environmental considerations for the rural nature of the area should be an integral part of the planning process.

Continually work on the plan as it is a living document. The vision of the plan is a call to action and not a finished product.

3.4 PLANNING CHALLENGES

Introduction: Our vision is consistent with the PCDP. The 2014 lava threat in Pahoa has shifted attention to the HPP-Keaau area. As a result of the lava threat the subdivision has partnered with the county and Civil Defense for the safety and benefit of the Puna District and its residents. As we move forward, we recognize there are challenges.

Funding: Because of the private nature of the HPP subdivision, the association is ineligible to receive county funds. We are seeking expertise as to options to be pursued in obtaining funds.

Growth: The size and complexity of issues due to rapid growth in the subdivision may require professional expertise and knowledge.

Infrastructure: Presently HPP has substandard infrastructure capacity for its population levels to maintain public safety and accommodate growth that has occurred and will be occurring.

Monies: Our only source of income at this time is from road maintenance fees charged to owners. Our challenge is to have the level of service increase and mirror the level of annual assessments/taxation by county and state governments.

Natural Hazards: This area is vulnerable to natural hazards such as lava flows, hurricanes, tsunamis, and earthquakes. Eradication efforts of invasive species, such as albizia trees, fire ants, etc., add to the growing challenges already facing our community.

Zoning: The subdivision is presently zoned as agricultural with the exception of the larger parcels which are zoned 0. Legal issues such as eminent domain, deed restrictions, ordinances vs resolutions, commercial zoning, and special permits will need professional consultation.

SECTION 4

4.1 INTRODUCTION

In 2014 the CAC of HPPOA devised a survey of questions geared to the community's needs. Over four hundred surveys were returned and the results tallied. The three major categories of priorities identified by the responses to the survey are Recreational, Town and Village Centers, and Infrastructure.

4.2 RECREATION

From the survey, the highest priority was for recreational facilities, such as parks and recreational/sports fields. A community park or sports fields would aid in family, youth, and senior time together; encourage physical activity; and provide usable space during a disaster. It would foster communication and build community. Some of the specific items mentioned in the survey were the following: development of parks, walking and bike trails, swimming pool, gymnasium, sports fields, community hall, theater, library, after school center, senior center, dog park, skateboard park, tennis courts, and playgrounds for young children.

Our survey is in agreement with Section 3.1 of the 2011 PCDP which states "the DOE maintains recreational facilities in Pahoa, Keaau, and Mt View for the purpose of student activities. Some facilities are owned and maintained by community associations; some subdivisions contain underdeveloped parcels set aside for parks. However funds have not been available to develop facilities on them either from private or public sources. As population and residential development increases at a fast pace, there is a need to establish community parks in large underserved subdivisions such as HPP." (PCDP Fig 3-3 Overview of Parks and Natural Area Network in PUNA designates proposed parks in HPP)

4.3 TOWN/VILLAGE/COMMUNITY CENTERS

From the survey, the second priority was for the Town Center. Specifically, surrvey responses requested the following: retail (grocery store, bakery, restaurants, drug stores, hardware) and personal businesses (beauty shop), transit hub, medical services (pharmacy, urgent care), light industry (auto repair, plumbing, electrical), elderly center/housing, farmers market, gas station, post office, police and fire station, schools, and libraries. (PCDP Reference Table 5-1)

The sustainable community concept is perfect for this area as there is a need for services and jobs within this community which is miles from existing facilities. A regional town center in HPP (Kaloli Drive) would increase access to necessary resources for community members across their life spans; would reduce traffic on highways; would improve economic development and provide a variety of types of employment opportunities; and would allow more families to shelter-in-place in times of disaster reducing the strains on the County as noted in PCDP Figure 3.2: Proposed Town and Village Center Locations. Land ownership and deed restrictions within HPP make several 20 acre, one 31 acre, and 40 acre parcel available for education or recreation for either state schools or private educational institutions or private or public recreational organizations (PCDP map 5-3).

4.4 INFRASTRUCTURE

HPP's infrastructure is recognized as substandard which was reflected in the survey's results and is the third major priority. Since the 1997 HPP Master Plan, there have been some improvements noted such as road paving, road reflectors, and signage. However, additional actions need to be taken to meet minimum needs. Some of these are pave all roads; install walking/bike paths; designate emergency roads, speed controls, and street lights; update telecommunication systems (internet, cable, phone); update Civil Defense sirens and radio transmissions; and, address water and sanitation issues. Many of these needs are addressed in the PCDP Chapters 3 and 4.

SECTION 5

SUMMARY:

The Hawaiian Paradise Park Community Action Committee (CAC) has taken the initial step of upgrading HPP's 1997 Master Plan to reflect the community's current conditions and needs and to create a vision for the future in conjunction with the Puna Community Development Plan and the Plan for the County of Hawai'i. During the entire process the CAC has made efforts to hear the voice of the community by both listening (surveys) and communicating (power point presentations and open meetings). The CAC has also made a goal of establishing communication with the district, county, state, and federal agencies to help guide HPP's future. A large and various list of general objectives were discussed in working to develop this plan to build a community that will support small commercial enterprises, light industry, recreational opportunities, job growth, and social and public services.

As part of our plan, the CAC updated current information of this second largest private subdivision in Hawaii encompassing such areas as climate, invasive species, population, natural hazards, and resources. HPP is one of the fastest growing areas in the state but the supporting infrastructure has not kept pace with growth. There are serious issues concerning land use and zoning stemming from HPP's history that will need to be studied and addressed. The CAC also described county resources relating to HPP in an effort to work with the county on upgrading and developing areas such as roads, civil defense, recreational parks, mail services, and zoning for a future town center.

Now that there is a vision, the next steps are to do further research of the resources and means to accomplish the objectives outlined. The CAC will act as a coordinating group for specialized implementation committees. The major priorities to be addressed by these subcommittees deal with recreation, infrastructure, and town/village/community centers. These subcommittees will develop an action plan which will encompass the process required; an estimated timeline;

coordination with the appropriate agencies;_and the finances needed. The CAC will also conduct annual reviews of the HPP plan and make any amendments deemed necessary as this is not a finished product but an ongoing planning process.

APPENDIX D

County Resolution Number 360-15

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COUNTY OF HAWAI'I STATE OF HAWAI'I

RESOLUTION NO. 360 16
(DRAFT 2)

RESOLUTION ACCEPTING THE DONATION OF LOT 31 OF THE HAWAIIAN PARADISE PARK SUBDIVISION, BEING TAX MAP KEY: (3)1-5-039:267, SITUATE AT KEA'AU, DISTRICT OF PUNA, COUNTY AND STATE OF HAWAI'I, FROM HAWAIIAN PARADISE PARK OWNERS ASSOCIATION

BE IT RESOLVED BY THE COUNCIL OF THE COUNTY OF HAWAI'I.

WHEREAS, Hawaiian Paradise Park Owners Association ("HPPOA") is the owner of Lot 31 in Block 5, parcel 267, containing an area of 20 acres, more or less, identified as Tax Map Key: (3)1-5-039:267, situate at Kea'au, in the District of Puna, County and State of Hawai'i, as delineated on Exhibit "A" attached; and

WHEREAS, HPPOA is desirous of donating the subject parcel to the County of Hawai'i to establish a park in its subdivision to support and encourage healthy lifestyles and healthy families; and

WHEREAS, Article XIII, Section 13-12 of the Hawai'i County Charter, provides that the council may accept gifts, which include the donation of real property, on behalf of the County of Hawai'i.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE COUNTY OF HAWAI'I, in accordance with Article XIII, Section 13-12 of the Hawai'i County Charter, the County of Hawai'i accepts the donation of Lot 31 in Block 5, parcel 267, containing an area of 20 acres, more or less, identified as Tax Map Key: (3)1-5-039:267, delineated on Exhibit "A" attached hereto, for purposes of establishing a park.

BE IT FURTHER RESOLVED that the Director of Parks and Recreation is directed to complete a master plan for this park before the expiration of two years from the date of a successful conveyance of this property to the County.

BE IT FURTHER RESOLVED that if the master plan is not completed after two years from the date of a successful conveyance of this property to the County, this donation shall be deemed invalid and the Director of Finance is directed to take steps to revert ownership of the subject parcel to the Hawaiian Paradise Park Owners Association.

BE IT FURTHER RESOLVED that a letter of appreciation be sent to the Hawaiian Paradise Park Owners Association acknowledging this generous donation.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to: (1) Mayor William P. Kenoi; (2) the Department of Parks and Recreation; (3) Deputy Corporation Counsel Belinda Castillo Hall; and (4) Hawaiian Paradise Park Owners Association, HC 3, Box 11000, Kea'au, Hawai'i 96749.

Dated at Kona, Hawai'i, this 22nd day of January, 2016.

INTRODUCED BY:

COUNCIL MEMBER, COUNTY OF HAWAI'I

COUNTY COUNCIL
County of Hawai'i
Hilo, Hawai'i

I hereby certify that the foregoing RESOLUTION was by the vote indicated to the right hereof adopted by the COUNCIL of the County of Hawai'i on January 22, 2016.

ATTEST:

COUNTY CLERK

CHAIRPERSON & PRESIDING OFFICER

ROLL CALL VOTE

	AYES	NOES	ABS	EX
CHUNG			X	
DAVID	X			
EOFF	X			
ILAGAN	X			
KANUHA	X			
ONISHI	X			
PALEKA	X			
POINDEXTER	X			
WILLE	X			
	8	0	1	0

Reference: C-592.2/FC-43

RESOLUTION NO. 360 16

(DRAFT 2)

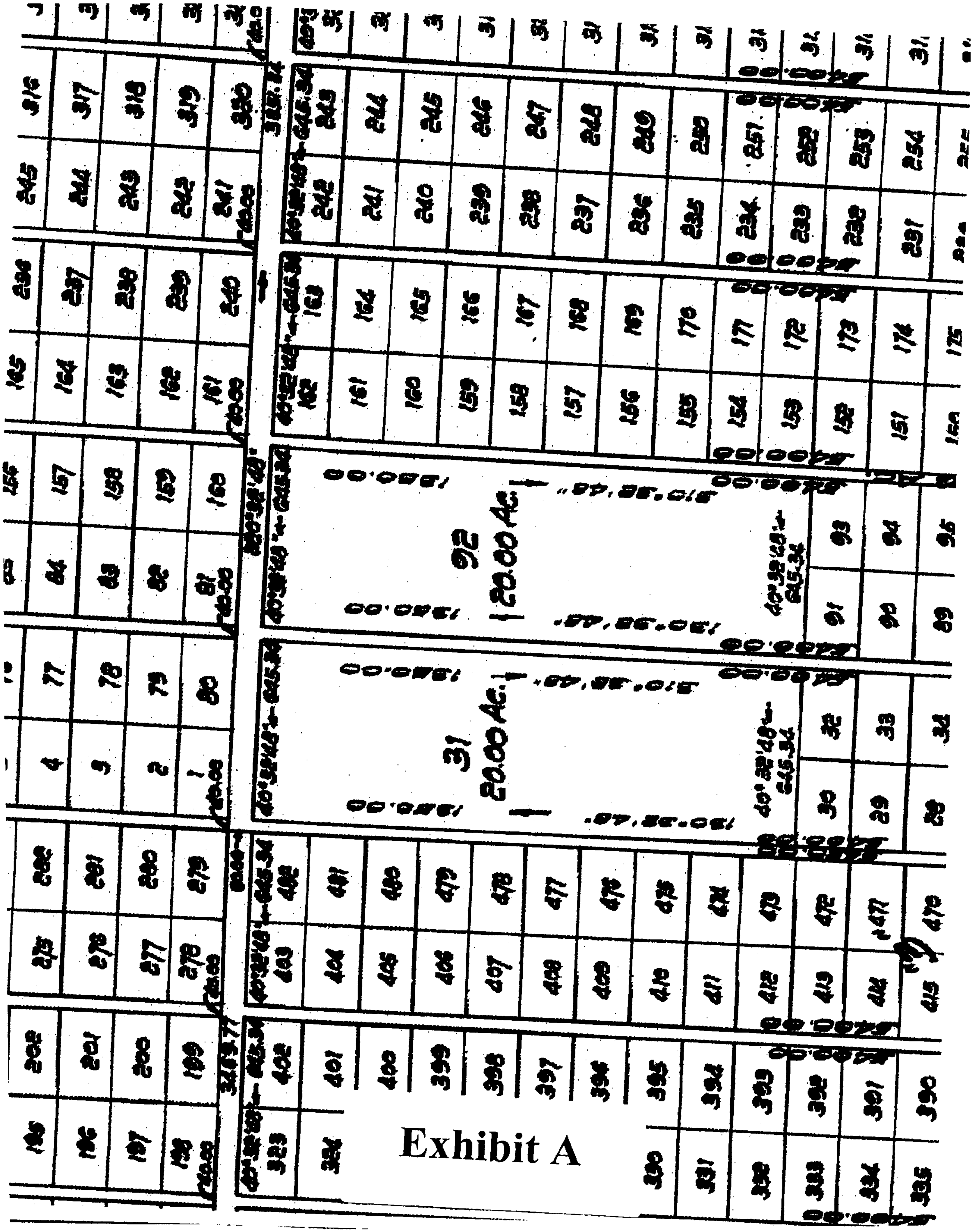

Exhibit A

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APPENDIX E

Cultural Impact Assessment

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Cultural Impact Assessment for the Hawaiian Paradise Park New District Park Master Plan

TMK: (3) 1-5-039:267

Keaʻau Ahupuaʻa
Puna District
Island of Hawaiʻi

DRAFT VERSION

Prepared By:

Candace B. Gonzales, B.A., and
Lokelani Brandt, M.A.

Prepared For:

County of Hawaiʻi
Department of Parks and Recreation
25 Aupuni Street
Hilo, HI 96720

September 2024

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ASM Project Number 44440.01

Cultural Impact Assessment for the Hawaiian Paradise Park New District Park Master Plan

TMK: (3) 1-5-039:267

Kea‘au Ahupua‘a
Puna District
Island of Hawai‘i

ASM affiliates

CHAPTERS

Page

FIGURES

Page

FIGURES

Page

TABLES

Page

1. INTRODUCTION

At the request of SSFM International, Inc., on behalf of the County of Hawai‘i (CoH) Department of Parks and Recreation (P&R), ASM Affiliates (ASM) has prepared this Cultural Impact Assessment (CIA) to inform an Environmental Assessment (EA) being prepared for the proposed Hawaiian Paradise Park New District Park (referred to hereafter as the ‘proposed project’) located on the twenty acre parcel identified as Tax Map Key (TMK): (3) 1-5-039:267, in the Hawaiian Paradise Park residential subdivision in Kea‘au Ahupua‘a, Puna District, Island of Hawai‘i (Figures 1, 2 and 3). The use of County-owned lands along with County funding necessitates compliance with Hawai‘i Revised Statutes (HRS) Chapter 343.

This CIA has been prepared in accordance with the Office of Environmental Quality Control (OEQC) *Guidelines for Assessing Cultural Impacts*, adopted by the Environmental Council, State of Hawai‘i, on November 19, 1997 (OEQC 1997) and signed into law on April 26, 2000 as part of Act 50 (House Bill Number 2895), which requires that HRS Chapter 343 environmental assessments to include a disclosure of the effects of the proposed action on the cultural practices of the community and State. Act 50 further states that environmental studies “. . . should identify and address effects on Hawaii’s culture, and traditional and customary rights” and that “native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the ‘aloha spirit’ in Hawai‘i. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on governmental agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.”

In 2021, the OEQC (the Agency that first developed the guidelines for preparing CIAs) was renamed the Environmental Review Program (ERP) and assigned to the State of Hawai‘i’s Office of Planning and Sustainable Development (OPSD). The ERP currently facilitates Hawai‘i’s environmental review process (commonly known as the Hawai‘i Environmental Protection Act, or HEPA), pursuant to HRS Chapter 343. The OPSD-ERP provides guidance regarding the HEPA process at their website (https://planning.hawaii.gov/erp/), including guidance for preparing CIAs, consisting of a link to a copy of the 1997 *Guidelines for Assessing Cultural Impacts* (https://files.hawaii.gov/dbedt/erp/OEQC_Guidance/1997-Cultural-Impacts-Guidance.pdf), which are the guidelines that were followed to prepare this report.

This report is divided into four main chapters. Chapter 1, the introduction, includes an overview of the proposed project as well as a physical description of the project area. To provide a cultural context of the project area, Chapter 2 includes cultural-historical background information specific to the project area and the broader geographical region of Kea‘au Ahupua‘a, and at times the greater Puna District. This chapter also includes a summary of prior archaeological and cultural studies that have been conducted within or near the project area. The methods and results of the consultation process are then presented in Chapter 3. Lastly, Chapter 4 includes a discussion of potential cultural impacts as well as actions and strategies that may help to mitigate any identified impacts.

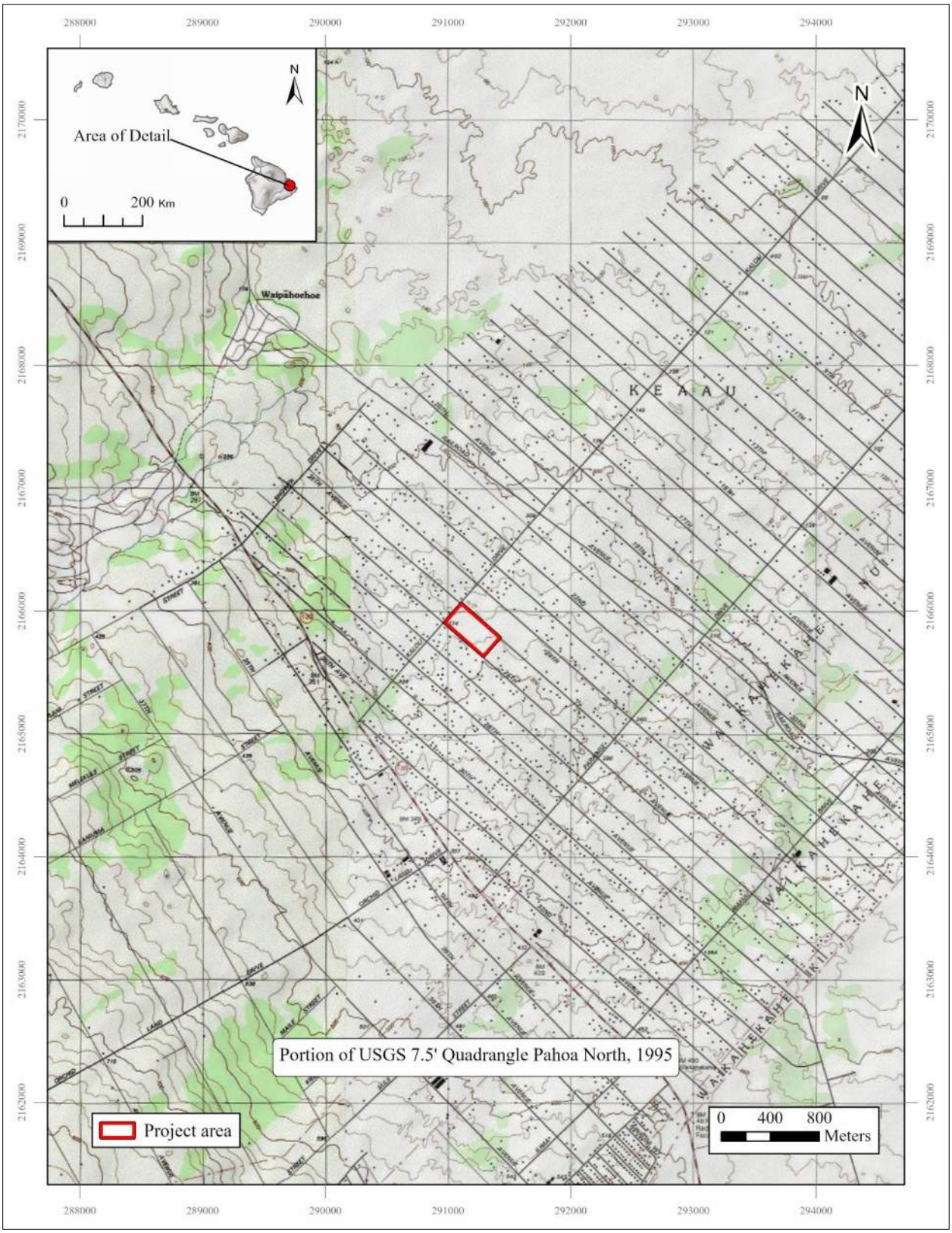


Figure 1. Project area location.

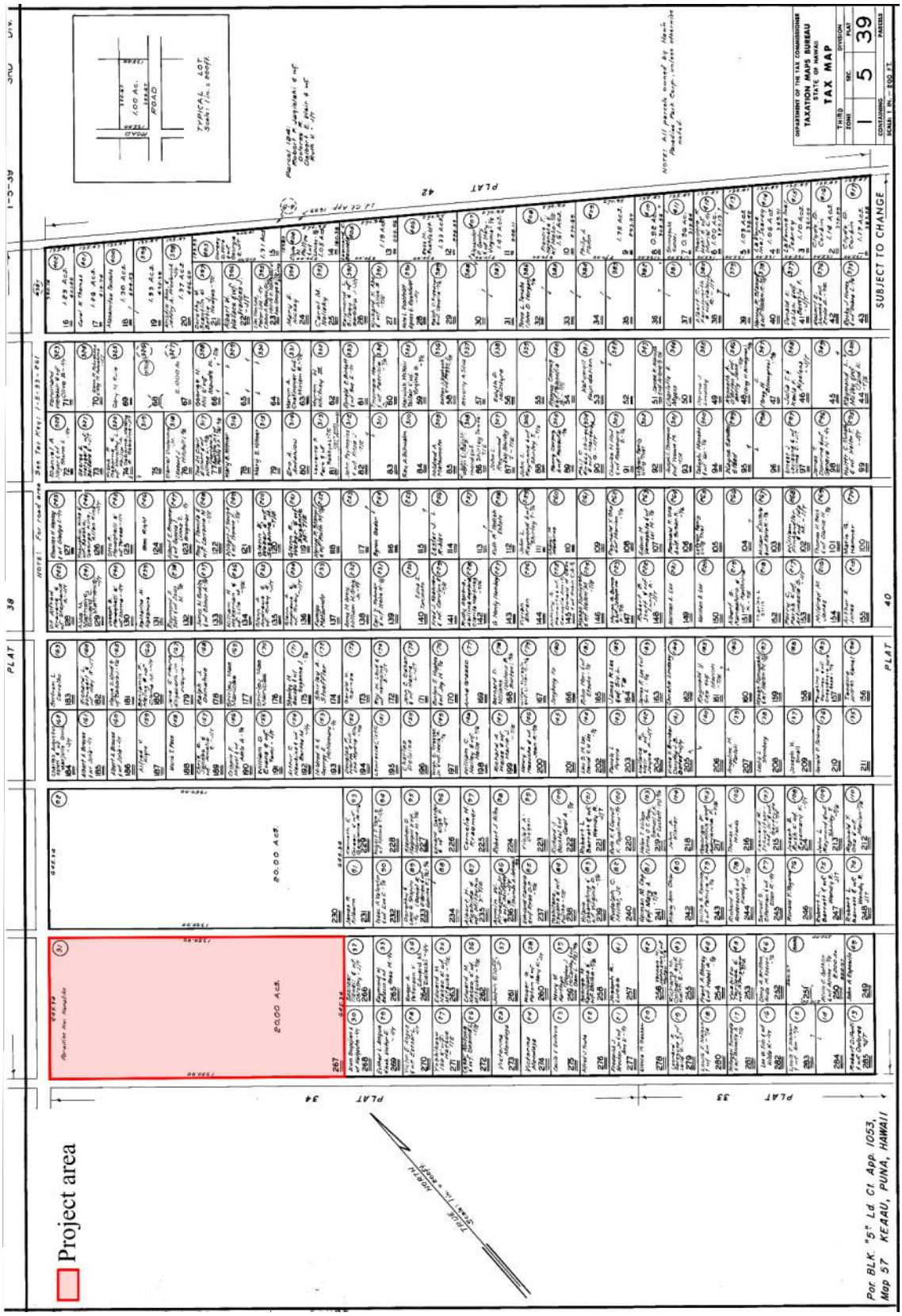


Figure 2. Tax Map (3) 1-5-039 showing project area located within parcel 267.

Figure 3. Google Earth™ satellite image showing project area location.

PROJECT AREA DESCRIPTION

The 20-acre project area is in the Hawaiian Paradise Park residential subdivision in Kea‘au Ahupua‘a, Puna District, Island of Hawai‘i at the corner of Kaloli Drive between 25th Avenue (‘Okika Avenue) and 26th Avenue (‘Olena Avenue; see Figures 1, 2, and 3). Located at elevations ranging from 256 to 292 feet above sea level and a little over 4 miles from Kaloli Point, the project area boundaries are coterminous with the TMK parcel boundaries. It is bound along its *makai* (northeast) edge by 25th Avenue (Okika Avenue; Figure 4), along its *mauka* (southwest) edge by 26th Avenue (Olena Avenue; Figure 5), Kaloli Drive at its northwestern edge (Figure 6), and by privately-owned residential parcels along its southeast edge, specifically TMK parcel 266 which is developed with a single-family residence, and parcel 268 which is currently undeveloped. The subject parcel is accessible via Kaloli Drive and 25th and 26th Avenues (see Figures 4 and 5).

Figure 4. *Makai* (northeastern) boundary of project area (on right) along 25th (‘Okika Avenue), view to the west-northwest.

Figure 5. *Mauka* (southwest) boundary of project area (to the left) along 26th Avenue, view to the east.

Figure 6. Northwestern boundary of project area along Kaloli Drive, view to the northeast.

Geology, Soils, and Vegetation

The project area is situated on lava flows of Puna Basalt that have been radiocarbon dated to c.a. A.D. 1410-1460 (Sherrod et al. 2007). These lavas (labeled Qp4 in Figure 7) consist of a series of shield-stage flows from Kīlauea Volcano that cover a large portion of the Puna District and are often referred to collectively as the ʻAi Lāʻau flows (Allred and Allred 1997). Lava tubes with occasional surface openings are a common feature these flows and several lava tube systems have been mapped beneath the Hawaiian Paradise Park Subdivision, but none beneath the current project area. Soils in the current project area (labeled 653 in Figure 8) are classified as Keaukaha highly decomposed plant material with a two to ten percent slope. This soil typically "consists of very shallow to shallow, well drained soils that formed in a thin mantle of organic material and small amounts of volcanic ash overlaying *pāhoehoe* lava" (Soil Survey Staff 2022). This part of the Puna District typically receives between 118 to 200 inches of rain annually and there are no permanent or intermittent streams in the project area or immediate vicinity.(Giambelluca et al. 2014).

Vegetation in the project area is dominated by thick ground weeds and sporadic canopy trees. Interspersed are thickets of strawberry guava (*Psidium cattleyanum*), glory bush, *(Tibouchina urvilleana*), Guinea grass (*Megathyrsus maximus*), and some young Albizia trees (*Albizia julibrissin*; Figures 9, 10, 11, and 12). A few native species are present such as *ʻōhiʻa lehua* (*Metrosideros polymorpha*) and *uluhe* (*Dicranopteris linearis*), which are found sporadically throughout the project area (Figure 13). Mechanical disturbance created by the construction of the grid-like subdivision roads were observed along all project area boundaries except for its southeast edge. Small semi-cleared driveways were observed in different parts of the project area. These roads appear to be used to access the parcel for illegal dumping including pig carcasses and modern rubbish (Figures 14, 15, and 16). One of these paths also leads to a pig trap located centrally, near the northwest boundary (Figure 17).

Figure 7. Geology underlying the project area.

Figure 8. Soils in the project area.

Figure 9. Typical ground cover and overstory observed in the project area, view to the east.

Figure 10. Strawberry guava thicket observed in project area, view to the northwest.

Figure 11. Typical ground cover and overstory in the project area, view to the south-southwest.

Figure 12. Example of dense Guinea grass in parts of the project area, view to the northeast.

Figure 13. *ʻŌhiʻa lehua* and *uluhe* in project area, view to the east.

Figure 14. Example of illegal dumping within project area, view to the north.

Figure 15. Modern rubbish illegally dumped in the project area, view to the south.

Figure 16. Modern rubbish illegally dumped in the project area, view to the southwest.

Figure 17. Pig trap observed near northwestern boundary (Kaloli Drive), view to the west.

PROPOSED PROJECT DESCRIPTION

Due to rapid population growth in the Puna District, especially in the Hawaiian Paradise Park residential subdivision, the need for a district park in this specific residential area was recognized in the *Puna Community Development Plan* (CDP) (County of Hawaii 2008). Stakeholder meetings involving the Hawaiian Paradise Park Owners Association, the Department of Parks and Recreation Maintenance and Recreation Division, the Department of Planning Long-range Planning Division, and the Department of Parks and Recreation Elderly Assistance Division were conducted between November 7th and November 22nd, 2017. These sessions identified current needs, assessed the park's alignment with the Puna CDP, and examined potential senior activity and program requirements (County of Hawaii 2018). In the subsequent year, public meetings held on January 7th and February 19th, 2018, at the Hawaiian Paradise Park Owners Association Activity Center presented three park development alternatives. The first meeting involved a presentation introducing the alternatives, followed by breakout sessions focusing on each site. Participants provided input on opportunities, issues, constraints, and additional recreational amenities for consideration. The second meeting featured the presentation of the preliminary master plan and a question-and-answer segment.

Through these meetings it was decided that a district park capable of accommodating all ages and physical capabilities was necessary to provide a safe space for recreational opportunities and organized sports. The park plans include a base plan (Figure 18) as well as a base plan + options (Figure 19). These plans are conceptual and may change. The base plan includes a community center, baseball field, a football field, a playground, skatepark, comfort station, and a covered play court, with parking and picnic areas. The base + options model includes all facilities noted in the base plan as well as a pool and pool building, sand volleyball court, dog park, pickle ball and tennis courts. Due to the estimated high costs of the project, it is likely that a park construction phasing plan will be developed.

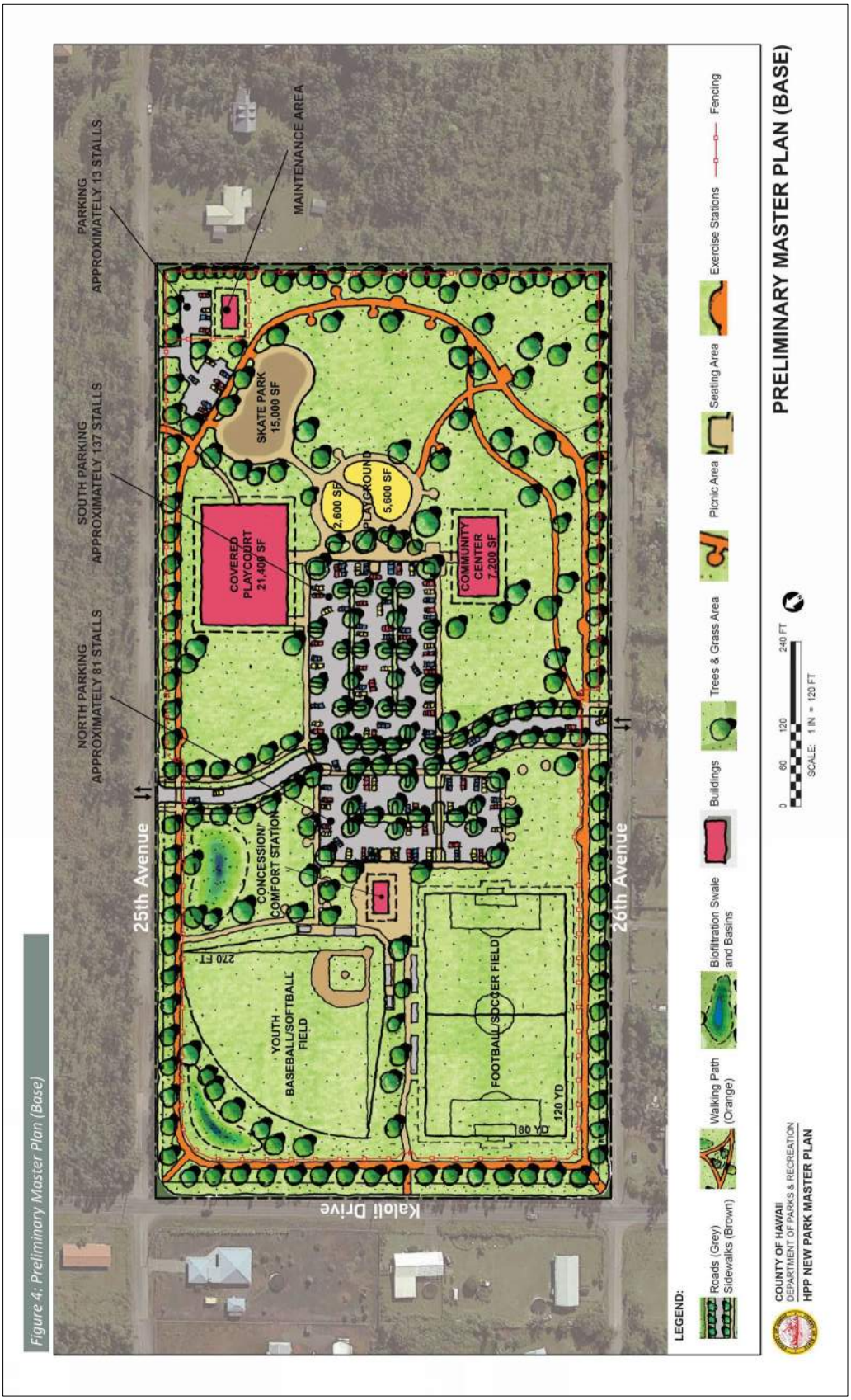


Figure 18. Base master plan.

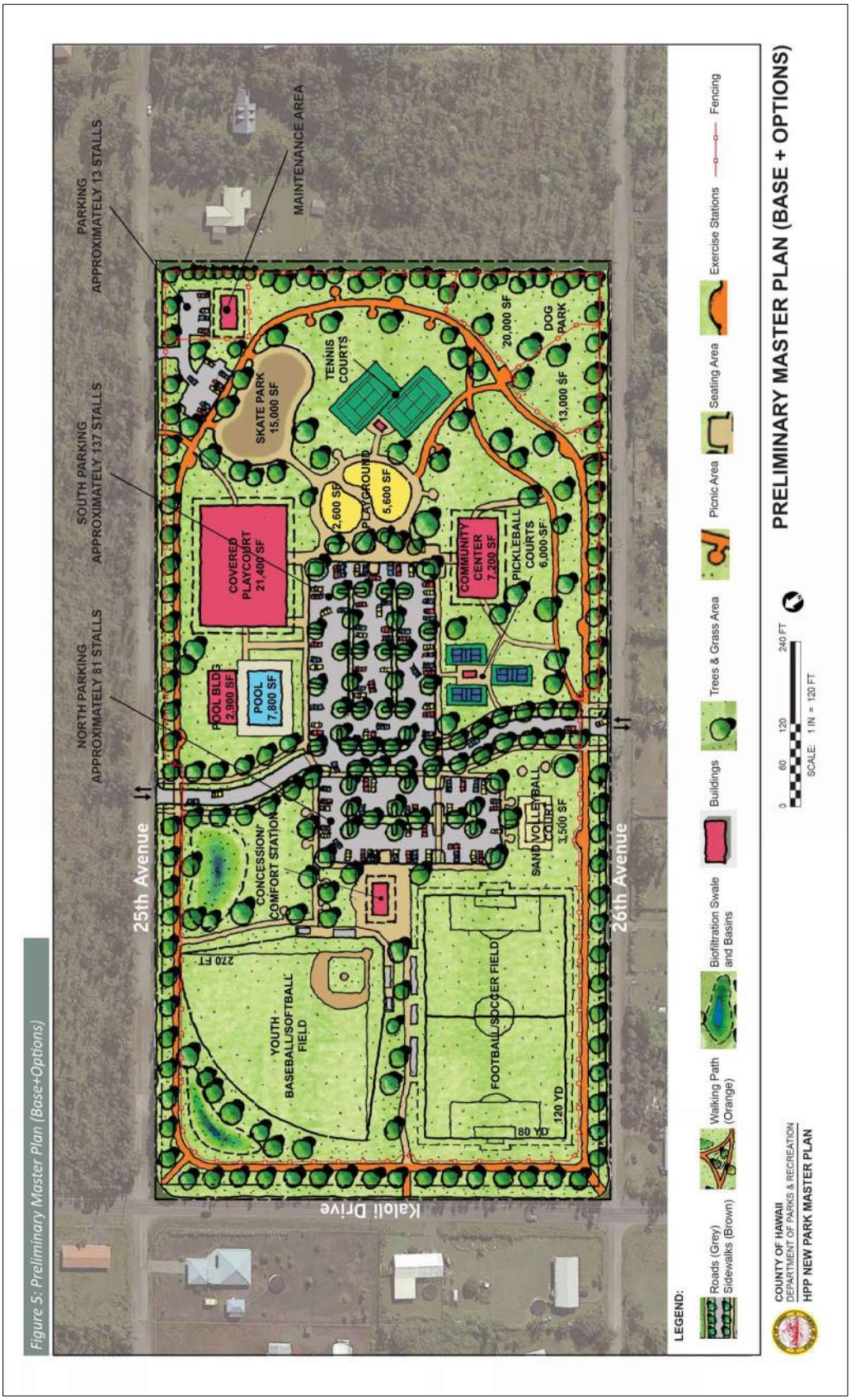


Figure 19. Base + option master plan.

2. BACKGROUND

As specified in the OEQC *Guidelines for Assessing Cultural Impacts* (1997:1), "…the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment." For this CIA, the *ahupua'a* of Kea'au is considered the 'study area', while the location of the proposed development activities is referred to as the 'project area'.

To generate a set of expectations regarding the nature of cultural resources and customary practices that might be encountered within the current project area and to establish a context within which to assess the significance of such resources, this background section begins with a general culture-historical context. This is followed by culture-historical background information concerning the history of Kea'au. Limited background information for Puna, the broader regional designation in which Kea'au is situated, also falls within the parameters of the OEQC guidelines and ensures that a broader set of cultural practices and histories are considered. Following this background section is a discussion of relevant prior archaeological and cultural studies that have been conducted within and in the immediate vicinity of the project area.

RESEARCH METHODS

The culture-historical context and summary of previously conducted archaeological and cultural research presented below are based on research conducted by ASM Affiliates at various physical and digital repositories. Primary English language and Hawaiian language resources were found at multiple state agencies, including the State Historic Preservation Division, Hawai'i State Archives, and the Department of Accounting and General Services Land Survey Division. Digital collections provided through the Office of Hawaiian Affairs Papakilo and Kīpuka databases, Waihona 'Āina, the Ulukau Hawaiian Electronic Library, and Newspapers.com. Lastly, secondary resources curated at ASM Affiliates' Hilo office offer general information regarding the history of land use, politics, and culture change in Hawai'i, enhancing the broad sampling of source materials cited throughout this CIA.

CULTURE-HISTORICAL CONTEXT

While the question of when Hawai'i was first settled by Polynesians remains contested, scholars working in the fields of archaeology, folklore, Hawaiian studies, and linguistics have offered several theories. With advances in palynology and radiocarbon dating techniques, Kirch (2011), Athens et al. (2014), and Wilmshurst et al. (2011) have argued that Polynesians arrived in the Hawaiian Islands sometime between A.D. 1000 and A.D. 1200. This initial migration on intricately crafted *wa'a kaulua* (double-hulled canoes) to Hawai'i from Kahiki, the ancestral homelands of Hawaiian deities and peoples from southern Pacific islands, occurred at least from initial settlement to the 13th century. According to Fornander (1969), Hawaiians brought from their homeland certain Polynesian customs and beliefs: the major gods Kāne, Kū, Lono, and Kanaloa (who have cognates in other Pacific cultures); the *kapu* system of political and religious governance; and the concepts of *pu'uhonua* (places of refuge), *'aumakua* (ancestral deity), and *mana* (divine power). Archaeologist Kenneth Emory who worked in the early to mid-20th century reported that the sources of early Hawaiian populations originated from the southern Marquesas Islands (Emory in Tatar 1982). However, Emory's theory is not universally accepted, as Hawaiian scholars in the past and present have argued for a pluralistic outlook on ancestral Hawaiian origins from Kahiki (Case 2015; Fornander 1916-1917; Kamakau 1866; Kikiloi 2010; Nakaa 1893; Poepoe 1906).

While stories of episodic migrations were widely published in the Hawaiian language by knowledgeable and skilled *kū'auhau* (individuals trained in the discipline of remembering genealogies and associated ancestral stories), the cultural belief that living organisms were *hānau 'ia* (born) out of a time of eternal darkness (*pō*) and chaos (*kahuli*) were brought and adapted by ancestral Hawaiian populations to reflect their deep connection to their environment. As an example, the *Kumulipo*, Hawai'i's most famed *ko'ihonua* (a cosmogonic genealogical chant), establishes a birth-rank genealogical order for all living beings (Beckwith 1951; Liliuokalani 1978). One such genealogical relationship that remains widely accepted in Hawai'i is the belief that *kalo* (taro) plants (in addition to all other plants, land animals, and sea creatures), are elder siblings to humans (Beckwith 1951). This concept of hierarchical creation enforces the belief that all life forms are intimately connected, evidencing the cultural transformations that occurred in the islands through intensive interaction with their local environment to form a uniquely Hawaiian culture.

In Hawai'i's ancient past, inhabitants were primarily engaged in subsistence-level agriculture and fishing (Handy et al. 1991). Following the initial settlement period, communities clustered in the *ko'olau* (windward) shores of the Hawaiian Islands where freshwater was abundant. Sheltered bays allowed for nearshore fisheries (enriched by

numerous estuaries) and deep-sea fisheries to be easily accessed (McEldowney 1979). Widespread environmental modification of the land also occurred as early Hawaiian *kanaka mahi'ai* (farmers) developed new subsistence strategies, adapting their familiar patterns and traditional tools to work efficiently in their new home (Kirch 1985; Pogue 1978). Areas with the richest natural resources became heavily populated over time, resulting in the population's expansion to the *kona* (leeward) side of the islands and to more remote areas (Cordy 2000).

Overview of Traditional Hawaiian Land Management Strategies

Adding to an already complex society was the development of traditional land stewardship systems, including the *ahupua'a.* The *ahupua'a* was the principal land division that functioned for both taxation purposes and furnished its residents with nearly all subsistence and household necessities. *Ahupua'a* are land divisions that typically include multiple ecozones from *mauka* (upland mountainous regions) to *makai* (shore and near-shore regions), assuring a diverse subsistence resource base (Hommon 1986). Although the *ahupua'a* land division typically incorporated all of the eco-zones, their size and shape varied greatly (Cannelora 1974). Noted Hawaiian historian and scholar Samuel Kamakau summarized the ecozones that could be found in a given *ahupua'a*:

> Here are some names for [the zones of] the mountains—the *mauna* or *kuahiwi*. A mountain is called a *kuahiwi*, but *mauna* is the overall term for the whole mountain, and there are many names applied to one, according to its delineations (*'ano*). The part directly in back and in front of the summit proper is called the *kuamauna*, mountaintop; below the *kuamauna* is the *kuahea*, and makai of the *kuahea* is the *kuahiwi* proper. This is where small trees begin to grow; it is the *wao nahele*. Makai of this region the trees are tall, and this is the *wao lipo*. Makai of the *wao lipo* is the *wao 'eiwa*, and makai of that the *wao ma'ukele*. Makai of the *wao ma'ukele* is the *wao akua*, and makai of there is the *wao kanaka*, the area that people cultivate. Makai of the *wao kanaka* is the *'ama'u*, fern belt, and makai of the *'ama'u* the *'apa'a*, grasslands.
>
> A solitary group of trees is a *moku la'au* (a "stand" of trees) or an *ulu la'au*, grove. Thickets that extend to the *kuahiwi* are *ulunahele*, wild growth. An area where *koa* trees suitable for canoes (*koa wa'a*) grow is a *wao koa* and mauka of there is a *wao la'au*, timber land. These are dry forest growths from the *'apa'a* up to the *kuahiwi*. The places that are "spongy" (*naele*) are found in the *wao ma'ukele*, the wet forest.
>
> Makai of the *'apa'a* are the *pahe'e* [*pili* grass] and *'ilima* growths and makai of them the *kula*, open country, and the *'apoho* hollows near to the habitations of men. Then comes the *kahakai*, coast, the *kahaone*, sandy beach, and the *kalawa*, the curve of the seashore—right down to the *'ae kai*, the water's edge.
>
> That is the way *ka po'e kahiko* [the ancient people] named the land from mountain peak to sea. (Kamakau 1976:8-9)

The *maka'āinana* (commoners, literally the "people that attend the land") who lived on the land had rights to gather resources for subsistence and tribute within their *ahupua'a* (Jokiel et al. 2011). As part of these rights, residents were required to supply resources and labor to *ali'i* (chiefs) of local, regional, and island chiefdoms. The *ahupua'a* became the equivalent of a local community with its own social, economic, and political significance and served as the taxable land division during the annual *Makahiki* procession (Kelly 1956). During the time of *Makahiki*, the paramount *ali'i* sent select members of his/her retinue to collect *ho'okupu* (tribute and offerings) in the form of goods from each *ahupua'a*. The *maka'āinana* brought their share of *ho'okupu* to an *ahu* (altar) that was marked with the image of a *pua'a* (pig), serving as a physical visual marker of *ahupua'a* boundaries. In most instances, these boundaries followed mountain ridges, hills, rivers, or ravines (Alexander 1890). However, Chinen (1958:1) reports that "oftentimes only a line of growth of a certain type of tree or grass marked a boundary; and sometimes only a stone determined the corner of a division." These ephemeral markers, as well as their more permanent counterparts, were oftentimes named as evidenced in the thousands of boundary markers names that are listed in Soehren (2005).

Ahupua'a were ruled by *ali'i 'ai ahupua'a* or chiefs who controlled the *ahupua'a* resources. Generally speaking, *ali'i 'ai ahupua'a* had complete autonomy over the *ahupua'a* they oversaw (Malo 1951). *Ahupua'a* residents were not bound to the land nor were they considered property of the *ali'i*. If the living conditions under a particular *ahupua'a* chief were deemed unsuitable, the residents could move freely in pursuit of more favorable conditions (Lam 1985). This structure safeguarded the well-being of the people and the overall productivity of the land, lest the chief loses the principal support and loyalty of his or her supporters. In turn, *ahupua'a* lands were managed by an appointed *konohiki*, oftentimes a chief of lower rank, who oversaw and coordinated stewardship of an area's natural resources (Lam 1985). In some places, the *po'o lawai'a* (head fisherman) held the same responsibilities as the *konohiki* (Jokiel et al. 2011).

When necessary, the *konohiki* took the liberty of implementing *kapu* (restrictions and prohibitions) to protect the *mana* of an area's resources from environmental and spiritual depletion.

Many *ahupua'a* were divided into smaller land units termed *'ili* and *'ili kūpono* (often shortened to *'ili kū*). *'Ili* were created for the convenience of the *ahupua'a* chief and served as the basic land unit which *hoa'āina* (caretakers of particular lands) often retained for multiple generations (Jokiel et al. 2011; MacKenzie 2015). As *'ili* were typically passed down in families, so too were the *kuleana* (responsibilities, privileges) that were associated with it. The right to use and cultivate *'ili* was maintained within the *'ohana*, regardless of the succession of *ali'i 'ai ahupua'a* (Handy et al. 1991). Malo (1951) recorded several types of *'ili*, including the *'ili pa'a* (a single intact parcel) and *'ili lele* (a discontinuous parcel dispersed across an area). Whether dispersed or wholly intact, *'ili* required a cross-section of available resources, and for the *hoa'āina*, this generally included access to agriculturally fertile lands and coastal fisheries. *'Ili kūpono* differed from other *'ili* lands because they did not fall under the jurisdiction of the *ahupua'a* chief. Rather, they were specific areas containing resources that were highly valued by the ruling paramount chiefs, such as fishponds (Handy et al. 1991).

Ali'i 'ai ahupua'a, in turn, answered to an *ali'i 'ai moku* (chief who claimed the abundance of the entire *moku or* district) (Malo 1951). Hawai'i Island is comprised of six *moku* (districts) that include Kona, Ka'ū, Puna, Hilo, Hāmākua, and Kohala. Although a *moku* comprises multiple *ahupua'a*, *moku* were considered geographical subdivisions with no explicit reference to rights in the land (Cannelora 1974). While the *ahupua'a* was the most common and fundamental land division unit within the traditional Hawaiian land management structure, variances occurred, such as the existence of the *kalana*. By definition, a *kalana* is a division of land that is smaller than a *moku. Kalana* was sometimes used interchangeably with the term *'okana* (Lucas 1995; Pukui and Elbert 1986), but Kamakau (Kamakau 1976) equates a *kalana* to a *moku* and states that *'okana* is merely a subdistrict. Despite these contending and sometimes conflicting definitions, what is clear is that *kalana* consisted of several *ahupua'a* and *'ili 'āina*.

This form of district subdividing was integral to Hawaiian life and the product of advanced natural resource management systems. As populations resided in an area over centuries, direct teaching and extensive observations of an area's natural cycles and resources were retained, well-understood, and passed down orally over the generations. This knowledge informed management decisions that aimed to sustainably adapt subsistence practices to meet the needs of growing populations. The *ahupua'a* system and the highly complex land management system that developed in the islands are but one example of the unique Hawaiian culture that developed in these islands.

Intensification and Development of Hawaiian Land Stewardship Practices

Hawaiian philosophies of life in relation to the environment helped to maintain both natural, spiritual, and social order. In describing the intimate relationship that exists between Hawaiians and *'āina* (land), Kepā Maly writes:

> In the Hawaiian context, these values—the "sense of place"—have developed over hundreds of generations of evolving "cultural attachment" to the natural, physical, and spiritual environments. In any culturally sensitive discussion on land use in Hawai'i, one must understand that Hawaiian culture evolved in close partnership with its' natural environment. Thus, Hawaiian culture does not have a clear dividing line of where culture and nature begins.
>
> In a traditional Hawaiian context, nature and culture are one in the same, there is no division between the two. The wealth and limitations of the land and ocean resources gave birth to, and shaped the Hawaiian world view. The *'āina* (land), *wai* (water), *kai* (ocean), and *lewa* (sky) were the foundation of life and the source of the spiritual relationship between people and their environs. (Maly 2001)

The *'ōlelo no'eau* (proverbial saying) "*hānau ka 'āina, hānau ke ali'i, hānau ke kanaka*" (born was the land, born were the chiefs, born were the commoners), conveys the belief that all things of the land, including *kanaka* (humans), are connected through kinship links that extend beyond the immediate family (Pukui 1983:57). *'Āina* or land, was perhaps most revered, as noted in the *'ōlelo no'eau* "*he ali'i ka 'āina; he kauwā ke kanaka,*" which Pukui (Pukui 1983:62) translated as "[t]he land is a chief; man is its servant." The lifeways of early Hawaiians, which were dependent entirely from the finite natural resources of these islands, necessitated the development of sustainable resource management practices. Over time, what developed was an ecologically responsive management system that integrated the care of watersheds, natural freshwater systems, and nearshore fisheries (Jokiel et al. 2011).

Disciplined and astute observation of the natural world became one of the most fundamental stewardship tools used by the ancient Hawaiians. The vast knowledge acquired through direct observation enabled them to detect and record the subtlest of changes, distinctions, and correlations in the natural world. Examples of their keen observations are evident in the development of Hawaiian nomenclature to describe various rains, clouds, winds, stones, environments, flora, and fauna. Many of these names are geographically unique or island-specific, and have been

recorded in *oli* (chants), *mele* (songs), *pule* (prayers), *inoa ʻāina* (place names), and *ʻōlelo noʻeau* (proverbial sayings). Other Hawaiian arts and practices such as *hula* (traditional dance), *lapaʻau* (traditional healing), *lawaiʻa* (fishing), *mahiʻai* (farming) further aided in the practice of knowing the rhythms and cycles of the natural world. Comprehensive systems of observing and stewarding the land were coupled by the strict adherence to practices that maintained and enhanced the *kapu* and *mana* of all things in the Hawaiian world. In Hawaiian belief, all things natural, places, and even people, especially those of high rank, possessed *mana* or "divine power" (Pukui and Elbert 1986:235; Pukui et al. 1972). *Mana* was believed to be derived from the plethora of Hawaiian gods (*kini akua*) who were embodied in elemental forces, land, natural resources, and certain material objects and persons (Crabbe et al. 2017). Buck (1993) expanded on this concept noting that *mana* was associated with "the well-being of a community, in human knowledge and skills (canoe building, harvesting) and in nature (crop fertility, weather etc.)" (c.f. Else 2004:244).

To ensure the *mana* of certain resources, places, and people, *kapu* of various kinds were implemented and strictly enforced to limit over-exploitation and defilement. Elbert and Pukui (1986:132) defined *kapu* as "taboo, prohibitions; special privilege or exemption." Kepelino noted that *kapu* associated with *akua* (deities) applied to all social classes, while *kapu* associated with *aliʻi* were applied to the people (in Beckwith 1971). As *kapu* dictated social relationships, they also provided "environmental rules and controls that were essential for a subsistence economy" (Else 2004:246). The companion to *kapu* was *noa*, translated as "freed of taboo, released from restrictions, profane, freedom" (Pukui and Elbert 1986:268). Some *kapu*, particularly those associated with maintaining social hierarchy and gender differentiation were unremitting, while those *kapu* placed on natural resources were applied and enforced according to seasonal changes. The application of *kapu* to natural resources ensured that such resources remained available for future use. When the *aliʻi* or the lesser chiefs (including *konohiki* and *poʻo lawaiʻa*) determined that a particular resource was to be made available to the people, a decree was proclaimed indicating that *kapu* had been lifted, thereby making it *noa*. Although transitioning a resource from a state of *kapu* to *noa* allowed for its use, people were expected to practice sustainable harvesting methods and pay tribute to the paramount chief and the *akua* associated with that resource. *Kapu* were strictly enforced and violators faced serious consequences including death (Jokiel et al. 2011). Violators who escaped execution sought refuge at a *puʻuhonua*, a designated place of refuge or an individual who could pardon the accused (Kamakau 1992). After completing the proper rituals, the violator was absolved of his or her crime and allowed to reintegrate back into society.

In summary, the layering and interweaving of beliefs, land stewardship practices, and the socio-political system forms the basis of the relationship shared between the Hawaiian people and the land. It is through the analysis of these dynamic elements that we develop an understanding of the complexity of place.

CULTURE HISTORY OF KEAʻAU AHUPUAʻA

The *ahupuaʻa* of Keaʻau (Figure 20) is one of roughly sixty-two traditional *ahupuaʻa* that make up the *moku* (district) of Puna situated on the eastern shores of Hawaiʻi Island (Soehren 2005). Keaʻau is bound on the north by Waiākea and ʻŌlaʻa Ahupuaʻa. Along its southern boundary, Keaʻau is bound (from east to west) by Waikahekahenui, Waikahekaheiki, and Kahauale'a Ahupuaʻa until it reaches Kīlauea where it is cut off at its western end by Keauhou Ahupuaʻa. The Hawaiian proverb "Puna, mai ʻOkiʻokiaho a Māwae" describes the extent of the district spanning from ʻOkiʻokiaho the southern boundary, to Māwae, a fissure on the northern boundary. In the book, *Native Planters in Old Hawaii*, Handy et al. (1991) describe Puna as an agriculturally fertile land that has repeatedly been devastated by lava flows. Writing during the 1930s, they relate that:

> The land division named Puna—one of the six chiefdoms of the island of Hawaii said to have been cut (*ʻoki*) by the son and successor of the island's first unifier, Umi-a-Liloa—lies between Hilo to the north and Kaʻu to the south, and it projects sharply to the east as a great promontory into the Pacific. Kapoho is its most easterly point, at Cape Kumukahi. The uplands of Puna extend back toward the great central heights of Mauna Loa, and in the past its lands have been built, and devastated, and built again by that mountain's fires. In the long intervals, vegetation took hold, beginning with miniscule mosses and lichens, then ferns and hardier shrubs, until the uplands became green and forested and good earth and humus covered much of the lava-strewn terrain, making interior Puna a place of great beauty…(Handy et al. 1991:539)

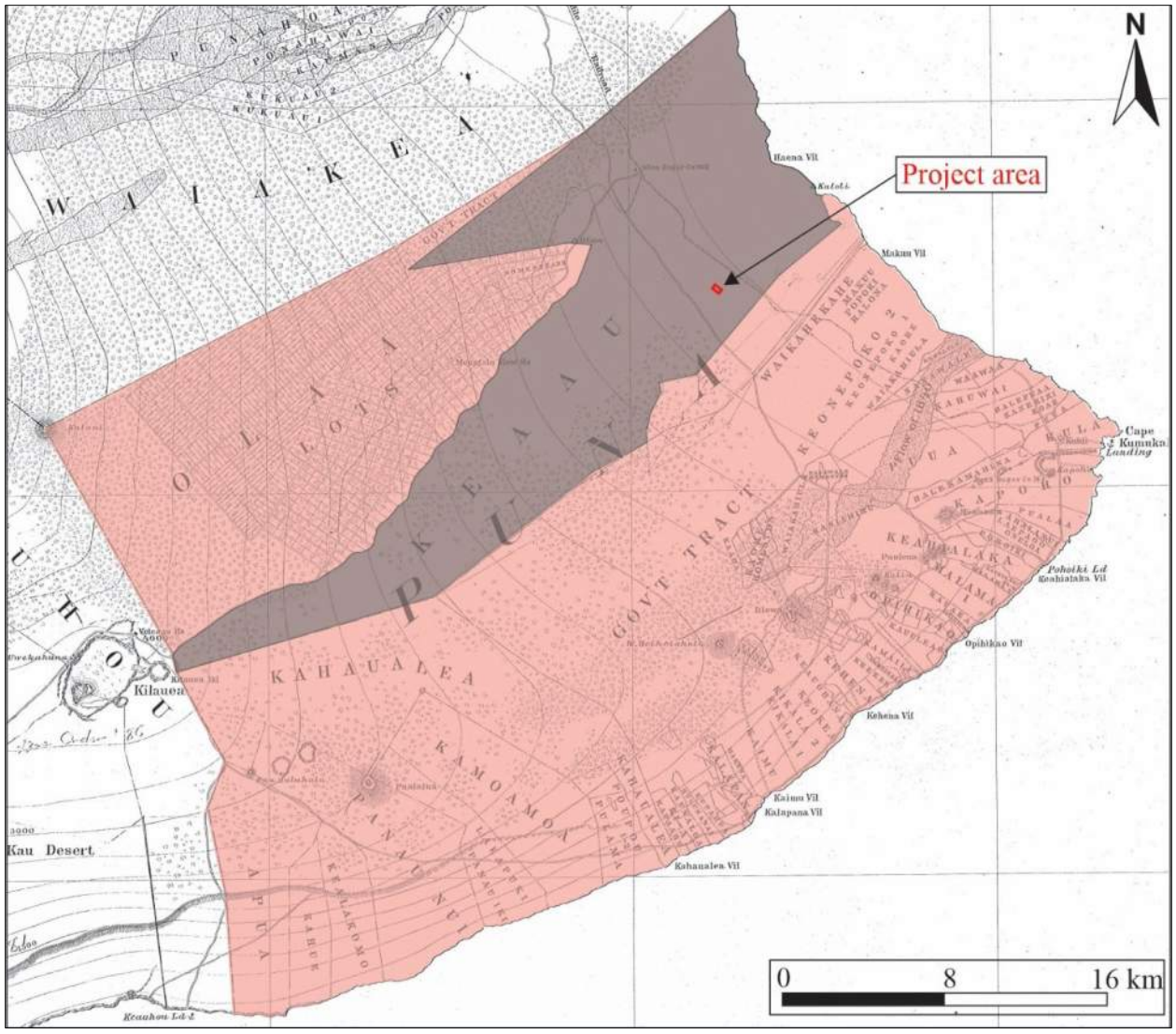


Figure 20. Portion of Hawai‘i Registered Map No. 2060 (Donn 1901) showing Kea‘au Ahupua‘a (shaded gray) within the *moku* of Puna (shaded pink).

As the easternmost district in the Hawaiian archipelago, Puna is the district most closely associated with the rising sun, and as Hawaiian scholar, Kekuewa Kikiloi (2010:89) explained, “the rising of the sun in the east symbolically represents the opening stages, birth, and a new beginning of life.” Because of its geographical placement and the presence of certain elemental forces, Puna is closely associated with the regenerative powers of the *akua* (deity, god) Kāne and the destructive and creative forces of the *akua* Pelehonuamea (Pele). While Pele’s presence in the form of molten lava or expanses of hardened black lava fields is most evident on the land today, the ancient *mo‘olelo* (accounts, stories, history) of Puna tell a different story as it honors the district’s connection to the sun and describes its once lush and verdant landscape, both of which are associated with Kāne.

It is imperative to note that the countless *mo‘olelo* telling of Puna’s association with Kāne, Pele, and other deities are not merely fragments of an ancient and fanciful tale. Rather these *mo‘olelo*, as handed down over the generations, are important mnemonic devices that tell us of the complex interactions in the natural world, as they were understood by the indigenous inhabitants of this land. In Puna, these interactions play out daily as part of a living and ever-changing landscape. These *mo‘olelo* convey the beliefs and practices that Hawaiians developed in response to co-living in this dynamic landscape we know today as Puna.

Kāne and Pelehonuamea

Due to its location in the east and its association with the rising sun, the Puna District is synonymous with the *akua* (god, deity) Kāne. The sun is regarded as a manifestation of Kāne and his domain extended over the east where the sun rises (Kanahele 2011; McGregor 2007). Maly (1998:13) noted that "the god Kāne in his attributes as giver of light and life, plays an important role as healer, and many native customs and practices of healing are associated with the sun rising from the east in Puna." In addition to his affiliation with the sun, Kāne also manifested as freshwater resources, both surface and subsurface waters, and is precisely the resource from which the Puna District—*puna* translated as "spring"—derives its name (McGregor 2007; Pukui and Elbert 1986). Kāne's association with Puna is interwoven with the *mo'olelo* of the Pele clan. According to McGregor (2007:145), it is "believed that the waters of the Puna District are sacred to Kāne and that the steam generated by the heat of Pelehonuamea [Pele] is sacred to her." In some Puna traditions, Kāne in his fiery hot sun form (Kānehoalani) is said to have guided the migration of the Pele clan from the islands in the west to the east landing in Puna where Pele established her residence (Kanahele 2011). Kanahele (2011:49) added that "Kānehoalani, the sun, is the purest and ultimate form of the volcano" and the "sun is the source of her [Pele's] persona." Writing about the Puna District during the 1930s, Handy et al. (1991:542) shared:

> One of the most interesting things about Puna is that Hawaiians believe, and their traditions imply that this was once Hawaii's richest agricultural region and that it is only in relatively recent time that volcanic eruption has destroyed much of its best land. Unquestionably lava flows in historic times have covered more good gardening land here than in any other district. But the present desolation was largely brought about by the gradual abandonment of their country by Hawaiians after sugar and ranching came in…

Handy's sentiments may have been inspired by the traditional stories that imply that prior to Pele's arrival in Puna, the district was closely associated with Kāne. This belief is conveyed in several of Puna's *'ōlelo no'eau* one of which states "*'Aina i ka houpo o Kāne*," translated as "land on the bosom of Kāne" (Pukui 1983:11). Similar sentiments are found in another *'ōlelo no'eau*, "*Ke one lau'ena a Kāne*," translated as "the rich, fertile land of Kāne" (Pukui 1983:190)." Pukui (1983:190) explained that before Pele, Puna "was said to have been a beautiful, fertile land loved by the god Kāne." With Pele's arrival and subsequent settlement, the district was transformed "into a land of lava beds, cinder, and rock" (Pukui 1983:190). Geological changes brought about to the Puna District by Pele are well documented in Hawaiian historical genres and literature. It is believed that these accounts reflect the geological changes of Kīlauea, with Pele representing geologic instability and Kāne representing a state of volcanic inactivity and quietness (Maly 1998).

Kalākaua (1888) indicates that active worship of Pele was ongoing since at least the 12th century and that the abolition of the traditional *kapu* system in 1820 had little to no effect on this practice, which remains ongoing. In addition to being revered as a goddess, Pele was also worshipped as an *'aumakua* (family/personal god) by her descendants. According to Nimmo (1990:43), "most Hawaiians living in the volcano areas of Hawai'i, the districts of Ka'ū, Puna, and Kona, at the time of European contact traced their ancestry to Pele". Pele is frequently and comprehensively referenced in historical and mythological literature, and traditional tales of Pele's migration to Hawai'i from Kahiki are many and varied. Several versions of the Pele migration legend exist. According to one version of the migration legend, Pele, the daughter of Haumea and Moemoe-a-alii, was tempted by the urge to travel. Nestling her favorite sister who was born in the shape of an egg, Hi'iaka-i-ka-poli-o-Pele, safely under her bosom, Pele traveled to the Hawaiian Islands with the aid from her brothers Pu-ahiuhiu (whirlwind), Ke-au-lawe/Ke-au-miki (tide), and Ke-au-kā (current). She landed on the island of Kaua'i and became enamored with a young chief named Lohi'au. She then continued her journey through the islands to secure a location where she could dig a home for herself and her new lover (Beckwith 1970). Beckwith (1970:172-173) presented the following *mele* (song) that recounts the migration of Pele and her family from their homeland, Polapola to Hawai'i:

No Kahiki mai ka wahine o Pele	The woman Pele comes from Kahiki,
Mai ka aina mai o Polapola	From the land of Polapola,
Mai ka punohu a Kane mai ke ao lapa i ka lani	From the ascending mist of Kane, from the clouds that move in the sky
Mai ka opua lapa i Kahiki	From the pointed clouds born at Kahiki.
Lapa ku i Hawai'i ka wahine o Pele	The woman Pele was restless for Hawai'i.
Kalai i ka wa'a o Honua-ia-kea	'Fashion the canoe Honua-ia-kea,
Ko wa'a, e Kamohoali'i, hoa mai ka moku	As a canoe, O Kamohoali'i, for venturing to the island.'
Ua pa'a, ua oki, ka wa'a o ke 'kua	

Ka waʻa o kalai Honua-mea o- holo	Completed, equipped, is the canoe of the gods,
Mai ke au hele aʻe, ua aʻe ka lani	The canoe for (Pele)-of-the-sacred-earth to sail in.
A i puni mai ka moku, a e aʻe kini	From the straight course the heavenly one turned
o ke ʻkua	And went around the island, and the multitude
Iawai ka hope, ka uli o ka waʻa?	of the gods stepped ashore.
I na hoaliʻi a Pele a e hue, e	ʻWho were behind at the stern of the canoe?ʼ
Me la hune ka la, kela hoʻonoho kau hoe	ʻThe household of Pele and her company,
O luna o ka waʻa, o Ku ma laua o Lono	Those who bail, those who work the paddles,
Holo i honua aina, kau aku	On the canoe were Ku and Lono.ʼ
I hoʻolewa ka moku, aʻe aʻe Hiʻiaka naʻi au ke ʻkua	It came to land, rested there,
Hele aʻe a komo I ka hale o Pele	The island rose before them, Hiʻiaka stepped ashore seeking for increase of divinity,
Huahuaʻi Kahiki lapa uila	Went and came to the house of Pele.
Uila Pele e huaʻi e	The gods of Kahiki burst into lightning flame with roar and tumult,
Huaʻina hoi e	Lightning flames gushed forth,
	Burst forth with a roar.

Kalākaua (1972:140) places the arrival of Pele and Hiʻiaka during the reign of Kamiole, or more specifically, in approximately A.D. 1175, and noted that "every tradition refers to them as deities at the time of their arrival at Hawaiʻi." When Pele arrived on the shores of Hawaiʻi, she discovered a fire god by the name of ʻAi Laʻau already had jurisdiction over the island. Westervelt (1916:3) related the following narrative which tells of how Pele managed to scare ʻAi Laʻau out of Puna and establish Kīlauea as her home:

> When Pele came to the island Hawaiʻi, she first stopped at a place called Ke-ahi-a-laka in the district of Puna. From this place she began her inland journey towards the mountains. As she passed on her way there grew within her an intense desire to go at once and see Ai-laau, the god to whom Kilauea belonged, and find a resting-place with him as the end of her journey. She came up, but Ai-laau was not in his house. Of a truth he had made himself thoroughly lost. He had vanished because he knew that this one coming toward him was Pele. He had seen her toiling down by the sea at Ke-ahi-a-laka. Trembling dread and heavy fear overpowered him. He ran away and was entirely lost. When Pele came to that pit she laid out the plan for her abiding home, beginning at once to dig up the foundations. She dug day and night and found that this place fulfilled all her desires. Therefore, she fastened herself tight to Hawaiʻi for all time.

According to Kalākaua (1972:139), Pele's "favorite residence was the vast and ever-seething crater of Kīlauea, beneath whose molten flood, in halls of burning adamant and grottoes of fire, she consumed the offerings of her worshippers and devised destruction to those who long neglected her or failed to respect her prerogatives". Hoʻoulumāhiehie (2006a), who penned a version of the epic tale of Pele's younger sister, Hiʻiakaikapoliopele indicates that on her way to Kīlauea, Pele carved out Malama, a crater inland of her landing place at Keahialaka in Puna. Pele was dissatisfied with this crater and proceeded to feverishly excavate two more craters, Puʻulena and Poho-iki, both of which she was also displeased with and abandoned as she continued her pursuit for a suitable home which she found at Halemaʻumaʻu. However ancient such legends describing Pele's arrival and settlement in Puna are, her presence persists today, and the old Puna families continue to respect and honor her role as the earthly creator.

Settlement of the Puna District: An Archaeological and Cultural Perspective

Due to the volcanic activity emanating from what geologists have termed the Kīlauea East Rift Zone and the scant nature of archeological studies conducted throughout the district, archaeological evidence demonstrating long-term occupation is limited or has been impacted by various historical lava flows (Burtchard and Moblo 1994). To this end, understanding Puna's Precontact settlement pattern is often based on historical descriptions (i.e. Coan 1882; Ellis 1827) and predictive models that consider the relative density of archaeological remains against general Precontact patterns to establish settlements in environmental settings that maximize access to critical resources (Burtchard and Moblo 1994). Considering these factors, it is believed that the first settlers of Puna established themselves along the shoreline where there was access to marine resources, inland agriculturally fertile areas, and where shoreline freshwater springs were readily available. Drawing upon historical description, McEldowney (1979) developed a

Historic Period land-use model for Hilo and Puna. Using her model, the project area falls within what she dubbed "Zone II Upland Agricultural Zone" (Figure 21) which she described thusly:

> Although estimates as to the extent of this zone vary in early journal accounts, most confirm the presence of unwooded grasslands or a "plain" behind Hilo and in a band from Kea'au to roughly Mountain View, basically corresponding to the distribution of ash soils…Scattered huts, emphasized by adjacent garden plots and small groves of economically beneficial tree species, dotted this expanse up to 1,500 ft elevation (i.e. the edge of the forest)…Within this zone, the possibilities of remnant agricultural complexes could be high on both ash and older aa or pahoehoe substrates that have not been disrupted by historic agricultural practices. (McEldowney 1979:18-19)

While McEldowney's (1979) zones of early Historic land use are largely shaped by early historical accounts and loosely determined by topographic elevations, they also consider environmental variables and human resource needs, offering insight into the prehistoric past (Burtchard and Moblo 1994). In their refinement of the model as it applies to Puna, Burtchard and Moblo elaborate on McEldowney's Zone II which they identified as Windward Inland Terrain subzone:

> The inland portion of the [Upland Agricultural Zone] includes low to moderate elevation landforms (circa 200 to 700 ft) extending to approximately five miles inland from the coast. Because of relatively easy access and reliable rainfall, this zone is expected to have been linked to the coast, providing agricultural support throughout the prehistoric period. Land-use intensity should have increased as volcanic destruction of arable ground and/or late prehistoric population demands increased pressure to exploit agricultural land. Agricultural feature density should be moderate and decrease with distance to the coast. (Burtchard and Moblo 1994:26)

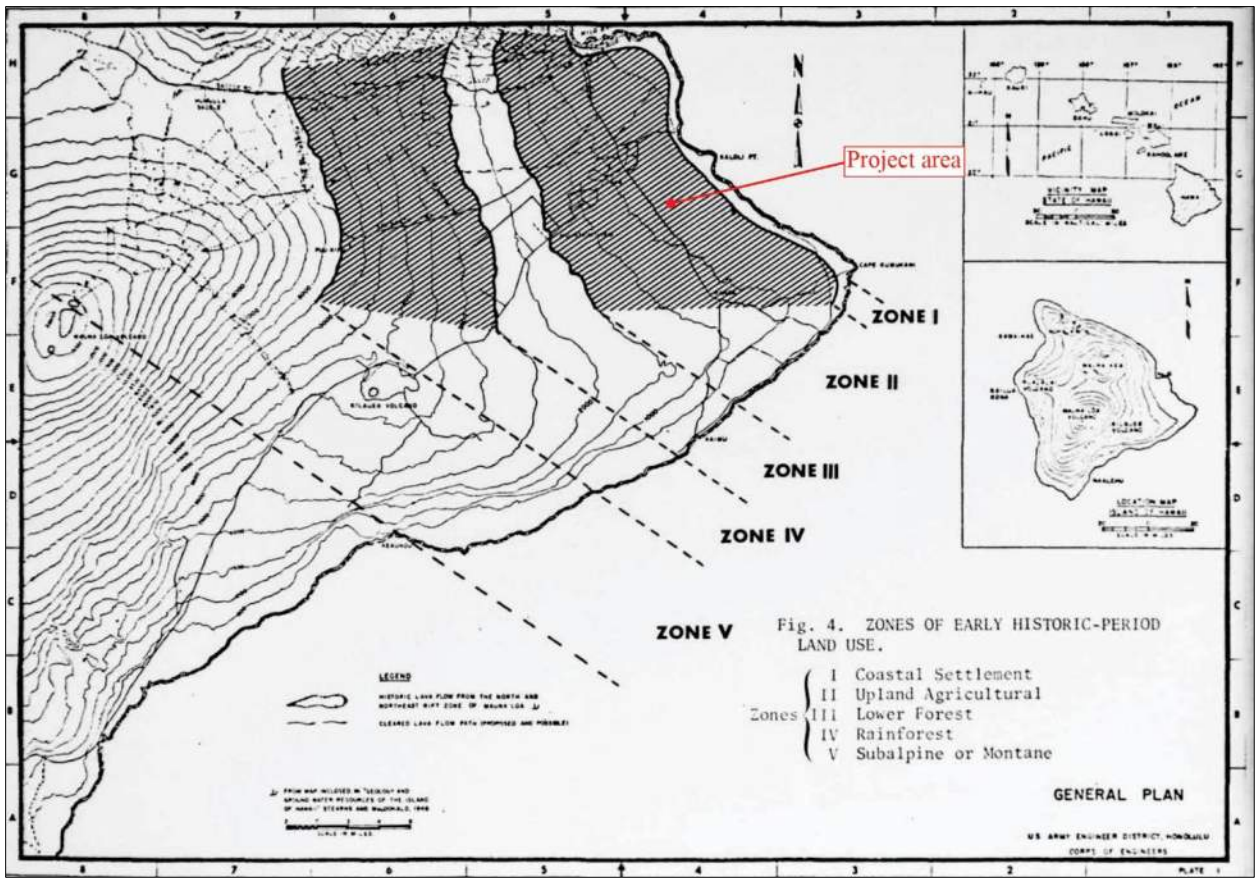


Figure 21. Land use map showing study area within Zone II, Upland Agricultural Zone (McEldowney 1979:64).

Burtchard and Moblo (1994) concluded that within Puna, the most intensively utilized areas during the Precontact and Early Historic Periods were likely directed toward the coast and clustered around embayments where access to marine resources and agricultural areas could better support aggregated populations. Due to more reliable precipitation patterns, the coastal settlement clusters were likely concentrated in the district's windward coast between "…Kaimū,

around Kumukahi towards Hilo Bay" (Burtchard and Moblo 1994:28). During the early expansion period, people probably began utilizing the agricultural resources of upland Puna (Burtchard and Moblo 1994). As coastal populations increased, the need for food caused people to seek arable land at higher elevations. This trend of increasing population along desirable coastal locations and the expansion into upland regions to support the coastal populations would have continued throughout prehistory, slowly populating more marginal areas of the Puna District. As population density increased through A.D.1600-1700s, so would political competition. This competition, undoubtedly, produced conflict, which led to political exiles and further expansion into upland areas as these refugees sought asylum in more remote places and hidden lava tubes (Burtchard and Moblo 1994).

While archaeological evidence provides some understanding of the district's settlement, ethnographic research emphasizes a long-standing connection between the *ʻohana* (families) from Puna and the adjacent district of Kaʻū. Pukui explained that the families from Puna and Kaʻū shared a close relationship as expressed in the *ʻōlelo noʻeau* "*Hilinaʻi Puna, kālele ia Kaʻū*" literally translated as "Puna leans and reclines on Kaʻū" (Pukui 1983:107). Pukui (1983:107) added that this saying was:

> Said of one who leans or depends on another. The ancestors of these two districts were originally of one extended family. The time came when those of each district decided to have a name of their own, without breaking the link entirely. Those in Kaʻū referred to themselves as the Mākaha and those in Puna as the Kumākaha. These names are mentioned in the chants of the chiefs of Kaʻū.

Another *ʻōlelo noʻeau* recorded by Pukui conveying a similar belief reads, "*Hilinaʻi Puna kālele ia Kaʻū, hilinaʻi Kaʻū kālele ia Puna*" translated as "Puna trust and leans on Kaʻū, Kaʻū trusts and leans on Puna" which means "the people of Puna and Kaʻū are related" (Pukui 1983:107). Pukui attributes the ancestor named ʻĪ as one of the progenitors of the Puna-Kaʻū extended family. The proverb, "*Ka hālau a ʻĪ*" translated as "the house of ʻĪ" describes the spreading of this family throughout Hāmākua, Hilo, Puna, and Kaʻū (Pukui 1983:141).

Celebrated Landscape and Agricultural Practices of the Puna District

Celebrated for its lush vegetation, Puna is most famous for its expansive *hala* (pandanus) groves that fringe the district's coastal and *kula* (open plain) regions. Because of the abundance of *hala*, the natives of Puna learned to utilize nearly all parts of the plant. As indicated by Handy (1940:194), Puna's vast *hala* groves are honored in the *ʻōlelo kaulana* (famed saying) "*Puna paia ala i ka hala*" (Puna hedged with fragrant *hala*). Pukui (1983:301) added that "in the olden days the people would stick the bracts of *hala* into the thatching of their houses to bring some of the fragrance indoors." The presence of Puna's sweet-smelling *hala* groves is prevalent throughout written historic literature and oral traditions. The *ʻōlelo noʻeau* "*Ka makani haliʻala o Puna*" boast of the fragrance-bearing winds of Puna scented with *maile* (*Alyxia spp.*), *ʻōhiʻa lehua* (*Metrosideros polymorpha*), and *hala* (Pukui 1983:158). Pukui (1983:158) explained that "it was said that when the wind blew from the land, fishermen at sea could smell the fragrance of these leaves and flowers." Another *ʻōlelo noʻeau* concerning Keaʻau's *hala* groves reads "*Ka ua kāhiko hala o Keaʻau*," which Pukui (1983:168) translated as "the rain that adorns the pandanus trees of Keaʻau." A wealth of traditional accounts for this district can be found in the legend of the volcanic goddess, Pele, and her younger sister Hiʻiakaikapoliopele. The following *mele*, *Ke Haʻa Lā Puna i ka Makani*, accompanied the very first recorded *mele hula* of the Pele and Hiʻiaka saga which references Keaʻau, its famed *hala* groves and identifies Hāʻena, an *ʻili* in Keaʻau as the birthplace of *hula* (Kanahele 1992:110-111):

Ke haʻa lā Puna i ka makani	Puna is dancing in the breeze
Haʻa ka ulu hala i Keaʻau	The hala groves at Keaʻau dance
Haʻa Hāʻena me Hōpoe	Hāʻena and Hōpoe dance
Haʻa ka wahine	The woman dances
ʻAmi (ʻoni) i kai o Nānāhuki	[She] dances at the sea of Nānāhuki
Hula leʻa wale	Dancing is delightfully pleasing
I kai o Nānāhuki	At the sea of Nānāhuki
ʻO Puna kai kūwā i ka hala	The voice of Puna resounds
Pae i ka leo o ke kai	The voice of the sea is carried
Ke lū lā i nā pua lehua	While the lehua blossoms are being scattered
Nānā i kai o Hōpoe	Look towards the sea of Hōpoe
Ka wahine ʻami i kai o Nānāhuki	The dancing woman is below, towards Nānāhuki
Hula leʻa wale	Dancing is delightfully pleasing
I kai o Nānāhuki	At the sea of Nānāhuki

While exalted for its glorious fragrance, the pandanus tree (*pū hala,* or *hala*) (Figure 22) was exploited for more utilitarian purposes. The dried leaves were often used to plait *lauhala* mats, which was thatched onto house rafters (a method typically employed in Puna and the neighboring district of Hilo in the absence of *pili* grass) and house walls, pillows, fans, floor coverings, canoe sails, baskets, and occasionally as clothing (Handy 1940; Handy et al. 1991; Summers 1999). William T. Brigham, former Director of the Bernice Pauahi Bishop Museum, described seeing the natives of Puna weaving the mats for which the district was famous:

> Puna was a famous region for hala mats, and in 1864, the author, when journeying through the district with that noble missionary the Reverend Titus Coan, saw many a party in the curious open caves (caused by a breakdown of the lava crust in some of the many streams of lava, ancient and recent, that form much of the surface of Puna) busily engaged in weaving mats, a work for which the comparative coolness and dampness of the caves was most suited. A quarter of a century later in traveling the same road with a younger companion the scene was greatly changed: the caves were there, the hala trees were there, but the inhabitants had gone, and for sixty miles there was nothing but a few deserted churches and some aged breadfruit trees to tell that once people had lived there. Fifteen years later the scene had again changed owing to the opening of roads and the cultivation of sugarcane, but the present inhabitants were not the old natives, and the mat making is only here and there continued when there is a chance to sell to the foreigner. (Brigham and Stokes 1906:29)

The inhabitants of Puna were undoubtedly recognized for their expertise and skill in *lauhala* weaving. Maly relates, "to this day, Puna is known for its growth of *hala*, and the floors and furniture of some of the old households are still covered with fine woven mats and cushions. Weaving remains an important occupation of many native families of Puna." (1998:6). According to Fornander (1918-1919), two particular styles of *lauhala* mats were associated with Puna; the *makali'i*, a braided, small-stranded mat, and the *puahala* or *hīnano* made from the male pandanus blossom. The latter was especially valued, and "is only made in Puna where the hala tree is very abundant. It is a regular article of trade among the natives who greatly prized it as a choice mat to sleep on" (Summers 1999:17).

The *hala* tree also carries spiritual significance, some of which is derived from the literal meaning, "to pass; elapse, as time; to pass away" (Pukui and Elbert 1986:50). *Lei* (garland of flowers or foliage) strewn together from the *'āhui hala* (pandanus fruit keys) is often gifted to an individual to commemorate the passing of a major life event or given to a deceased individual to help usher their spirit into the afterlife. Handy (1998) conveys the significance of *hala*, which played a role in protecting a newborn baby's placenta (*'iewe*). The *'iewe*, which was concealed high up in the leaves prevented it from being pilfered. The people of Puna were sometimes known as *maka kōkala* (thorny eyes) by the inhabitants of the neighboring district of Ka'ū, who likened the spined leaves of the *hala* with the long eyelashes of the baby whose *'iewe* it was sheltering, providing a "bright keen look" (Handy and Pukui 1998:160; Pukui and Elbert 1986).

Figure 22. Man standing in a Puna *pū hala* grove in 1888 (Brigham and Stokes 1906:28).

Historical literature reveals that the *hala* groves were also utilized for the cultivation of staple food crops, particularly *kalo*. While the *ʻulu* (breadfruit) appears to be the dominant source of sustenance for residents of Puna, *kalo* (taro) undoubtedly rivaled it as a staple food source. Unlike the neighboring district of Hilo, Puna lacked continuously flowing streams, which therefore made growing *kalo* using the popular *loʻi* (irrigated fields) method nearly impossible. Despite this, Puna received ample rainfall throughout the year, which made the cultivation of dryland *kalo* possible, even "along the coast as far as Hilo (Handy 1940:126). Handy et al. (1991:541) relate that "the wet and sometimes marshy pandanus forests from Kapoho through Poho-iki to ʻOpihikao used to be planted with taro in places." The method of planting dryland taro in the lowland forests of Puna is described by Handy et al. (1991:104) as the "*pa-hala* (pandanus clearing) method." When used to grow *kalo*, the method involved the following:

> . . .Make holes in the *ʻaʻa* (broken lava) by taking out some of the stones. Be sure that the place chosen is in a *pu hala* grove, to save the labor of hauling *hala* branches into the patch later on. Fill the hole with whatever weeds can be found and leave them there for six weeks or more. The weeds will rot and make soil. When the weeds have rotted away, the taro *huli* are wrapped in *lau hala* (*hala* leaves) to keep them moist and are planted. When three or four leaves have appeared on each *huli*, then that is the time to cut down the *pu hala* to let in the sun. The branches of the *hala* are cut off and the patch covered with them until this is not a trace of the taro to be seen. This is left until sufficiently dry to set on fire. The fire does not hurt the taro much as the *huli* are already well rooted. The *hala* reduced to ashes, give the taro the needed nourishment and they grow so tall that a man can be hidden under their leaves. (Handy et al. 1991:104-105)

This method of cultivating dryland *kalo* in Puna could also be practiced on grass-covered slopes rather than directly atop lava. Unlike the previous method, the surface organic matter would undergo an initial burn-off before being planted. Handy elaborates:

> On slopes covered with grass, like those of Hamakua on Maui and Hawaii and Kohala on Hawaii, the grass was formerly burned off and the ground cleared (*waele*) of brush and stubble. This was also done in Puna and elsewhere on land covered with staghorn fern. The field then had to be dug over (*ohiki*) and the stubble thrown out. The open soil was left for a few weeks, or until the small rubbish had decayed. On the windy slopes of Kohala the whole field was covered with cut grass to keep the moisture in. In planting, small holes were made in the soft earth several feet apart and a cutting dropped into each. The old procedure, termed *okupe*, was to thrust the digging stick into the soft earth with the right hand, lift the soil to one side, and drop the cutting into the hole with the left. The cuttings were left uncovered until the rootlets showed vigorous growth; then each cutting was straightened and soil pressed down around it. Kamakau (40) advised burning over the whole field again when the plants showed four or five leaves, weeds, taro leaves and all, after which he says the taro springs forth so luxuriantly "that a man could be hidden among the leaves." (Handy 1940:52)

In slightly more elevated regions of Puna such as lands *mauka* of the current study area, *kalo* could be planted in the depression left by a toppled over *hāpuʻu* fern trunk:

> In *pa pulupulu*, where there were fern-tree (*pulupulu*) forests at relatively low altitudes, as in Hilo and Puna districts on the island of Hawaii, the fern trunks were toppled over. The holes made by the removal of the bulbous bases were suited to planting taros without further excavation. Presumably, the discarded trunks, with the starchy core removed for use as food for men or feed for hogs, were heaped around the clearing, making an enclosure (*pa*). (Handy et al. 1991:51)

In addition to *kalo*, *ʻuala* (sweet potato), was grown in great quantities throughout Puna, and Handy (1940) suggests that although it was indeed cultivated widely, it does not appear to have been a staple food of the district which was "most famous for its breadfruit" (1940:190):

> . . .The sandy soil southeast of Honolulu must have been utilized for sweet potatoes. As to the interior of northern Puna in ancient times, I have no information. There are a few patches now in Koae and the vicinity of Kapoho; the slopes and higher ground inside Kapoho crater are ideal for sweet potatoes. A variety of wild potato with deeply cut leaf, which had obviously gone wild from cultivation, was found near the rich taro land of Malama homesteads. It is safe to assume that sweet potatoes were cultivated throughout southeast Puna both inland and along the coast wherever there were plantations. They are still grown in small patches at Kaimu, Kalapana, and Kapaahu. It is said that on the barren coast beyond Kapaahu, fishermen scraped together piles of broken lava and rubbish when rains came and successfully grew sweet potatoes in them. Despite the fact that sweet potatoes were planted almost universally and many patches are still maintained, the Puna natives

> seem to regard this vegetable with little interest, probably because Puna people prided themselves upon and relished their breadfruit, and also because potato was nowhere and at no time the staple for this rainswept district. (Handy 1940:165)

The barrenness of surrounding lava flows was not a limiting factor in propagating *ʻuala*, which requires practically no soil to flourish. Its propagation is discussed in fair detail by 19th and early 20th century visitors to the district, who describes seeing *ʻuala* growing from mounds of lava stones. For example, an account from 1853 relates:

> There is an increasing attention paid to the culture of the sweet potato, to which our soil and climate are admirably adapted. It grows well in almost every part of the Islands, and no where better than among the dry hot stones of Puna, Kau and Kona on Hawaii,—No one who has ever traveled over those districts can fail to have been struck with astonishment at the sight of beautiful sweet potatoes growing in hills of broken lava with not a particle of earth to be seen in their vicinity. The natives sometimes manure these hills of lava by placing a few boughs upon the lava, then piling stones on them, and when they are partially decayed pulling up the stems or woody part which leaves the leaves and bark to moisten and enrich the hill. The sweet potato is the great article of food in the dry burnt districts of Hawaii, and the cost of raising it is next to nothing. The yield, I am told, is from 50 to 75 bbls. per acre. (Royal Hawaiian Agricultural Society 1853:7)

ʻUlu (breadfruit), another important staple crop was a *kinolau* (physical manifestation) of the goddess Haumea, the "patron of childbirth," and the principle staple food of Puna where it was most famous (Beckwith 1970:283; Handy et al. 1991). Careful and gentle propagation was required, which entailed the removal and replanting of the root sucker cutting while ensuring it remained within its original, undisturbed soil casing. Concerning *ʻulu* as a sustainable food source, Handy et al. (1991:152) explain that "except in Puna, Hawaii, breadfruit was wholly secondary to taro and sweet potato as a staple. I am told that in Puna in a good year, breadfruit may be eaten for 8 months of the year, beginning with May."

In addition to these staples, other crops such as *niu* (coconut) and *ʻawa* were readily produced in Puna. The uses for *niu* recounted by Handy et al. (1991) were many and varied. It thrived in coastal Puna and is frequently mentioned in historical accounts. With respect to varieties, Handy lists only two: the *niu hiwa* (often used for ceremony, medicine, and cooking), and the *niu lelo* (used primarily for nonreligious purposes). The method of propagating *niu* involved burying a sprouted nut on top of an octopus (*heʻe*) at a hole deep enough to bury it completely. The buried *heʻe* was purported to "give the root a spread and grip like its own and to produce nuts that were bulbous like its head or body (*pu*)" (Handy et al. 1991:172). Water from the *niu* was palatable, flavorful, and rich in nutrients. It could also be utilized spiritually by priests practicing divination. The raw meat is edible and could be scraped out of the shell with a large *ʻopihi* shell and eaten as is or incorporated into the preparation of various sweets including *haupia* (*haukō*), *kūlolo, and piʻepiʻe ʻulu*. Besides being utilized for human consumption, coconut meat could also be used to feed animals. Handy et al. (1991:174) explained:

> In some localities in Puna, pigs were taught to open their own coconuts. When the owners of the pigs expected to be absent for some time, they husked a quantity of the nuts, leaving a strip of husk on each one about two inches in width. When a pig wanted to open a nut, he grasped it by this strip of husk and dashed it against a rock. Thus, the pigs were assured of fresh food until the owners returned.

The meat of the coconut could also be crafted into fresh coconut oil. Handy et al. (1991:192) describes the process as it was done in Puna thusly:

> In Puna, *manoʻi* or coconut oil was made as follows: The fresh gratings, with *maile* or other *kupukupu* (any odoriferous plant) to give fragrance, were placed in a container in the hot sun. When the oil separated away from it, the mass was squeezed through *ahuawa* and the refuse (*oka*) thrown away. The oil was used for anointing the body and hair and washing the hair.

Coconuts husk also provided fibers that were plaited to make sennit *ʻaha* (cordage) that was used for lashing house timbers, adzes, and canoe parts. The coconut shell was cleaned and sometimes split in half where it would be fashioned into medicine, food, and drink receptacles, including *ʻapu* that was used for serving and mixing *ʻawa*. The trunk of the coconut was carved to form the main body of the *pahu hula* drum. Coconut leaf stems and midribs were used to clean pig intestines, make brooms, shrimp snares, and for stringing *kukui* nuts to be burned as candles. The leaves were plaited to make fans and playing balls for children, and the end of the leaf was used as *kapu* markers along the coastline or to frighten fish out from under ocean ledges (Handy et al. 1991).

ʻAwa, a plant described as the "cherished narcotic" of the Hawaiian people by Handy et al. (1991:192) was utilized by all socioeconomic classes in Hawaiian Prehistory and is mentioned in several *moʻolelo* (traditional accounts) for the Puna District. Pukui (1983) lists the following Hawaiian proverbs describing the district's famed *ʻawa*:

> *ʻAwa kau lāʻau o Puna.*
> Tree-growing ʻawa of Puna.
> Tree-grown *ʻawa* of Puna was famous for its potency. It was believed that birds carried pieces of *ʻawa* up into the trees where it would grow (ibid.:29)

> *Puna, ʻāina ʻawa lau o ka manu.*
> Puna, land of the leafed *ʻawa* planted by the birds. (300)

> *Ka ʻawa lena o Kaliʻu.*
> The yellowed *ʻawa* of Kaliʻu.
> Refers to Kaliʻu, Kilohana, Kauaʻi. People noticed drunken rats in the forest and discovered some very potent *ʻawa* there. There is a Kaliʻu in Puna, Hawaiʻi, where good *ʻawa* is also grown. (140)

The *ʻawa* roots were carefully chewed (pounded in later years) into balls (*mana* or *mana ʻawa*), strained with the stem fibers of the *ahuʻawa*, and presented as offerings or drunken out of polished *niu* shell *ʻapu ʻawa* cups for pleasure, ceremonial, and relaxation purposes. It was also a principal element in the treatment of both physical and spiritual ailments in living subjects by the *kahuna* (priests) and a crucial ingredient in ritualistic use in which its procurement and preparation were handled with the utmost care. Of all the districts of Hawaiʻi Island, Puna was the most renowned for its *ʻawa*, producing the finest *ʻawa kau laʻau*:

> *Kau laʻau* is the famous *awa* of Puna, Hawaii, which grows in the crotches of trees where, according to the Hawaiians, it becomes planted by birds building pieces of the stem into their nests (M). A line from a mele reads: "Ka manu ahai kanu awa e" (The bird clipping the twig of awa and planting it elsewhere; see 21, p. 30). Kaaikamanu (Ka) identifies it as the same as *Mokihana*, but Mrs. Pukui, who is very well acquainted with Puna (Kaaikamanu came from eastern Maui) tells me that any variety might be found growing in this way. This Puna *awa* was famous for its strength, which was due, in Mrs. Pukui's opinion, to the fact that its roots grew in sunlight. (Handy et al. 1991:202-203)

Because of this unique cultivation method, the natives of Puna were renowned across the archipelago for producing the most superior and potent *ʻawa*. This notion is expressed in several traditional accounts including, *Ka Moʻolelo o Hiʻiakaikapoliopele* (Hoʻoulumāhiehie 2006b) when Pele introduced herself to the striking Lohiʻauipo from Kauaʻi. After Pele indicated that she was from Puna, Lohiʻau responded, *"no Puna ʻiʻo o kā ʻoe, no ka ʻāina ʻawa lau a ka manu, ka ʻāina i ka polo hīnano*" (is that so, you are from Puna, from the land of the young *ʻawa* plant of the birds, the land of the pandanus trees). This *moʻolelo* as well as that concerning the highly skilled rat shooter named Pīkoi-a-ka-ʻalalā (Kaui 1865-1866), and the legend of Ke-au-nini (Westervelt 1916) suggest that the *ʻawa* found growing in the trees of Puna was spread throughout the forest by birds. The account of Ke-au-nini (Westervelt 1916:198) explains that this type of *ʻawa* was also found growing in the Panaʻewa forest. Westervelt (1915b:198) noted: "he picked up the stones and ran to Pana-ewa and got the awa hanging on the tree…" The intoxicating effects of *ʻawa*, especially the potent Puna variety, induce a supreme state of physical relaxation and ataraxia and are described in a *mele* sung by Hiʻiaka as she traversed a trail through the darkened Panaʻewa forest:

Ka wai mukiki ale lehua a ka manu,	O honey-dew sipped by the bird,
Ka awa ili lena i ka uka o Ka-liʻu,	Distilled from the fragrant lehua;
Ka manu ahaʻi lau awa o Puna:	O yellow-barked awa that twines
Aia i ka laau ka awa o Puna.	In the upper lands of Ka-liʻu;
Mapu mai kona aloha iaʻu—	O bird that brews from this leafage
Hoolaau mai ana iaʻu e moe,	Puna's bitter-sweet awa draught;—
E moe no au, e-e!	Puna's potentest awa grows
	Aloft in the crotch of the trees.
	It wafts the seduction to sleep,
	That I lock my senses in sleep!
	(Emerson 1915:31)

Rains and Winds for Kea‘au and the Greater Puna District

There are many *‘ōlelo no‘eau* the make reference to Puna and most mention the land covered in inky lava left in Pele’s furious wake and the atmosphere, which was scented with the fragrances of *hala*, *maile*, and *lehua* blossoms. In addition to the *‘ōlelo no‘eau*, the names of *ua* (rains), and *makani* (winds) within a particular *ahupua‘a* or broader region evidence the long-term relationship of various communities to their immediate environment. Geographer Katrina-Ann R. Kapā‘anaokalāokeola Nākoa Oliveira offers a concise description of the natural environment as it was understood by Native Hawaiians of the past:

> Ancestral Kānaka recognized the connection between the heavens, lands, and oceans and how all three were interconnected and interdependent upon one another. In spite of the interwoven nature of the sky, land, and sea, however, Kānaka of ancestral times did not have a term that directly translates to what we have come to know today as “environment.” Rather, the *Hawaiian Dictionary* offers two phrases that approximate the notion of environment: (1) “‘ano o ka nohona” and (2) “nā mea e ho‘opuni ana.” ‘Ano o ka nohona refers to the nature of one’s relationship to one’s surroundings or places. Nā mea e ho‘opuni ana relates to everything that surrounds or encircles a person. (Oliveira 2014:64)

Reacquainting ourselves with the names of rains and winds allows us to appreciate the environment as it was once observed by ancestral Hawaiian populations. Several rain names specific to Kea‘au and the broader Puna District have been recorded, three of which were documented by Pukui (1983) in her book *‘Ōlelo No‘eau, Hawaiian Proverbs & Poetical Sayings* (Table 1). These *‘ōlelo no‘eau* speak specifically of the Kiawelehua, Līhau, and the Moanianilehua rains of Puna.

Table 1. *‘Ōlelo no‘eau* associated with the rains of Kea‘au and Puna.

‘Ōlelo No‘eau	*Literal/Figurative Translation*
Ka ua Kiawelehua o Hōpoe.	The Kiawelehua rain of Hōpoe (Pukui 1983:370).
Ka ua Līhau o Pāhoa.	The Līhau rain of Pāhoa (Pukui 1983:373).
Ka ua moaniani lehua o Puna.	The rain that brings the fragrance of the lehua of Puna (Pukui 1983:374).

Akana and Gonzalez (2015) in their book *Hānau Ka Ua*, *a collection of Hawaiian rain names*, describe the cultural significance of rain:

> Our kūpuna [ancestors] had an intimate relationship with the elements. They were keen observers of their environment, with all of its life-giving and life-taking forces. They had a nuanced understanding of the rains of their home. They knew that one place could have several different rains, and that each rain was distinguishable from another. They knew when a particular rain would fall, its color, duration, intensity, the path it would take, the sound it made on the trees, the scent it carried, and the effect it had on people. (Akana and Gonzalez 2015:xv)

Listed in Table 2 are those rain names associated with Kea‘au and lower Puna that has been documented by Akana and Gonzalez (2015). Of the seventeen rain names recorded for lower Puna, three, the Kāhikohala, Kiawelehua, Lanipōlua are specific to Kea‘au:

Table 2. Rain names associated with Kea‘au and Lower Puna by Akana and Gonzalez (2015).

Rain Name	*Literal/Figurative Translation*
‘Alaea	“Red rain.” Refers to a rain that falls in successive showers.
Alanilehua	“Lehua water or nectar.” Refers to a rain assocaited with the nectar of lehua blossoms.
‘Awa	“Bitter.” Refers to bitter, cold, dark rain, mist, fog, vog, or smoke of the mountains. Same as ‘Awa‘awa
‘Awa‘awa	“Bitter.” Refers to bitter, cold, dark rain, mist, fog, vog, or smoke of the mountains. Same as ‘Awa.
‘Iwilani	Refers to a rain associated with the god Kāne.
Kāhikohala	Specific to Kea‘au. Translates as “to adorn the hala trees”
Kanikanilehua	Refers to the chattering of birds on ‘ōhi‘a lehua trees, the rustling of lehua flowers, or the drinking of the rain by lehua flowers. Same as Kanilehua.

Table 2 continues on next page.

Table 2. Continued.

Rain Name	*Literal/Figurative Translation*
Kanilehua	Refers to the chattering of birds on ʻōhiʻa lehua trees, the rustling of lehua flowers, or the drinking of the rain by lehua flowers. Same as Kanikanilehua.
Kiawelehua	Specific to Keaʻau. Translates as "swaying lehua." Refers to "the rain that sets the lehua of Hōpoe to swaying" (Akana and Gonzalez 2015:80).
Kuakualau	Refers to a shower over the sea, accompanied by wind. Same as Kualau.
Kualau	Refers to a shower over the sea, accompanied by wind. Same as Kuakualau.
Lanipōlua	Specific to Keaʻau. Translates as "very dark sky." Refers to a heavy shade cast by gray clouds taht rest bove the rees as watery mists; a misty, light rain.
Līhau	Translates as "cool, moist, fresh." Refers to a gentle, cool rain.
Lokuhala	Translates as "to drench hala trees." Refers to a downpour.
Nahunahu	Translates as "to bite." Refers to the pelting rain associated with Hawaiʻi island.
Noe	Translates as "mist, fog, vapor, rains spray." Refers to a fog or mist that is lighter than the uhiwai, but heavier than the ʻohu, ʻehu, and ʻehuehu.
Polohīnano	Translates as "white hīnano blossom with its stem."

End of Table 2.

Whereas *Hānau Ka Ua* by Akana and Gonzalez (2015) provides us with a comprehensive listing of rains across the Hawaiian Islands, there is no comparable publication to date for wind names. Listed in Table 4 are wind names that can be found in an array of Hawaiian and English language primary sources.

Table 3. Wind names associated with Puna.

Wind Name	*Literal/Figurative Translation*
ʻAwa	Translates as "bitter." A bitter, cold wind of the Puna region (Akana and Gonzalez 2015).
Moelehua	Translates as "sleeping lehua." Also a rain name.
Moaniʻala	Translates as "fragrant breeze." A light, gentle breeze usually assoicated with fragrance of Puna. Same as Moani (Stodden n.d).
Uahipele	Translates as "Pele has purged." A wind associated with Kīlauea (Stodden n.d.).
Ulumano	A winds associated with Keaʻau in Waiolono
ʻUnuloa	Translates as "the long gathering." A wind associated with Puna, Hawaiʻi.

Select *Moʻolelo* and *Kaʻao* for Keaʻau Ahupuaʻa and the Greater Puna District

As the Hawaiian people had no written language until after the arrival of the first Protestant missionaries in 1820, traditional *moʻolelo* (stories, history), *kaʻao* (myths, legends), along with other forms of oral expressions such as *mele* and *oli* (songs and chants), and *ʻōlelo noʻeau* (proverbs and sayings) were passed down orally from one generation to the next. Traditional *moʻolelo* and *kaʻao* associated with Keaʻau Ahupuaʻa abound with references to Kāne, the god of sunlight, fresh water, verdant growth, and forests as well as the fiery female fire goddess, Pele (Beckwith 1970; Pukui 1983). Legendary sources indicate that Puna was, among other things, renowned for its rain and fertility, fragrant breezes, and potent *ʻawa* that was often cultivated in the trees. Additionally, many legends associated with Puna feature not only humans, gods, goddesses, and *kupua* (demi-gods), but *moʻo* (guardians of fresh water with reptilian features), *pōhaku* (stones), and *ʻaumakua* (family or personal ancestral gods). The following paragraphs is a summary of *moʻolelo* and *kaʻao* that make explicit reference to Keaʻau Ahupuaʻa including the famed Hāʻena Beach and the Panaʻewa Forest.

Ka Moʻolelo O Hiʻiakaikapoliopele

A tale of perseverance, bravery, and spite is recounted in *Ka Moʻolelo O Hiʻiakaikapoliopele*, initially published in the Hawaiian language newspaper *Ka Naʻi Aupuni* between the years 1905-1906 by Hoʻoulumāhiehie. Throughout the early 21st century, Hawaiian language scholar, Puakea Nogelmeier compiled the individual chapters written by Hoʻoulumāhiehie, translated each page of text, and published it in a double volume (one in Hawaiian and the other in the English) (Hoʻoulumāhiehie 2006a, 2006b). Nogelmeier notes that Hoʻoulumāhiehie's version is one of twelve

known published accounts of *Ka Moʻolelo O Hiʻiakaikapoliopele*, of which select portions are summarized and presented below.

After leaving their homeland of Kahiki and settling in Puna on Hawaiʻi Island, Pele and her siblings ventured down to Hāʻena in Keaʻau to bathe in the sea. While there, Pele was overcome with the desired to sleep. She informed her youngest sister, Hiʻiaka not to allow any of their siblings to awaken her to which Hiʻiaka consented. In her dream state, Pele followed the sound of a *pahu* (drum), which carried her spirit to the island of Kauaʻi, where she saw and met a striking man named Lohiʻau. The two met and fell madly in love, however, given that Pele was in her spirit form, she made it clear to Lohiʻau that she must return to Hawaiʻi Island. Pele's long sleep was cause for concern and although tempted to awaken her sister, Hiʻiaka held true to her sister's commands.

Finally, Pele roused from sleep and called upon each of her sisters where she made a proposition, asking which one of them would fetch her dream lover Lohiʻau from Kauaʻi. Knowing Pele's tempestuous nature, each feared possible repercussions and refused to go. After being denied, her youngest sister, Hiʻiaka appeared to her. The irascible Pele demanded that Hiʻiaka travel to Kauaʻi to fetch Lohiʻau and sent her on her way with strict instructions. Hiʻiaka was not to take him as her husband, she was not to touch him, and she was to take no longer than forty days on her journey. While Hiʻiaka agreed to her sister's demands, she realized that in her absence, Pele would become incensed with a burning and vehement fury and destroy whatever she desired. So Hiʻiaka set forth two stipulations; her beloved *ʻōhiʻa lehua* grove was to be spared from destruction, and Pele was to protect her dear friend Hōpoe in her absence. In this version of the story, Hōpoe is described as a young girl from Keaʻau that was skilled at riding the surf of Hāʻena, and the one who taught Hiʻiaka the art of *hula*. Pele agreed to Hiʻiaka's requests, and Hiʻiaka departed on her journey to retrieve Pele's lover. In a sympathetic act, Pele bestowed supernatural powers upon Hiʻiaka so that she would be protected against the dangers she would undoubtedly face along the way.

In preparing for her journey, Hiʻiaka went first to Kīlauea and performed a sacrificial ritual at the rim of the crater. While en route to Kīlauea, Hiʻiaka met a young female, Wahineʻōmaʻo, who asked to join Hiʻiaka on her journey. After departing Kīlauea, the two girls descend from Laʻa (variation of the name ʻŌlaʻa) until they reached Kuolo in Keaʻau—a place that bordered the Panaʻewa Forest. Having learned from her parents that Panaʻewa was a place of certain death for travelers who dared to venture into the territory of Panaʻewa, the guardian *moʻo*, Wahineʻōmaʻo turned to Hiʻiaka and expressed her concern and offered a second and much safer route of travel along the coast. Concerned with meeting the deadline set by her sister, Hiʻiaka and Wahineʻōmaʻo agreed to take the shorter inland trail through Panaʻewa. Upon reaching Kūkulu, a high place in the Panaʻewa Forest, the two women were observed by Kūkulukukui and Kapuakoaiʻa, the guardian birds for the chiefly *moʻo* Panaʻewa. The two guards quickly went to Panaʻewa to report the presence of Hiʻiaka, "the champion, the dynamic one of the lightning skirt from Kīlauea" (Hoʻoulumāhiehie 2006a:51). After hearing the news of Hiʻiakaʻs presence in the forest, Panaʻewa called out:

> "What matter would be the doom she might bring, if it truly is she who had entered the lehua groves here in Panaʻewa.
>
> She and her people should know that the chiefs of Hilo have no regard for them.
>
> And my kapu, my sacred law, is firmly set, that no man or woman may arrogantely tread amid the lehua trees of Panaʻewa without my consent. But as to those stone-eating, land-eating, lehua-grove eating women, I would never allow them to enter here into Panaʻewa. If it turns out that is not Hiʻiaka, but some local women from up by the shoreside of Hilo, then say nothing and you two can allow her to go along this road to get to Waiākea." (Hoʻoulumāhiehie 2006a:52)

Just as Kapuakoaiʻa finished speaking to Panaʻewa, Hiʻiakaʻs voice was heard echoing through the forest, where she recited a chant requesting permission from Panaʻewa to pass through his forest. Angered by Hiʻiakaʻs request, Panaʻewa sharply responded:

> "You have no pathway here in Panaʻewa. You are an arrogant woman, coming down from inland Puna, a marginal land used up by the gods, and you proudly assume this to be your road to travel. Certainly you know that Panaʻewa is a sacred forest, not to be wantonly traversed by the stone-eaters. There is no road here. As though your eyes didn't see that the road for travel is seaward of Hāʻena." (Hoʻoulumāhiehie 2006a:52)

Having heard Panaʻewaʻs discourteous remarks, Wahineʻōmaʻo turned to Hiʻiaka and again reminded her of the coastal trail which would be easy to travel but Hiʻiaka remained firm and insisted they pass through the forest. Having hear the mighty growl and harsh retorts of Panaʻewa, Hiʻiaka prepared herself and her companion for the impending danger that the merciless Panaʻewa would unleash on them. Here Panaʻewa:

> Then devoured all of the cooked taro corms and the broiled taro leaves that the sentinels had brought. When sated, the moʻo commanded the two sentinels, Kūkulukukui and Kapuakoaiʻa, to go and cut the heads of all of the flying ghost (spirits) in Panaʻewa and to flood the path that Hiʻiaka and company were advancing upon with their blood. (Hoʻoulumāhiehie 2006a:53)

Hiʻiaka then prepared Wahineʻōmaʻo for the imminent danger stating:

> "Listen, hold fast to my skirt. Hold on tight, and don't let your grip loosen, or you will be swept away by the tide of blood from Panaʻewa. Wherever I go, you must come along. We will know defeat in the dawn hours, but Panaʻewa will lose in the twilight of evening. As we go along, if you hear the roar of voices echoing through Panaʻewa forest, recognize that the red tide of the moʻo, Panaʻewa, had begun to flow. This will temper my skirt, once it's been soaked in the red waters." (Hoʻoulumāhiehie 2006a:53)

In a short time, the women found themselves caught in the red flood of Panaʻewa with nothing more than their chins bobbing above the red waters. Fearful of whether they would survive, Wahineʻōmaʻo cried out to her companion. Hiʻiaka quickly replied, "hold your breath my friend…I shall call upon our elder sister, our brothers and our ancestors" (Hoʻoulumāhiehie 2006a:53). Responding to their sister's cries, Pele and her brother Lonomakua began to stoke the fires of Kīlauea and in no time, thick smoke blanketed the slopes of Maunaloa, Maunakea, and Hualālai and darkness fell over the *lehua* filled forest of Panaʻewa.

Clinging to life, Hiʻiaka again called out in chant. Pele sent billows of smoke to her sister and informed her to summon the help of their brothers. Knowing that to defeat Panaʻewa would require more than what Hiʻiaka was capable of, she cried out to her powerful brothers, Kauilanuimakaʻehaikalani, Kamohoaliʻi, Kahuilaokalani, Kaʻekaokalani, and to Kāneikawaiola to send down their clouds and water. As Hiʻiaka beckoned her siblings for help, they responded by sending torrential rain from the heavens, flashing their lightning across the sky, and violently shaking the earth. As the waters rushed into Panaʻewa's domain, the trees were pushed over and the mighty waters swept over the pitiless *moʻo.* Unable to withstand the powerful torrents, Panaʻewa shapeshifted, transforming himself into a *lehua* tree and later into an *ʻamaʻumaʻu* fern to no avail. Panaʻewa could not fight back against the raging waters and his body and spirit grew weak. Recognizing that the only way out of this disaster was to reconcile with Hiʻiaka, the fading Panaʻewa called out asking to be spared but Hiʻiaka refused his pleas. Panaʻewa was seized by the water and his lifeless body carried out to the depth of the ocean where it was devoured "whole into the belly of a big-mouthed fish" (Hoʻoulumāhiehie 2006a:57). With their path now cleared of the malevolent *moʻo*, Panaʻewa, Hiʻiaka and her companion carried on with their journey until they reached Waiākea. She continued on with her journey and at each stop Hiʻiaka was faced with various challenges that required her to battle for her life, and in some instances to restore life. However, with each challenge, Hiʻiaka's understanding of her own power as a goddess continued to grow.

From Hoʻoulumāhiehie's narrative, we learn of the *lehua*-filled Panaʻewa Forest, which was closely guarded by the *moʻo*, Panaʻewa, and his bird guards, Kūkulukukui and Kapuakoaiʻa, was a forest for those of Hilo. We also learn of two main trails that connected Keaʻau in Puna to Waiākea in Hilo, with the longer route passing along the coast and the shorter but more treacherous one cutting through the Panaʻewa forest. This narrative also describes the forest being demolished by red and white waters, perhaps a reference to a volcanic eruption, which was later extinguished by a great flood of water.

In a latter portion of this story, Hoʻoulumāhiehie tells of Hiʻiaka's return trip to Keaʻau. As noted at the beginning of this story, as a stipulation for retrieving Lohiʻau, Hiʻiaka requested that her sister, Pele spare her beloved *lehua* grove from destruction and protect her dear friend Hōpoe. Hiʻiaka hadn't ventured for very long when she realized that the volcano had begun to smoke thickly, trailing towards Hōpoe's home of Keaʻau. It was not long before the smoke burst into a scorching fire. Filled with dread and sensing that her sister had betrayed her promise, Hiʻiaka continued her journey to Kauaʻi. The days passed slowly, utterly too slow for Pele who grew impatient with her younger sister. At last, Hiʻiaka found Lohiʻau, unfortunately, all that remained of Lohiʻau was his lifeless corpse. Keenly aware that she could not deliver Lohiʻau to her sister in such a state, Hiʻiaka used her healing powers to return his wandering spirit back into his body.

While Hiʻiaka was on Oʻahu atop Pōhākea, the impatient Pele was furious and shook the earth with great ferocity and heaved her lava in a torrent of devastation, annihilating Hiʻiaka's beloved *ʻōhiʻa lehua* forest and finally consuming Hōpoe as she lingered by the sea. Enraged by her sister's spiteful acts, Hiʻiaka turned her wrath onto her beloved sister Pele. The two sisters went head-to-head in a brutal battle that could only be subdued by the older gods. Fearing that the two sisters would destroy the entire island, the elder gods intervened and quieted the battle between the two powerful sisters.

Upon Hōpoe's demise at the hands of Pele, she underwent a metamorphosis, becoming a stone delicately poised along the shores of Hāʻena in Keaʻau. Reborn in this form, she engaged in a perpetual dance, swayed by the ocean of Nānāhuki, the soft breeze or the rumbling of the earth. Meanwhile, Hiʻiaka harboring bitterness over her sister's betrayal, fulfilled her solemn oath by returning Lohiʻau to Pele with unwavering fidelity.

Paliuli, the Mythical Land Featured in the Legend of Kepakaʻiliʻula and Lāʻieikawai

At least two traditional accounts make reference to Paliuli, a mythical land located in Keaʻau, Puna. In the legendary account concerning the mythical being named Kepakaʻiliʻula, (Fornander 1916-1917) described the *ahupuaʻa* of Keaʻau as both the birthplace of Kepakaʻiliʻula as well as the area that led to a hidden land known as Paliuli. The portion of the story concerning Keaʻau is presented below.

Kepakaʻiliʻula's parents were two very powerful Puna chiefs, Kū, his father and Hina, his mother. Hina had two brothers, Kiʻihele and Kiʻinoho, who both in a dream state discovered the whereabouts of the mythical land of Paliuli. Before leaving to Paliuli, the brothers learned that their sister had become pregnant. After arriving at Paliuli, the brothers soon discovered the abundance and beauty of this enchanted land, which Fornander described as:

> … a very good land, flat, fertile and well filled with many things desired by man; the ohias [*sic*] were as large as breadfruit; they saw a fish pond within the land stocked with all kinds of fish of the sea with the exception of the whale and the shark, so they made their home there. They began to cultivate the soil, raised different animals until the place was filled with everything imaginable. (Fornander 1916-1917:498)

After filling this land with every kind of food imaginable, the brothers desired to share their wealth with their nephew Kepakaʻiliʻula. The two brothers proceeded from Paliuli and went down to Keaʻau to the home of their sister Hina. Upon their arrival at their sister's home, they exchanged greetings and wept, at which time "Hina rose and went out to relieve herself" (Fornander 1916-1917:500). When Hina departed the house, the brother searched for the child, only to find an egg lying on the ground where Hina had been sitting. Kiʻihele picked up the egg and wrapped it in a feathered cape, before returning to Paliuli. The brothers looked after the delicate egg and Kiʻinoho exercised all his power to care for it. After ten days, Kiʻinoho unwrapped the feathered cape and saw that the egg had formed into a beautiful child. The brothers decided to leave the child wrapped in the cape for another forty days, after which, they saw that the child had grown even more beautiful and was free from any deformities. They named this child Kepakaʻiliʻula.

Kepakaʻiliʻula was unlike no other child they had seen for his skin and eyes were as red as the feathered cape that enwrapped him. His skin color was said to have lit up Paliuli both day and night and his only equal was the fire goddess Pelehonuamea. The brothers raised Kepakaʻiliʻula on a strict diet of bananas at Paliuli until he reached maturity, at which time they prepared him for marriage. Here, the story departs from the lands of Puna and Kepakaʻiliʻula journeys to Kona in search of a suitable wife.

The second account featuring the lands of Paliuli appeared in the romance of Lāʻieikawai as recorded by (Kalākaua 1888). Although the origins of this story are set in the Koʻolau District of Oʻahu, mention is also made of Paliuli in Keaʻau along with other localities in the islands. The story begins with Kahauokapaka and his wife Malaekahana to whom were born four girls. Set on having a son, Kahauokapaka vowed that any daughters born from their union would be put to death, at least until a son was born. In accordance with the vows and without mercy, Kahauokapaka killed their first four daughters. Sometime later, Malaekahana became pregnant again, this time with twins, and fearing her husband's cruel vows, she sought to keep their birth a secret. When the pangs of labor began, Malaekahana sent her husband to fetch her some small fish from the shore. In his absence, she delivered twin girls named Lāʻieikawai and Lāʻielohelohe both of whom were accompanied by a rainbow.

To prevent the death of the twins, Malaekahana consigned the care of the former to their grandmother, Waka and the latter to the priest, Kapukaihaoa. To secure the whereabouts of the twins, Waka took Lāʻieikawai to the cavern of Waiapuka and Kapukaihaoa took Lāʻielohelohe to the sacred birthplace, Kūkaniloko. Because of their exceptional beauty and sacredness, the caregivers were cautious and periodically moved the girls from place to place. In a dream, Waka was directed by Kapukaihaoa to take Lāʻieikawai to Paliuli. Their journey to Hawaiʻi Island was, however, met with many challenges as knowledge of the girl's beauty had begun to circulate. Waka diligently directed her efforts toward safeguarding her granddaughter from the numerous suitors vying for her attention.

Of those captivated by the elusiveness of Lāʻielohelohe was Hulumaniani, a great prophet of Kauaʻi. Following the rainbow attached to Lāʻieikawai, Hulumaniani made his way through the islands in search of a girl, stopping at different localities to conduct ceremonies. From Kauwiki, Hāna, Hulumaniani caught the glimpse of a faint rainbow on the east side of Hawaiʻi Island and after holding a ceremony, his patron god informed him "that the person whose

shadows he had seen were living in the forest of Puna, in a house thatched with yellow feathers of the *oo* [*Moho nobilis*]" (Kalākaua 1888:459). Later a chief named Aiwohikupua of Wailua, Kauaʻi sough pursuit of Lāʻieikawai. Having "landed at Keaau, where the people were surf-bathing" the chief left his men and carrying a feather mantle as a gift to Lāʻieikawai, made the long and wearisome "journey through the thick jungle" (Kalākaua 1888:461). After hearing the crow of a rooster, Aiwohikupua came to clearing in the forest and found the house of Lāʻieikawai "all covered with choice yellow feathers of the *oo*" (Kalākaua 1888:461). Having seen the exquisiteness of her feathered house, Aiwohikupua was filled with shame for he felt that his feathered mantle, although stunningly beautiful, was no match to the beauty of Lāʻieikawai's feathered home so he left for Kauaʻi without ever seeing the maiden of Paliuli. When he returned home to Kauaʻi, Aiwohikupua solicited the help of his sisters; Maileha'iwale, Mailekaluhea, Mailelauliʻi, Mailepākaha, and Kahalaomapuana. On his second attempt, Aiwohikupua brought his sisters to the home of Lāʻieikawai and the elder four, using their *maile* scents, attempted to attract her out of the house but despite their best efforts, Lāʻieikawai refused. Disheartened by her outright refusal, Aiwohikupua knew no other way to win over Lāʻieikawai so he again, returned home to Kauaʻi. His sisters, however, begged him not to give up but he found no desire in trying once more.

When Aiwohikupua left for Kauaʻi, his sisters, although strangers to Hawaiʻi Island, made their way back to Paliuli and found shelter in Lāʻieikawai's yard in the clump of some *hala* trees. For four nights, the four *maile* sisters kept a fire burning and took turns singing to lure the maiden from her home to no avail. Finally, the youngest sister decided to make a musical instrument from ti leaf which she played with much allure. Alas, the sound of the instrument got the attention of Lāʻieikawai. After inquiring with her *kahu* (attendant) about the source of the sweet melody, Lāʻieikawai invited Kahalaomapuana into her home and later invited the four *maile* sisters. Pleased with their interaction, Lāʻieikawai ordered a house be built for the sisters and adopted them as companions and guards.

Although the story continues with efforts from Aiwohikupua along with other suitors attempting to woo Lāʻieikawai, references to Keaʻau, like those mentioned above, point to the surf of Keaʻau and the mythical lands of Paliuli.

The Legend of ʻIwa

The namesake of the subject *ahupuaʻa* of Keaʻau appears as the name of a famous fisherman in the *Legend of ʻIwa* presented by Fornander (1918-1919). As the story goes, Keaʻau was in possession of two extraordinary *leho* (cowry) shells named Kalokuna. These *leho* had the wondrous effect of instantly attracting *mūheʻe* (squid) to jump in the canoe. Day after day, Keaʻau would take his canoe and float upon the ocean, lowering Kalokuna into its great depths and returning home with large amounts of *mūheʻe*. Unbeknownst to Keaʻau, word of his spectacular shells had spread, and they became highly desired by the *aliʻi* ʻUmi-a-Līloa (ʻUmi) of Waipiʻo, who was living in Kona at the time. Upon his command, messengers were sent to confiscate the *leho* from Keaʻau.

While ʻUmi enjoyed the benefits of his new possessions, Keaʻau conspired a plan to reclaim his prized shells. Arming himself with valuable gifts including a pig, *ʻawa*, and some of the much-celebrated *kapa māmaki* of ʻŌlaʻa, Keaʻau set sail in search of an exceptional thief who would be able to retrieve his treasured *leho*. He sailed all around Hawaiʻi Island, even touching upon the shores of Lānaʻi, and Maui, but failed to find anyone clever enough. Once on Molokaʻi, Keaʻau learned of the young ʻIwa, who possessed the skills he was seeking.

Keaʻau sailed his canoe along the shore until he came to a beach and spotted a little boy running about without his *malo* (loincloth). Recognizing him as ʻIwa, Keaʻau met with the boy's father, Kukui, who instructed him to present ʻIwa with the gifts he brought from Puna. After receiving the gifts and cooking and feasting on the pig, ʻIwa agreed to aid Keaʻau in the retrieval of his valued shells. Sailing together, the pair eventually stalled in waters near Keāhole Point in Kona where they spied ʻUmi's fishing canoe containing Keaʻau's prized *leho*.

Unbeknownst to ʻUmi, ʻIwa dove into the water and swam towards his canoe. As ʻUmi lowered the pair of *leho* into the great depths, ʻIwa removed them from the chief's fishing line and swam the line deeper where he tied it off to some coral. He returned the pair of shells to Keaʻau who gratefully continue his favorite pastime of fishing for *mūheʻe*. Meanwhile, ʻUmi tried to pull up his fishing line, but it appeared to be stuck. He feared that if he pulled too hard his line would break and he would lose the shells. Refusing to continue tugging at his line, he decided to wait until someone could dive down and untangle his line for him. Unfortunately, no one could hold their breath long enough to reach the bottom of the line, so ʻUmi had to expand his search.

The runners ʻUmi sent out located ʻIwa at Leleiwi, where he made his home with Keaʻau. In an act of betrayal, he divulged the location of Keaʻau's treasured *leho* and agreed to steal them from their hiding place among the house rafters. Through doing so, ʻIwa was able to gain favor with the king. This *moʻolelo* continues with ʻIwa's exploits in Waipiʻo Valley.

Kūkaʻōhiʻaakalaka

A portion of the tale of Kūkaʻōhiʻaakalaka, presented in *Folktales of Hawai'i* by Pukui and Green (1995), occurs in Keaʻau. Kūkaʻōhiʻaakalaka (Kūkaʻōhiʻa), or Kū-the-ʻōhiʻa-of-the-forest, was a fisherman who resided with his wife in Keaʻau. His sister, Kauakuahine, lived nearby in ʻŌlaʻa with her farmer husband and their children. Usually, Kauakuahine would trade vegetables for some of her brother's dried fish, however, Kūkaʻōhiaakalaka's wife was quite selfish and did not like to share their catch, opting instead to hide the fish beneath the sleeping mats in their house.

One day, Kauakuahine made her usual trip to Keaʻau with a bundle of vegetables, hoping to trade for fish to feed her family. She arrived at her brother's house, but he was out fishing, and she was instead met by his wife who lied and denied having any fish, indicating she only had salt. Sick of constantly being denied by her sister-in-law, Kauakuahine headed to the shore where she gathered *limu* (seaweed) instead of the delicious fish she had hoped to take home. When she arrived at her home, her husband and children excitedly ran out to greet her. After slapping each of them and turning them into rats, Kauakuahine reformed herself into a spring.

Meanwhile, Kūkaʻōhiʻa was alerted to the situation by the gods, who appeared to him as he was fishing. Infuriated, Kūkaʻōhiʻa returned home and saw how his wife had hidden the fish from his sister beneath the mats. He could not control his wrath, and after an awful confrontation, he murdered his wife. He traveled to ʻŌlaʻa and was overcome with sadness when he saw his brother-in-law, nieces and nephews were turned into rats. Overcome with grief, he found the spring of his sister and dove into it. As a result, he was transformed into an *ʻōhiʻa* tree which "bears only two blossoms to this day, and when a branch is broken off, blood flows from the body of the tree" (Pukui and Green 1995:20).

Legend of Kaipalaoa, the Hoʻopapa Youngster

The lands of Keaʻau are mentioned in the legend of Kaipalaoa documented by Fornander (1916-1917). This legend begins with Kaipalaoa, a young lad from Waiākea, Hilo who went out in search of his father Halepaki. After learning that his father had been killed by Kalanialiʻiloa, a *kapu* chief of Kauaʻi during a *hoʻopāpā* (skillful art of wit) battle, Kaipalaoa took up *hoʻopāpā* as a profession. The young boy trained under his mother, Wailea and later under his aunty, Kalenaihaleauau who was the wife of Kukuipahu, the chief of Kohala. Although Halepaki was skilled at *hoʻopāpā*, he was not classed as an expert. Kalanialiʻiloa, on the other hand, was exceptionally skilled in *hoʻopāpā* and managed to defeat many opponents. As a visual reminder of his exceptional skill, Kalanialiʻiloa constructed a nearly enclosed *pā iwi* (bone fence) around his house made from the bones of those he defeated in prior *hoʻopāpā* contest. Having completed his training, Kaipalaoa set out to Kauaʻi to avenge his father's death. Arriving at Pōkaʻi in Waiʻanae, Oʻahu, Kaipalaoa saw the canoes of Pueonuiokona, the chief of Kauaʻi preparing for their return trip so he asked the king if could accompany them on their trip to Kauaʻi to which the king obliged.

At dawn the following morning, Kaipalaoa took one of the king's canoes, loaded it with his calabash, and sailed ahead of the king and his men for Kauaʻi. After landing in Hanalei, he proceeded to Wailua, where Kalanialiʻiloa resided. When Kaipalaoa saw the nearly completed bone fence, he looked around and saw the bones of his father, Halepaki, still fresh and unbleached. Kaipalaoa wept at the sight of his father's bones and to initiate a battle with Kalanialiʻiloa, the boy immediately replaced a nearby flagstaff with the *ʻōililepa* fish and on the *kapu* sticks he placed the *kikakapu* fish. Upon seeing these acts, Kalanialiʻiloa summoned his messengers to meet the boy and inform him and the people of Kauaʻi that the king had accepted his challenge.

The boy was invited into the Kalanialiʻiloa's compound and soon the battle of wits ensued. Kaipalaoa attempted to lure the king of out of his house, but just as Kaipalaoa has predicted, the king refused, so the young boy entered the king's house. The king and his men removed all the floor covering and left Kaipalaoa with a bare spot which they poured water onto thereby leaving the boy to sit in a mud puddle. Kaipalaoa, however, was prepared and from his calabash, he took out some *kuolohia* grass which he laid over the mud. Then he took out a mat made from the *hala* blossoms of Puna, then an *ʻōʻūholowai kapa* robe from ʻŌlaʻa, all of which were scented strongly with the *ʻōlapa*. They then proceeded to build a fire and roast a pig. Time after time, Kalanialiʻiloa's and his men tried to trick Kaipalaoa but the boy continued to outsmart them. As the *hoʻopāpā* battled continued, both Kalanialiʻiloa and his men as well as Kaipalaoa began to make poetical references to various places including Keaʻau and other noted areas of Puna. In one part of the *hoʻopāpā*, Kalanialiʻiloa's men called out the following riddle which makes reference to the *ʻōmaʻo* bird shivering in the rain of Keaʻau:

Ke aua ala ka omao,	The omao chirps,
Ke kuululu la i ka ua,	It shivers in the rain,
No Puna i Keaau, Iwainalo la,	In Puna, at Keaau, at Iwainalo,

No Puna. (Fornander 1916-1917:589) In Puna. (Fornander 1916-1917:588)

The *hoʻopāpā* battle continued until Kalaniali‘iloa and his men were unable to retort to riddle put forth by Kaipalaoa. Kalaniali‘iloa and his men were subsequently killed, baked, and their bones stripped of flesh and Kaipalaoa was victorious over those who has killed his father Halepaki.

The Heart Stirring Story of Ka-Miki

In the story titled “The Heart Stirring Story of Ka-Miki” (*Kaʻao Hoʻoniua Puʻuwai no Ka-Miki*), published in *Ka Hōkū o Hawai‘i* (a Hawaiian language newspaper) between 1914 and 1917, tells of two supernatural brothers, Ka-Miki and Maka-‘iole, who were skilled *ʻōlohe* (competitors/fighters) and their travels around Hawai‘i Island by way of the ancient trails and paths (*ala loa* and *ala hele*), seeking competition with other *ʻōlohe* (skilled fighters). As described by Maly (1998:17):

> The narratives were primarily recorded for the paper by Hawaiian historians John Wise and J.W.H.I. Kihe (with contributions from Steven Desha Sr.). While Ka-Miki is not an ancient account, the authors set the account in the thirteenth century (by association with the chief Pili, who came to Hawai‘i with Pā‘ao). They used a mixture of local stories, tales, and family traditions in association with place names to tie together fragments of site specific history 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.

A portion of the legend set in Puna, published between October 21 and November 18, 1915, and translated by Maly (1998:17-25), describes many people and places within the district and is summarized below. During an expedition through the uplands of Puna, Ka-Miki and Maka-‘iole encountered a man named Pōhakuloa who was intently working on a large *koa* log. They were headed to Kea‘au but had lost their way. They stopped and asked Pōhakuloa for directions, but he was startled by the unexpected appearance of the brothers and replied impolitely. Taunts were exchanged between the two parties, which led to a physical altercation. It was at this point, Pōhakuloa realized that these two men were extraordinarily skilled and spiritually protected, and he quickly admitted his defeat. Pōhakuloa wished to prepare a meal and drink of *ʻawa* with his newfound friends and solicited the help of his brother-in-law, an *ʻōlohe* chief named Kapu‘euhi (also the ancient name of the Mountain View area of Puna). However, Kapu‘euhi had plans of his own. He intended to compete with and conquer the brothers but was defeated by them instead. Kapu‘euhi was infuriated by his defeat, and by Pōhakuloa’s refusal to aid in retaliation against Ka-Miki and Maka-‘iole.

Kapu‘euhi invited the brothers back to his house to partake in a meal and a particularly potent type of *ʻawa*, scheming to get them drunk. Unbeknownst to Ka-Miki and Maka-‘iole, this was common practice for Kapu‘euhi, who often housed weary travelers, intoxicated them with *ʻawa*, then killed them and stole their belongings. Kapu‘euhi waged a bet with the brothers; if they couldn’t drink five cups of the *ʻawa*, then he would throw them out and they would be at the mercy of the Puna forest. Ka-Miki and Maka-‘iole agreed and counteracted his bet with one of their own; if they were able to drink five cups, they would throw Kapu‘euhi out of his own house. The brothers prayed and chanted to their ancestral goddess and were able to consume the entire quantity of *ʻawa* without getting drunk. As agreed, upon, Kapu‘euhi was thrown out. Stunned, and angered that he was thwarted once again, Kapu‘euhi requested assistance from Kaniahiku (a much-feared Puna *ʻōlohe* and forest guardian) and her grandson Keahialaka. “At that time, Keahialaka was under the guardianship of Pānau and Kaimū, and he enjoyed the ocean waters from Nānāwale to Kaunaloa, Puna” (*Ka Hoku o Hawai‘i* October 28, 1915; translated by Maly (1998:20), which Maly suggests is symbolic of controlling those regions.

Together, Kapu‘euhi and Kaniahiku conspired to lead the brothers deep into the Puna forest, where Kaniahiku would be able to murder them, all the while maintaining the façade that they were taking them to the *ʻawa* grove of Mauānuikananuha. Once Ka-Miki and Ka-‘iole were well within the domain of Kaniahiku, she created a dark and murky environment, spreading gloomy mists and an overgrowth of twisted vegetation intended to ensnare the brothers. Ka-Miki and Maka‘iole were overcome and left for dead by Kapu‘euhi, who made his way back to safety, led by Kaniahiku’s sister. They prayed to their ancestor, Ka-uluhe-nui-hihi-kolo-i-uka for help. At once, her presence became apparent, and the brothers were able to continue to the *ʻawa* grove. Another attempt by Kaniahiku to kill the brothers was made, however, Ka-uluhe’s protection over them was too strong, and she failed.

Ka-Miki and Ka-‘iole realized that Kapu‘euhi had deceived them and had been in affiliation with Kaniahiku. They were angered and trapped him in the *ʻawa* grove. In an effort of retaliation, Kaniahiku summoned for her grandson, Keahialaka, and readied herself for a battle. Ka-Miki and Maka-‘iole reprimanded Kaniahiku for her

deceitful actions, which only served to anger her even further. Aggressively, Kaniahiku attacked Ka-Miki with her tripping club and spear, but Ka-Miki was far too elusive for her. He swiftly evaded each attempt at injury made on his behalf. In desperate need of assistance, Kaniahiku beckoned Keahialaka by playing her nose flute, urging him to hurry to her side. Although Keahialaka was strong and skillful in the arts of *ʻōlohe*, he was all too easily overcome by Ka-Miki. His grandmother was also captured, in an attempt to free him from Ka-Miki.

Kaniahiku was astounded at the dexterity of the brothers. Their skill was incomparable to any other *ʻōlohe* she had ever encountered, and even her own skill paled in comparison, for she had never been defeated. All at once, she surrendered to Ka-Miki and Makaʻiole, who in turn released her and her grandson. Back at Kaniahiku's house, a meal was prepared, the *ʻawa* of Kaliʻu was enjoyed, and the gods were honored with offerings. Kaniahiku requested that the brothers take Keahialaka with them as they continued their journey on the *ala loa*, declaring that if they did, they would be welcomed wherever their travels took them in Puna. Ka-Miki and Makaʻiole approved of this request and took Keahialaka on as their companion. Together, the three men journeyed throughout various districts of Hawaiʻi Island and competed in many *ʻōlohe* competitions.

Chiefly Rule in Puna

The following section presents a summary of the *aliʻi* rule on Hawaiʻi Island with an emphasis on the Puna District. Unlike other parts of Hawaiʻi Island where extensive literature on the area's *aliʻi* history is abundant, historical references describing the *aliʻi* history in the Puna District are limited. However, from these few historical accounts, some understanding of Puna's royal lineage can be gleaned.

The years between A.D. 1100 and 1300 are referred to as Hawaiʻi's Expansion Period. This period is characterized by the dispersal of the population from the windward into the leeward and more marginal areas of Hawaiʻi. It is also during this period that Tahitian migrations to Hawaiʻi took place (Kirch 1985). In the Puna District, the Tahitian priest Pāʻao made landfall and constructed Wahaʻula Heiau located in Pūlama Ahupuaʻa. According to Kamakau (1991:100):

> Puna on Hawaii island was the land first reached by Pāʻao, and here in Puna he built his first *heiau* for his god Ahaʻula and named it Ahaʻula [Wahaʻula]. It was a *luakini*.
>
> It is thought that Pāʻao came to Hawaiʻi in the time of the *aliʻi* Laʻau because Pili ruled as *mōʻī* after Laʻau…It is said that Hawaiʻi island was without a chief, and so a chief was brought from Kahiki; this is according to the chiefly genealogies. Hawaiʻi island has been without a chief for a long time, and the chiefs of Hawaiʻi were *aliʻi makaʻāinana* or just commoners, *makaʻāinana*, during this time.

Kamakau (1991:97) goes on to explain that Pāʻao came from "…Wawau and ʻŪpolu on an island farther south…" and after a quarrel with his brother Lonopele, left his homeland and sailed for Hawaiʻi. Once in Hawaiʻi, Pāʻao established a new religious priesthood that included the practice of human sacrificing at certain *heiau luakini*. Because of Hawaiʻi Island's apparent lack of royalty, Pāʻao sent back to his homeland for a new ruler and selected Pilikaʻaiea (Pili). The arrival of Pili to Hawaiʻi ushered in a new era of ruling chiefs and priesthood order that lasted until the reign of Kamehameha I (Beckwith 1970; McGregor 2007; Westervelt 1915a).

Known as one of the oldest *heiau* found throughout Hawaiʻi, "Wahaula was a tabu temple of the very highest rank" (Westervelt 1915a:5). According to Westervelt (1915a) the natives of Puna often chanted, "*No keia heiau oia ke kapu enaena*" which translates as "concerning this heiau is the burning tabu." So sacred was Wahaʻula that the smoke that billowed from the fires burning within the *heiau* was always watched with great anxiety by the people living in its vicinity. As reported by Westervelt (1915a:6) "this smoke was the shadow cast by the deity worshipped, and was far more sacred than the shadow of the highest chief or king in all the islands" and walking through the smoke was "sufficient cause for death." Westervelt (1915a) related the story of a young chief, who while on a circuit around the island met certain death when he encountered the smoke from Wahaʻula. He was clubbed by the Mū, the body snatchers who guarded the *heiau,* placed onto the large sacrificial stone, and killed. To prevent his bones from defilement, the spirit of the young chief visited his father, the high chief of Kaʻū, and instructed him to retrieve his bones from the *heiau*. The father followed the instructions, arrived at Wahaʻula, retrieved his son's bones, and returned them to his homeland in Kaʻū.

In the following narrative by Fornander (1880), he described the *heiau*'s general location and note of the various chiefs who made efforts to rebuild Wahaʻula. Fornander (1880:35-36) also makes an interesting reference to an assemblage of plants that were contained within the *heiau.*:

> *Paao* is said to have made his first landfall in the district of Puna, Hawaii, where he landed and built a Heiau (temple) for his god and called it *Wahaula.* The ruins of this Heiau still remain a short distance south of the village of Kahawalea [Kahauleʻa] in Puna, but it is almost impossible now to

> say what portions of it date back to the time of *Paao*, seeing that it was almost entirely rebuilt by *Imaikalani*, a noted chief over the Puna and Kau districts *tempore Keawenui-a-umi*, some twelve or thirteen generations ago, and was again repaired or improved in the time of *Kalaniopuu*, who died in1782. It was the very last Heiau that was destroyed after the tabus were abrogated by *Kamehameha II* in 1820. It was built in the quadrangular or parallelogram form which characterized all the Heiau built under and after the religious régime introduced by *Paao*, and in its enclosure was a sacred grove, said to have contained one or more specimens of every tree growing on the Hawaiian group, a considerable number of which, or perhaps their descendants, had survived when last the author visited the place in 1869.

In Fornander's (1916-1917) account of Moʻikeha, it is said that when Moʻikeha left Tahiti for Hawaiʻi, he was accompanied by several family members including his younger brothers, Kumukahi and Haʻehaʻe. Upon their arrival in Hawaiʻi, these two brothers with the permission of Moʻikeha were allowed to take up residence, and the places in which they settled bear their names to this day and are considered by some to be a significant *wahi pana* (pulsing site) in Puna. These localities, Kumukahi and Haʻehaʻe are places found in Kula Ahupuaʻa in eastern Puna. In another account associated with Moʻikeha recorded by King David Kalākaua (1888), he detailed the journey taken by Moʻikeha from Raʻiatea and their arrival in the eastern part of Kaʻū where they secured supplies and water. After leaving Kaʻū, Moʻikeha's party arrived at Kumukahi, the easternmost cape in Puna, "but a recent eruption from the crater of Kilauea, or a subterranean channel connected with it, had devastated a wide strip of country near the coast, and after a brief stay sail was made for Kohala" (Kalākaua 1888:124). In a later part of the Moʻikeha story, Fornander (1916-1917:156) noted that after Ulu, the chief of Kaʻū was sent in search of Olopana who was believed to be in Tahiti, died at sea, Kapukini who was "…a chief of Puna, was made king of Hawaiʻi…"

Kamakau (1992) reported that by the time the *aliʻi* Līloa came to power (ca. A.D. 1580-1600) Hawaiʻi Island had been divided into six major districts, with each being ruled by an independent *aliʻi*. Kamakau (1992:1) stated that during his reign, Līloa managed to consolidate his rule of Hawaiʻi Island and that "the other chiefs all around Hawaii remained under his rule and placed their sons under his rule." One of Līloa's contemporaries was Hua-ʻā, the chief of Puna. Fornander (1916-1917), however, stated that Hua-ʻā ruled part of the district while the famed blind chief of Kaʻū, ʻĪmaikalani ruled the other half of Puna. Fornander's (1916-1917:228) statement concerning Puna's joint rule with the neighboring districts is also evidenced in the Legend of Halemano which reads:

> Concerning Kamalalawalu: she was the daughter of Hanakaulua and Haehae of Kapoho, Puna, Hawaii. The parents of Kamalalawalu were chiefs of the land of Kapoho. She was a very beautiful woman to behold, far superior to all the women of Puna and Hilo, a virgin, brought up under very strict kapu; no person was allowed to see her and she had no companions other than her own brother, Kumukahi. These two had eight hundred dogs for their companions.
>
> At this time Huaa was the king of Puna, and Kulukulua was the king of Hilo. Both of these kings were courting Kamalalawalu, giving her large quantities of properties from Puna and Hilo, with the idea that in time one of them would win her hand and take her to wife.

When Līloa died, his kingdom passed to his eldest son Hākau, however, Hākau's mistreatment of the chiefs and people led to his demise, and his kingdom was seized by his half-brother ʻUmi A Līloa (Kamakau 1992). ʻUmi A Līloa, using his wit and following the advice of his *kahu hānai* (foster parent) came into power and sought to consolidate his rule of Hawaiʻi Island. After seizing the districts of Hilo and Hāmākua, ʻUmi A Līloa went on to capture the Puna District when his adopted warrior son, Piʻimaiwaʻa killed Hua-ʻā on the battlefield of Kuolo in Keaʻau (Kamakau 1992). Cordy (2000:211) and others have attributed ʻUmi A Līloa as the builder of the *heiau* atop Puʻu Kūkiʻi in Kula Ahupuaʻa in eastern Puna stating:

> Several other heiau scattered about the island are also associated with ʻUmi, said to have been built when he toured the island after coming to power. Dressed or cut-stone blocks were the hallmark of their construction. One of these heiau was Kūkiʻi heiau in Kula Ahupuaʻa in Puna. It was built atop a cinder cone, Puʻu Kūkiʻi.

Between A.D. 1640-1660, Hawaiʻi Island was under the rule of Lonoikamakahiki, a grandson of ʻUmi A Līloa (Cordy 2000). Fornander (1916-1917:272) in relating the life history of Lonoikamakahiki noted that he and his wife Kaikilani "Chiefess of Puna" took charge of the government. Later in the story, Fornander (1916-1917:318) mentioned Lililehua, the daughter of the chief Hua-ʻā as "the chief of Puna." By the early to mid-18th century, the rule of Puna appears to have toggled between the neighboring district chiefs. When the high chief Alapaʻinui died in A.D. 1752, he was succeeded by Kalaniʻōpuʻu. In A.D.1754, after many bloody battles, Kalaniʻōpuʻu, the *aliʻi ʻai moku* of Kaʻū, defeated his main rival Keaweʻōpala in South Kona and declared himself ruler over all of the island of Hawaiʻi

(Kamakau 1992). Kalani‘ōpu‘u was a clever and able chief and a famous athlete in all games of strength, but according to Kamakau (1992) he possessed one great fault, he loved war and had no regard for others' land rights. Just before Kalani‘ōpu‘u died in A.D. 1782, his rule of Puna and portions of Ka‘ū were challenged by ‘Īmakakōloa, a descendant of ‘Īmaikalani, both of whom descended from the famed ‘Ī line of chiefs. According to Fornander (1878:201-202) after Kalani‘ōpu‘u arranged "his worldly and spiritual affairs to his satisfaction":

> *Kalaniopuu* started with his chiefs and warriors for Hilo, in order to subdue the rebel chief of Puna. In Hilo *Kalaniopuu* consecrated the Heiau called Kanowa, in Puueo, to the service of his war-god; then took up his abode at Ohele, in Waiakea, and then the war with *Imakakoloa* commenced. The rebel chieftain fought long and bravely, but was finally overpowered and beaten. For upwards of a year he eluded capture, being secreted by the country-people of Puna. In the meantime *Kalaniopuu* moved from Hilo to the Kau district, stopping first at Punaluu, then at Waiohinu, then at Kamaoa, where he built the Heiau of Pakini in expectation of the capture of *Imakakoloa*. Finally, exasperated at the delay, and the refuge given to the rebal chief by the Puna people, *Kalaniopuu* sent *Puhili*, one of his Kahus, to ravage the Puna district with fire, *i.e.*, to burn every village and hamlet until *Imakakoloa* should be found or the people surrender him

According to Barrère (1959), the chiefs of the Puna District did not figure prominently in the Precontact political strife and turmoil on Hawai‘i Island. Barrère (1959:15) writes:

> Puna, as a political unit, played an insignificant part in shaping the course of history of Hawaii Island. Unlike the other districts of Hawaii, no great family arose upon whose support one or another of the chiefs seeking power had to depend for his success. Puna lands were desirable, and were eagerly sought, but their control did not rest upon conquering Puna itself, but rather upon control of the adjacent districts, Kau and Hilo.

Early Explorers and the Rise of Kamehameha I

British explorer Captain James Cook, in command of the ships *H.M.S. Resolution* and *H.M.S. Discovery*, landed in the Hawaiian Islands on January 18, 1778. The following January 17th [1779], on a return trip to Hawaiian waters, Cook anchored near Ka‘awaloa at Kealakekua Bay in the South Kona District to resupply his ships. This return trip occurred at the time of the annual *Makahiki* festival, and many of chiefs and commoners were gathered around the bay celebrating. According to John Ledyard, a British marine on board Cook's ship, upward of 15,000 inhabitants were present at the bay, and as many as 3,000 canoes came out to greet the ships (Jarves 1847:59). It has been suggested that Captain Cook was mistaken for the god Lono, as men would not normally be allowed to paddle out during *Makahiki* without breaking the *kapu* and forfeiting all of their possessions (Kamakau 1992) . On January 26th Kalani‘ōpu‘u, the reigning chief of Hawai‘i Island, visited Cook on board the *H.M.S. Resolution*, where they exchanged gifts. Kamehameha, the future ruler of all of Hawai‘i, was present at this meeting (Jarves 1847).

On February 4th, Cook set sail from Kealakekua Bay but a storm off the Kohala coast damaged the mast of the *H.M.S. Resolution*, and both ships were forced to return to Kealakekua to make repairs. With Cook's return, many of the inhabitants of Kealakekua began to doubt that he was actually the physical manifestation of Lono (Kamakau 1992). On February 13th, several natives were discovered stealing nails from the British ships. They were fired upon by the crew, and a chief close to Kalani‘ōpu‘u named Palea was knocked down, and his canoe taken. That night one of Cook's boats was stolen, and the following morning Cook set ashore at Ka‘awaloa with six marines to ask Kalani‘ōpu‘u for its return. Kalani‘ōpu‘u, however, denied any knowledge of the theft and Cook made the regretful decision to hold the chief captive until the boat was returned (Kamakau 1992). When Cook tried to seize Kalani‘ōpu‘u, however, a scuffle ensued and Cook was killed (along with four of his men and several natives) there on the shores of Ka‘awaloa, struck down by a metal dagger. When Cook fell, the British ships fired cannons into the crowd at the shore and several more natives were killed. Kalani‘ōpu‘u and his retinue retreated inland, bringing the body of Cook with them.

In March of 1779, after Cook's death, Captain King sailed along the Puna shoreline and described the district as sparsely populated, but verdant and fertile (Maly 1998). Captain King, mentioned that Kalani‘ōpu‘u had one of his residences there, and he provided the following description of the landscape:

> …the SE sides of the districts of Opoona & Kaoo [Puna and Ka‘ū]. The East part of the former is flat, coverd with Coco nut trees, & the land far back is of a Moderate height. As well as we could judge this is a very fine part of the Island, perhaps the best. Terreeoboo [Kalani‘ōpu‘u] has one of his residences here.

> On the SW extremity of Opoona the hills rise abruptly from the Sea side, leaving but a narrow border, & although the sides of the hills have a fine Verdure, yet they do not seem Cultivated, & when we saild pretty near & along this end of Opoona, we did not observe that it was equally Populous with the Eastern parts; before we reachd the East point of the Island, & all along this SE side the snowy mountain calls Roa (or extensive) [Mauna Loa] is very conspicuous. It is flattish at the top or makes what we call Table land… (Beaglehole 1967:606)

After the departure of *H.M.S. Resolution* and *Discovery*, Kalaniʻōpuʻu moved to Kona, where he surfed and amused himself with the pleasures of dance (Kamakau 1992). While he was living in Kona, famine struck. Kalaniʻōpuʻu ordered that all the cultivated products of that district be seized, and he then set out on a circuit of the island. Kalaniʻōpuʻu first went to Hinakahua in Kapaʻau, North Kohala where he amused himself with "sports and games such as hula dancing, *kilu* spinning, *maika* rolling, and sliding sticks" (Kamakau 1992:106). During his stay in Kohala, around 1780, Kalaniʻōpuʻu named his son Kiwalaʻō as his successor, and he gave the guardianship of the war god Kūkaʻilimoku to Kamehameha (Fornander 1996; Kamakau 1992). It was during his time in Kohala that an uprising, led by a highly esteemed chief of Puna named ʻĪmakakoloa, occurred. Upon hearing of the uprising, Kalaniʻōpuʻu immediately went to Hilo to quell the rebellion.

Though customary at the time to furnish the king's court with items such as "pigs, fish, taro, fruits and other forms of wealth" (Elkin 1904:26), it is said that ʻĪmakakoloa rebelled because he was tired of the incessant and exorbitant demands of Kalaniʻōpuʻu. As a chief who loved the people of Puna, and was beloved by them in return, ʻĪmakakoloa refused Kalaniʻōpuʻu's demands. He felt that "his own people who cultivated the ground should be provided with the necessaries of life, before the numbers of the royal court, who lived in idleness" (Elkin 1904:26). Rather than allow Kalaniʻōpuʻu access to the toils of the people of Puna, ʻĪmakakoloa:

> …seized the valuable products of his district, which consisted of hogs, gray tapa cloth (*ʻeleuli*), tapas made of *mamaki* bark, fine mats made of young pandanus blossoms (*ʻahu hinalo*), mats made of young pandanus leaves (*ʻahuao*), and feathers of the *ʻoʻo* and *mamo* birds of Puna. (Kamakau 1992:106)

This action angered Kalaniʻōpuʻu, who was insulted by the insubordination. He vowed revenge against ʻĪmakakoloa and devised a plan to kill him. A battle between the two chiefs ensued, and although ʻĪmakakoloa was a worthy opponent, his army was no match for Kalaniʻōpuʻu's superior force. After the battle, the Puna chief fled and was sheltered in the district by his people for more than a year. Kalaniʻōpuʻu, sworn to vengeance, ruthlessly stalked the fugitive chief for the duration of his emancipation, and in his rage, he ordered that Puna be burned to the ground. Fornander (1969:202) indicates that the district was "literally laid in ashes" as a result of Kalaniʻōpuʻu's vengeance.

While the rebel Puna chief was sought, Kalaniʻōpuʻu "went to Ka-ʻu and stayed first at Punaluʻu, then at Waiohinu, then at Kamaʻoa in the southern part of Ka-ʻu, and erected a heiau called Pakini, or Halauwailua, near Kamaʻoa" (Kamakau 1992:108). ʻĪmakakoloa was eventually captured and brought to the *heiau*, where Kiwalaʻō was to sacrifice him. "The routine of the sacrifice required that the presiding chief should first offer up the pigs prepared for the occasion, then bananas, fruit, and lastly the captive chief" (Fornander 1996:202). However, before Kiwalaʻō could finish the first offerings, Kamehameha, "grasped the body of Imakakoloʻa and offered it up to the god, and the freeing of the tabu for the heiau was completed" (Kamakau 1992:109) . Upon observing this single act of insubordination, many of the chiefs believed that Kamehameha would eventually rule over all of Hawaiʻi. After usurping Kiwalaʻō's authority with a sacrificial ritual in Kaʻū, Kamehameha retreated to his home district of Kohala.

After Kalaniʻōpuʻu died in April of 1782, and as custom dictated, all of the land held by the former chief were to be redistributed by the succeeding chief with the aid of his counselors in a process known as a *kālaiʻāina* (land division) (Kamakau 1992). Beamer (2014:45) described the importance of the *kālaiʻāina*, writing:

> Given the range and complexity of ʻŌiwi [native] land divisions, such a redistribution was no small task… This relatively uncertain portion of a mōʻī's [high chief] reign could lead to rebellion, since the mōʻī had to care for supporters as well as possible rivals when awarding lands. Tradition has shown a poorly executed kālaiʻāina could result in war if the division did not satisfy all the chiefs…

Following Kalaniʻōpuʻu's death, his son and appointed chief, Kiwalaʻō initiated the *kālaiʻāina*. Disagreements amongst the various chiefs quickly arose over Kiwalaʻō's land distribution. According to John Papa ʻĪʻī, Keōua (half-brother of Kiwalaʻō and chief of Kaʻū), requested for the lands of Waiākea, Keaʻau, and ʻŌlaʻa. In describing a conversation between Keōua and his advisor, ʻĪʻī writes:

> …perhaps you [Keōua] should go to the chief [Kiwalaʻō] and ask that these lands be given to us. Let Waiakea and Keaau be the container from whence our food is to come and Olaa the lid. Keoua did so, but the other Kau chiefs objected to this and spoke disparagingly to him. When Keoua

> returned, his advisor asked, "How was your venture?" When Keoua told him all that had been said, the man remarked seriously, "A break in a gourd container can be mended by patching, but a break in the land cannot be mended that way… (Ii 1959:14)

Several chiefs were unhappy with Kiwalaʻō's division of the island's lands, and civil war broke out. Kiwalaʻō, was killed at the battle of Mokuʻōhai, South Kona in July of 1782. Supporters of Kiwalaʻō, including his half-brother Keōua and his uncle Keawemauhili, escaped the battle of Mokuʻōhai with their lives and laid claim to the Hilo, Puna, and Kaʻū Districts. According to ʻĪʻī (1959) nearly ten years of almost continuous warfare followed the death of Kiwalaʻō, as Kamehameha endeavored to unite the Island of Hawaiʻi under one rule and conquered the islands of Maui and Oʻahu.

Fornander (1918-1919) provided an account of a subsequent battle that resulted in Kamehameha landing his war canoes in Keaʻau. Following the battle of Mokuʻōhai, a second battle known as Kauaʻawa ensued in the uplands of Kaʻū between two of Kamehameha's main rivals, Keōua and Keawemauhili. Although neither side was victorious, Kamehameha retreated to Laupāhoehoe in Hilo and planned another invasion on the chiefs of Hilo and Puna. On his second attempt to invade Puna, Kamehameha rallied his army and directed his men to land his war canoes at Pāpaʻi Bay in Keaʻau. On landing at Pāpaʻi, Kamehameha pursued some of the local fishermen intending to kill them, at which time his foot became lodged in a crevice. As he tried to free his foot, he was struck on the head with a paddle by one of the fishermen, which left him badly wounded. Under the old laws of the land, the harming of a chief meant certain death. However, in reflecting on his actions, Kamehameha pardoned the fishermen being that they were merely defending their village. It was on this account that the famous *Kānāwai Māmalahoa* was proclaimed. Fornander writes:

> Kamehameha's famous *mamalahoa* law was given by him after recovery from his serious situation and the capture of his assailants, when he uttered this decree to protect them and their people against the penalty, of the then law, of stoning to death. (Fornander 1918-1919:468)

Keōua became Kamehameha's main rival on the Island of Hawaiʻi, and he proved difficult to defeat (Kamakau 1992). Keawemauhili eventually gave his support to Kamehameha, but Keōua never stopped resisting. Around 1790, in an effort to secure his rule, Kamehameha began building the *heiau* of Puʻukoholā in Kawaihae, which was to be dedicated to the war god Kūkaʻilimoku (Fornander 1996).

Westervelt (1916) relates a story of Keōua, Keawemauhili, and Kamehameha that begins after the battle of Mokuʻōhai, but tells of another battle in ca. 1790 when Kamehameha routed Keōua at Waimea and Hāmākua and then sent men to attack Kaʻū. As Keōua attempted to return to his home district a portion of his army was killed by an eruption from Kīlauea Volcano. Westervelt writes:

> . . . Kiwalao's half-brother Keoua escaped to his district Ka-u, on the southwestern side of the island. His uncle Keawe-mau-hili escaped to his district Hilo on the southeastern side.
>
> For some years the three factions practically let each other alone, although there was desultory fighting. Then the high chief of Hilo accepted Kamehameha as his king and sent his sons to aid Kamehameha in conquering the island Maui.
>
> Keoua was angry with his uncle Keawe-mau-hili. He attacked Hilo, killed his uncle and ravaged Kamehameha's lands along the northeastern side of the island.
>
> Kamehameha quickly returned from Maui and made an immediate attack on his enemy, who had taken possession of a fertile highland plain called Waimea. From this method of forcing unexpected battle came the Hawaiian saying, "The spear seeks Waimea like the wind."
>
> Keoua was defeated and driven through forests along the eastern side of Mauna Kea (The white mountain) to Hilo. Then Kamehameha sent warriors around the western side of the island to attack Keoua's home district. Meanwhile, after a sea fight in which he defeated the chiefs of the islands Maui and Oahu, he set his people to building a great temple chiefly for his war-god Ka-ili. This was the last noted temple built on all the islands.
>
> Keoua heard of the attack on his home, therefore he gave the fish-ponds and fertile lands of Hilo to some of his chiefs and hastened to cross the island with his army by way of a path near the volcano Kilauea. He divided his warriors into three parties, taking charge of the first in person. They passed the crater at a time of great volcanic activity. A native writer, probably Kamakau, in the native newspaper *Kuokoa*, 1867, describes the destruction of the central part of this army by an awful explosion from Kilauea. (Westervelt 1916:140-141)

The untimely eruption of Kīlauea, as Keōua's army attempted to return to Kaʻū to stop Kamehameha's warriors from ravaging their home district, cost him about 400 fighting men along with an untold number of women and

children (Fornander 1996). Kamehameha's prophets said that this eruption was the favor of the gods who rejoiced at his building of Puʻukoholā Heiau. According to Westervelt, "The people said it was proof that Pele had taken Kamehameha under her special protection and would always watch over his interests and make him the chief ruler" (Westervelt 1916:146).

Unable to defeat Keōua in battle, Kamehameha resorted to trickery. When Puʻukoholā Heiau was completed in the summer of 1791, Kamehameha sent his two counselors, Keaweaheulu and Kamanawa, to Keōua to offer peace. Keōua was enticed to the dedication of the Puʻukoholā Heiau by this ruse, and when he arrived at Kawaihae, he and his party were sacrificed to complete the dedication (Kamakau 1992). It is widely thought that Keōua knew the likely outcome of his visit to Puʻukoholā Heiau, but sacrificed himself anyway to spare the people of Kaʻū from further bloodshed. The assassination of Keōua gave Kamehameha undisputed control of Hawaiʻi Island by 1792 (Greene 1993).

By 1796, with the aid of foreign weapons and advisors, Kamehameha conquered all of the island kingdoms except Kauaʻi. In 1810, when Kaumualiʻi of Kauai gave his allegiance to Kamehameha, the Hawaiian Islands were unified under a single leader (Kuykendall and Day 1976). Kamehameha would go on to rule the islands for another nine years and he and his high chiefs participated in foreign trade but continued to enforce the long-standing *kapu* system.

Accounts by Early Missionaries

The earliest account of the Puna region and Keaʻau come from the Journal of William Ellis, a member of the London Missionary Society. Six months following Kamehameha I's death in 1819, through a series of events, the *kapu* system was overthrown and the kingdom found itself in a time of extreme religious and political change. When the American missionaries arrived in 1820 (ʻĪʻī 1983) many *aliʻi* converted to Christianity with the others following their lead. When the British Reverend William Ellis arrived in 1822, Kamehameha II allowed him to stay in Hawaiʻi. The following year Ellis and the American Board of Commissioner for Foreign Missions (ABCFM) made their way around Hawaiʻi Island in search of communities within which they would establish future mission stations. During the tour, Ellis wrote of the things he saw, providing the earliest written accounts of the lifestyles of the Hawaiian people and the environment. Ellis also produced a map (Figure X) which shows the alignments of the trails they walked and some of the places they visited including Keaʻau.

Ellis entered into the Puna District from the south, along the *ala loa* (long trail), departing from Honolulu (spelt Honoruru) early, before moving onto Waiakahiʻūla where Ellis rested "under the shade of a canoe-house near the shore (Ellis 1963:224). At around noon, Ellis continued to the village inland, where Mr. Thruston and Mr. Bishop had gone to preach. Mr. Bishop had left earlier, desiring to reach Waiākea before night fall. Ellis and Thurston continued on to Keaʻau. Upon their arrival, Ellis describes Keaʻau (spelt Kaau) thusly:

> Soon after five p.m. we reached Kaau, the last village in the division of Puna. It was extensive and populous, abounding with well-cultivated plantations of taro, sweet potatoes, and sugar-cane; and probably owes its fertility to a fine rapid stream of water, which, descending from the mountains, runs through it into the sea. It was the second stream we had seen on the island.
>
> Having quenched our thirst, we passed over it by stepping on some large stones, and directed our way to the house of the head man, where we put up for the night. He was absent in the mountains, with most of his people, and Makoa could procure us no provisions. WE, however, succeeded in purchasing a fowl and some potatoes, and made a comfortable supper. While our boys were preparing it, Mr. Thurston preached to a considerable number of people who had collected outside of the house. We were afterwards joined in evening worship by the family, who at nigh furnished us with a comfortable and clean mat for our bed, an accommodation we did not always enjoy.

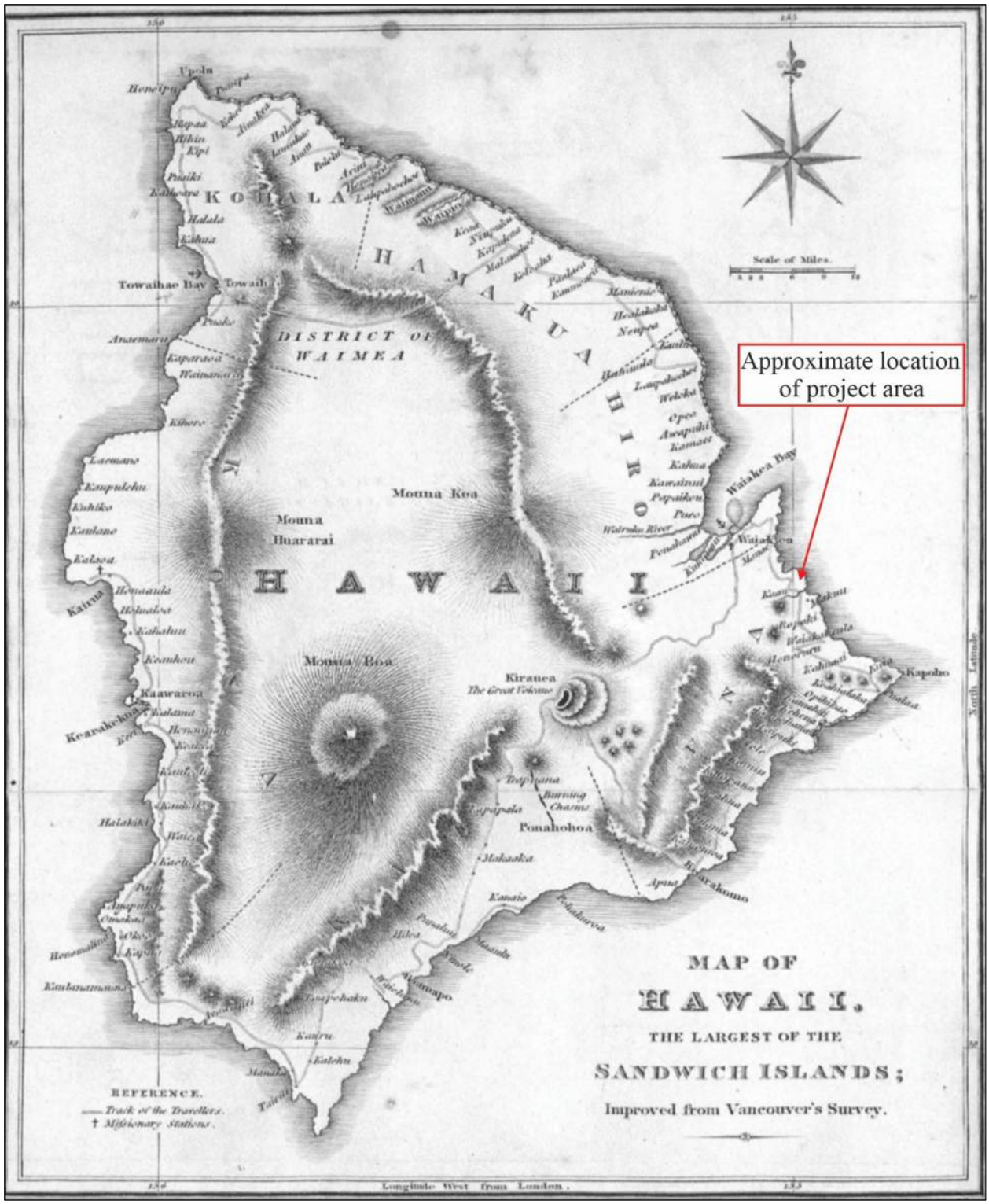


Figure 23. The island of Hawai‘i showing the route taken by Ellis in 1823 from Ellis’ Narrative – English Edition 1825; in (Fitzpatrick and Moffat 1986:87)

> Early on the 9th the house was crowded with natives, and a little before sun-rise morning worship was performed as usual.
>
> Some of natives observed, in conversation, "We shall never obtain the things of which you have told us, for we are a wicked and unbelieving people."
>
> …Before we left the place, the people offered for sale some curious deep oval baskets, with covers, made of the fibrous roots of ie. We purchased two, intending to preserve them as specimens of native ingenuity.
>
> Leaving the village of Kaau, we resumed our journey, and after walking between two and three hours, stopped in the midst of a thicket to rest, and prepare some breakfast.
>
> The natives produced fire by rubbing two dry sticks, of the hibiscus tiliaceus, together; and having suspended over it a small iron pot, in gipsy style, upon three sticks, soon prepared our food. At half-past ten we resumed our walk, and passing about two miles through a wood of pretty large timber, came to the open country in the vicinity of Waiakea. (Ellis 1963:224-225)

One year after Ellis' tour, the ABCFM established a base church in Hilo. From that church (Hāili), the missionaries traveled to the more remote areas of the Hilo and Puna Districts. David Lyman, who came to Hawai'i in 1832, and Titus Coan, who arrived in 1835 were two of the most influential congregational missionaries in Puna and Hilo. As part of their duties they compiled census data for the areas within their missions. In 1835, 4,800 individuals were recorded as residing in the district of Puna in the missionary census (Schmitt 1973); the smallest total district population on the island of Hawai'i. A year after Coan's arrival to the island, he traveled to Puna and recorded the following observations of the district's dramatic scenery:

> The district of Puna lies east and south of Hilo, and its physical features are remarkably different from those of the neighboring district.
>
> Its shore line, including its bends and flexures, is more than seventy miles in extent. For three miles inland from the sea it is almost a dead level, with a surface of pahoehoe or field lava, and *a-a* or scoriaceous lava, interspersed with more or less rich volcanic soil and tropical verdure, and sprinkled with sand-dunes and a few cone and pit-craters. Throughout its length it is marked with ancient lava streams, coming down from Kilauea and entering the sea at different points along the coast. These lava streams vary in width from half a mile to two or three miles. From one to three miles from the shore the land rises rapidly into the great volcanic dome of Mauna Loa (Long Mountain). The highlands are mostly covered with woods and jungle, and scarred with rents, pits, and volcanic cones. Everywhere the marks of terrible volcanic action are visible. The whole district is so cavernous, so rent with fissures, and so broken by fiery agencies, that not a single stream of water keeps above-ground to reach the sea. All the rain-fall is swallowed by the 10,000 crevices, and disappears, except the little that is held in small pools and basins, waiting for evaporation. The rains are abundant, and subterranean fountains and streams are numerous, carrying the waters down to sea level, and filling caverns, and bursting up along the shore in springs and rills, even far out under the sea. Some of these waters are very cold, some tepid, and some stand at blood heat, furnishing excellent warm baths. There are large caves near the sea where we enter by dark and crooked passages, and bathe by torchlight, far underground, in deep and limpid water.
>
> Puna has many beautiful groves of the cocoa-palm, also breadfruit, pandanus, and ohia, and where there is soil it produces under cultivation besides common vegetables, arrowroot, sugar-cane, coffee, cotton, or anges, citrons, limes, grapes, and other froots [sic]. On the highlands, grow wild strawberries, cape gooseberries, and the ohelo, a delicious berry resembling our whortleberry. (Coan 1882:39-40)

In 1841, missionaries documented the population of Puna at 4,371, having decreased by 429 individuals since the earlier census conducted in 1835. Coan noted that most of the inhabitants lived near the coast, although there were hundreds of individuals who lived inland (Holmes 1985). That same year, the United States Exploring Expedition under the direction of Commander Charles Wilkes, toured Hawai'i Island and traveled through the Puna District. Wilkes produced a map of Puna (Figure 24), which illustrates the coastal trail but shows only a large "Pandanus Forest" covering the lands of the project area. Wilkes described walking along the coast between Māku'u and Kea'au as well as the trail between Hilo and Nānāwale (Nanavalie) as follows:

> We passed several houses here [Nānāwale], and then proceeded on our way through Makuu Wekahika [Waikahekahe] to Keaau, where we arrived at sunset.

> In some places they have taken great pains to secure a good road or walking path; thus, there is a part of the road from Nanavalie to Hilo which is built of pieces of lava, about four feet high and three feet wide on the top; but not withstanding this, the road is exceedingly fatiguing to the stranger, as the lumps are so arranged that he is obliged to take a long and short step alternately; but this the natives do not seem to mind, and they pass over the road with great facility, even when heavy laden… (Wilkes 1845:188-193).

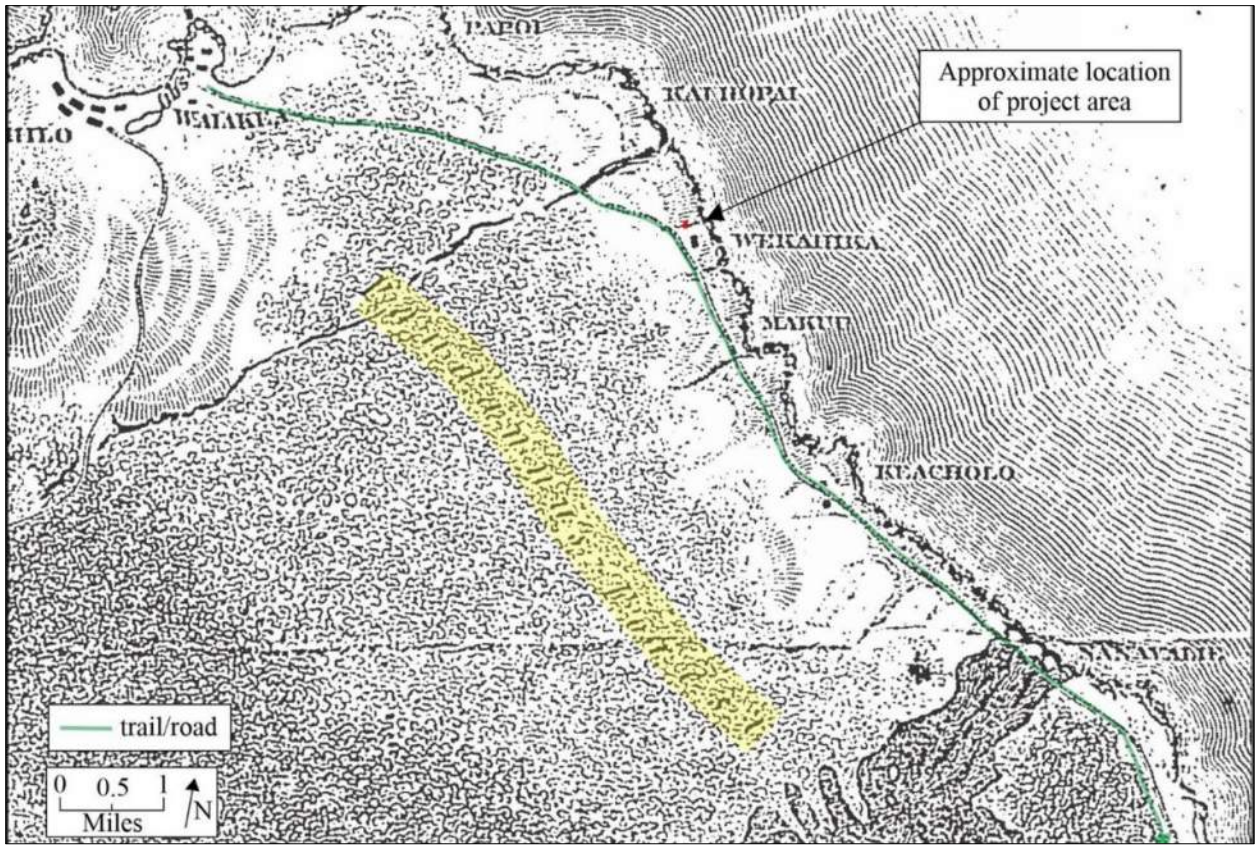


Figure 24. Portion of map titled "Part of the Island of Hawaii, Sandwich Islands, Showing the Craters and Eruptions of May and June 1840, by the U.S. Ex. 1841" (Wilkes 1845).

James J. Jarves, editor of the *Polynesian* newspaper, penned a series of articles in 1840 describing his journey through the Puna District. In one such article, Jarves spoke about traveling on a coastal Puna trail from Honolulu Ahupuaʻa (south of the project area) to Keaʻau:

> July 10. [1840] – Our course led us along the shore, formed by a wall of twenty feet in height, on which the surf rolled heavily, and loudly. The country bordering it was very picturesque with native hamlets amid shady groves. They were in primitive style, and the inhabitants appeared poor and destitute. Civilization had evidently made but little progress in this direction, and the whole scene, probably different but little from what it appeared in the days of Cook, excepting that we saw no *heiau*, or signs of idolatrous worship, or any rudeness or incivility among the people. It has the air of repose and happiness which was very gratifying, particularly in contrast with the dreary spectacle we had recently left. The men were mostly employed in fishing, but assembled readily at the sound of a conch, to attend meetings which Mr. L [Lyman] discoursed at every village we passed through. From the traces of cultivation, the numerous stone pavements, and the care bestowed in the erection of their houses, now old and out of repair, this was once no doubt a populous district. It is so now in comparison with others, but the inhabitants appear to be borne down by oppression and slavery. This cannot be attributed to missionary enterprise, for they seldom see a preacher, or attend meetings. Their labors being limited to an occasional tour through the district, and the attempt to form schools among the children, which are, however, dependent upon native teachers… (Maly 1999:in)

In 1846, Chester S. Lyman, visited Hilo and stayed with missionary Titus Coan and reported that the district of Puna had somewhere between 3,000-4,000 inhabitants (Lyman ms. Book III:3 in Maly 1998:35). Thus, less than fifty years after the arrival of the first Europeans, the population of Hawai‘i was in decline. In addition to providing population estimates, Lyman also describes walking along the coastal trail between Kea‘au and Maku‘u, which he described thusly:

> Started a little before 6 and walked two miles to a few houses on the shore, where we breakfasted in the school house …The path most of the way was on a lava bed immediately on the margin of the sea-the surf dashing beautifully at our feet. Five miles further on we came to Makuu, a small scattered village at 9 o'clock A.M. (Lyman ms. Book III in Maly 1999:37)

By 1850, the population of Hawai‘i Island had dropped to 25,846 individuals (Schmitt 1973:8). Maly summarized the reasons for the rapid decline of native populations thusly:

> Overall, historic records document the significant effect that western settlement practices had on Hawaiians throughout the islands. Drawing people from isolated native communities into selected village parishes and Hawaiian ports-of-call, had a dramatic, and perhaps unforeseen impact on native residency patterns, health, and social and political affairs. In single epidemics hundreds, and even thousands of Hawaiians died in short periods of time (Maly 1998:36).

The *Māhele ‘Āina* of 1848

By the mid-nineteenth century, the ever-growing population of Westerners in the Hawaiian Islands forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership. By 1840 the first Hawaiian constitution had been drafted and the Hawaiian Kingdom shifted from an absolute monarchy into a constitutional government. Convinced that the feudal system of land tenure previously practiced was not compatible with a constitutional government, the King (Kamehameha III) and his high-ranking chiefs decided to separate and define the ownership of all lands in the Kingdom (King n.d.). This change was further promoted by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that could be taken from them at any time. After much consideration, it was decided that three classes of people each had one-third vested rights to the lands of Hawai‘i: the King, the chiefs and *konohiki*, and their tenants (the *maka‘āinana* or common people). In 1845, the legislature created the "Board of Commissioners to Quiet Land Titles" (more commonly known as the Land Commission), first to adopt guiding principles and procedures for dividing the lands and granting land titles, and then to act as a court of record to investigate and ultimately award or reject all claims brought before them. All land claims, whether by chiefs for entire *ahupua‘a* or by tenants for their house lots and gardens, had to be filed with the Land Commission within two years of the effective date of the Act (February 14, 1846) to be considered (this deadline was extended several times for chiefs and *konohiki*, but not for commoners (Soehren 2005).

The King and some 245 chiefs (Kuykendall 1938) spent nearly two years trying unsuccessfully to divide all the lands of Hawai‘i amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (King n.d.). Once the King and his chiefs accepted the principles of the Privy Council, the *Māhele ‘Āina* (Land Division) was completed in just forty days (on March 7, 1848), and the names of all of the *ahupua‘a* and *‘ili kūpono* (nearly independent *‘ili* land division within an *ahupua‘a*, that paid tribute to the ruling chief and not to the chief of the *ahupua‘a*) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the *Buke Māhele* (Buke Māhele 1848). As this process unfolded King Kamehameha III, who received roughly one-third of the lands of Hawai‘i, realized the importance of setting aside public lands that could be sold to raise money for the government and also purchased by his subjects to live on. Accordingly, the day after the division with the last chief was recorded in the *Buke Māhele*, King Kamehameha III commuted about two-thirds of the lands awarded to him to the government (King n.d.). Unlike the King, the chiefs and *konohiki* were required to present their claims to the Land Commission to receive their awards (LCAw). The chiefs who participated in the *Māhele* were also required to provide to the government commutations of a portion of their lands in order to receive a Royal Patent giving them title to their remaining lands. The lands surrendered to the government by the King and chiefs became known as "Government Land," while the lands retained by Kamehameha III as his personal property became known as "Crown Land," and the lands received by the chiefs became known as "*Konohiki* Land" (Chinen 1958:vii; 1961:13). All lands awarded during the *Māhele* 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.

As a result of the *Māhele*, Kea‘au Ahupua‘a in its entirety was awarded as *Konohiki* Land to William C. Lunalilo as *‘āpana* (lot) 16 of LCAw 8559B (Figure 25). The Royal Patent (no. 7223), which conveyed an absolute fee simple

title to Kea‘au Ahupua‘a was not issued until 1879 by King Kalākaua, some five years after Lunalilo’s death (Figures 26 and 27). Kea‘au Ahupua‘a was one of sixty-five *ahupua‘a* maintained by Lunalilo following the *Māhele* (Kame‘eleihiwa 1992). The sixty-five *ahupua‘a* that he maintained as part of his personal land holdings were spread across six islands; Hawai‘i (n=31 *ahupua‘a*) of which, eight were in Puna; Maui (n=15 *ahupua‘a*); Lāna‘i (n=1 *ahupua‘a*); Moloka‘i (n=2 *ahupua‘a*); O‘ahu (n=9 ahupua‘a); Kaua‘i (n=7 *ahupua‘a*) (Kame‘eleihiwa 1992:236-237). Next to the *mō‘ī*, Kauikeaouli, Lunalilo ranked second for having the most lands as a consequence of the *Māhele*. Fearing that his son’s drinking habit and wasteful spending would lead to a total loss in the new capitalist system, in 1858, Lunalilo’s father, Charles Kana‘ina petitioned the court to appoint guardians to manage his son’s estate. The court concurred and subsequently appointed Kana‘ina, Armstrong, and J.W. Austin as guardians of his estate (Kame‘eleihiwa 1992).

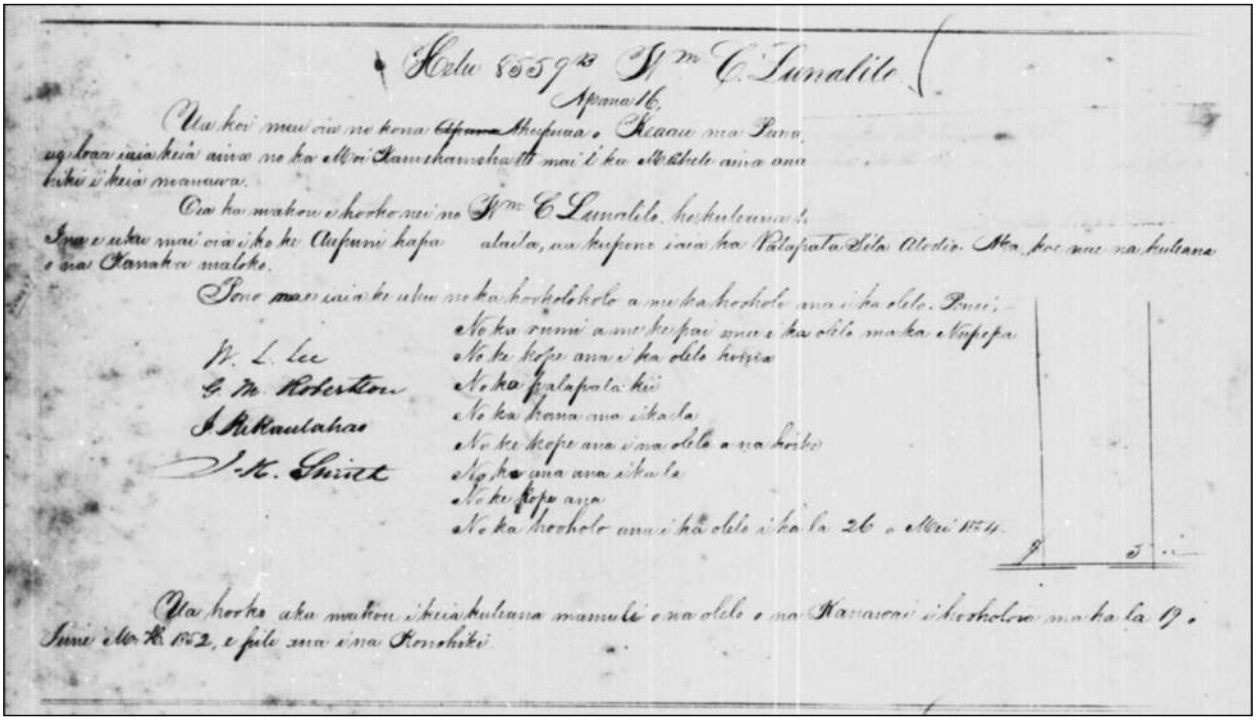
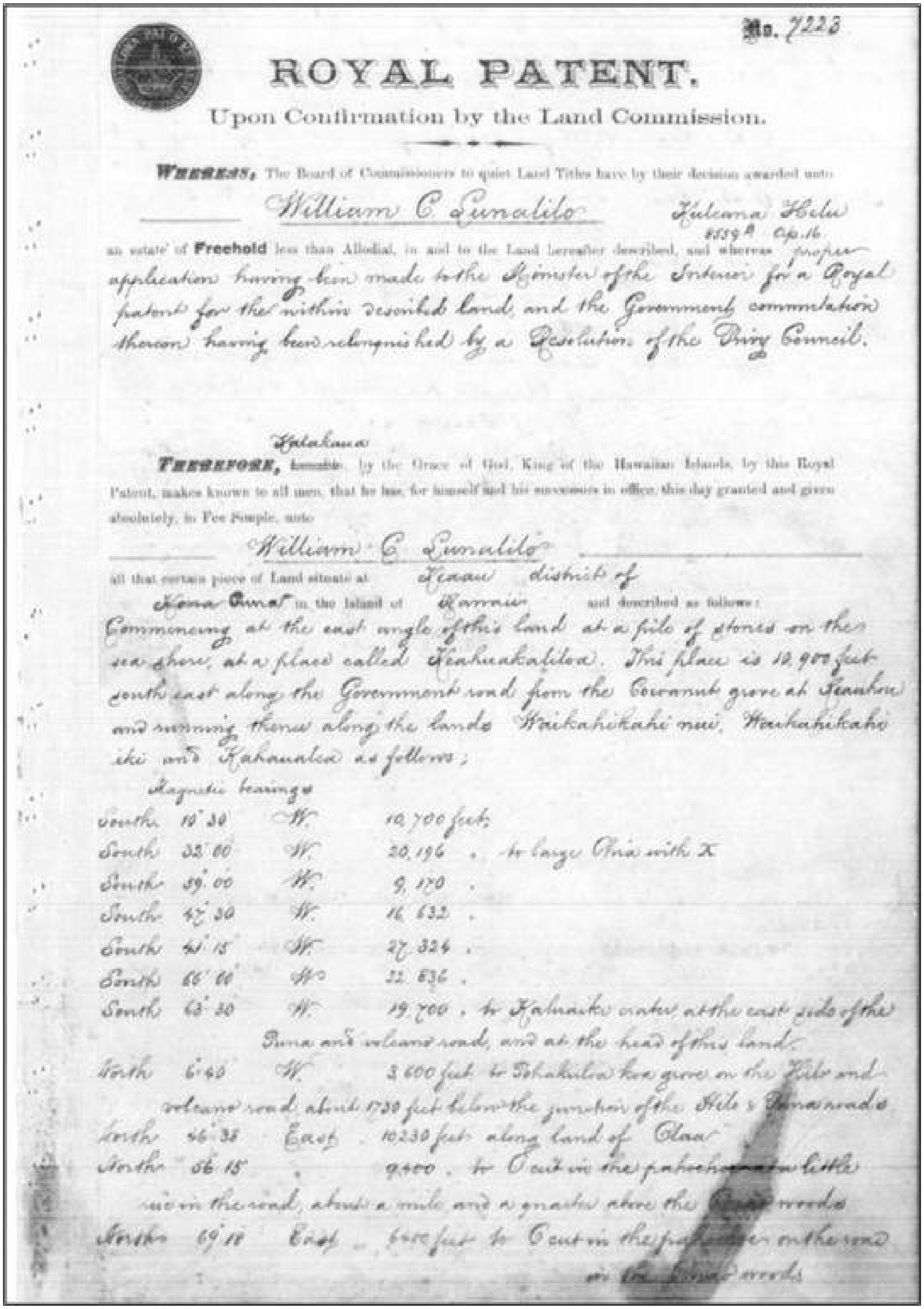


Figure 25. Land Commission Award 8559B *‘āpana* 16 to William C. Lunalilo (kipukadatabase.com).



No. 7223

ROYAL PATENT.

Upon Confirmation by the Land Commission.

WHEREAS, The Board of Commissioners to quiet Land Titles have by their decision awarded unto

William C. Lunalilo Kuleana Hilo 8559B Ap. 16

an estate of Freehold less than Allodial, in and to the Land hereafter described, and whereas proper application having been made to the Minister of the Interior for a Royal patent for the within described land, and the Government commutation thereon having been relinquished by a Resolution of the Privy Council.

THEREFORE, Kalakaua by the Grace of God, King of the Hawaiian Islands, by this Royal Patent, makes known to all men, that he has, for himself and his successors in office, this day granted and given absolutely, in Fee Simple, unto

William C. Lunalilo

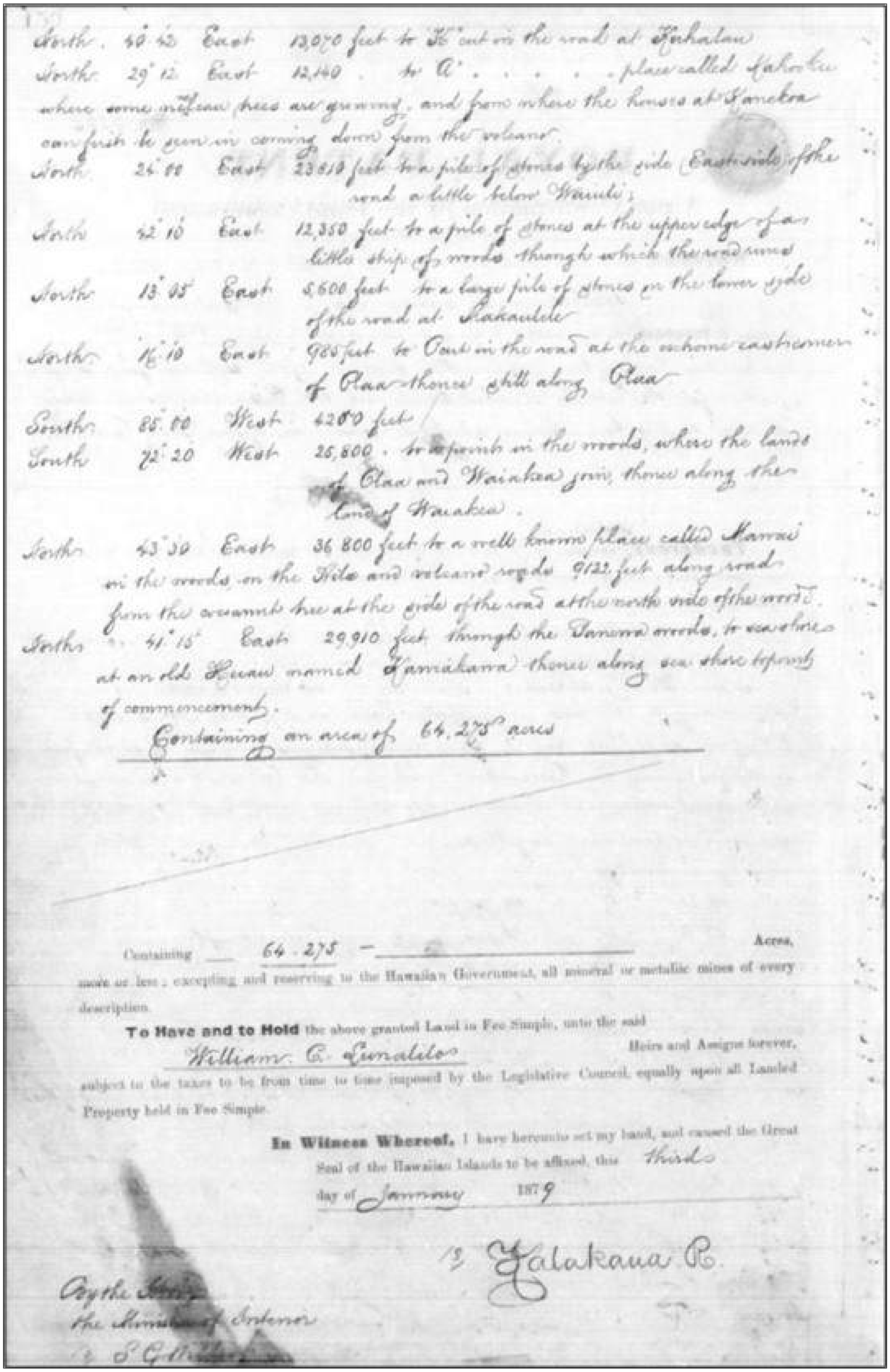
all that certain piece of Land situate at Keaau district of Kona Puna in the Island of Hawaii and described as follows:

Commencing at the east angle of this land at a pile of stones on the sea shore, at a place called Keahuakalikoa. This place is 10,900 feet south east along the Government road from the Cocoanut grove at Keaukaha and running thence along the lands Waikahikahi nui, Waikahikahi iki and Kahaualea as follows;

Magnetic bearings

South	10° 30'	W.	10,700 feet;	
South	33° 00'	W.	20,196	to large Ohia with X
South	39° 00'	W.	9,170	
South	47° 30'	W.	16,632	
South	41° 15'	W.	27,324	
South	66° 00'	W.	11,836	
South	63° 30'	W.	19,700	to Kalua... crater at the east side of the Puna and volcano road, and at the head of this land.
North	6° 40'	W.	3,600 feet	to Pohakuloa koa grove on the Hilo and volcano road about 1730 feet below the junction of the Hilo & Puna roads
North	46° 35'	East	10230 feet	along land of Olaa
North	56° 15'		9400	to O cut in the pahoehoe a little ... in the road, about a mile and a quarter above the ... woods
North	69° 18'	East	6400 feet	to O cut in the pahoehoe on the road in the ... woods

Figure 26. Royal Patent 7223 for Kea‘au Ahupua‘a issued to Lunalilo in 1879 by King Kalākaua (kipukadatabase.com).



North 40 42 East 13,070 feet to K cut in the road at Kahalau
North 29° 12 East 12,140 . to A . . . . . place called Kahoku
where some ohia trees are growing, and from where the houses at Kaneka
can first be seen in coming down from the volcano.
North 26° 00 East 23,810 feet to a pile of stones by the side East side of the road a little below Waiuli;
North 32° 10 East 12,350 feet to a pile of stones at the upper edge of a little strip of woods through which the road runs
North 13° 05 East 5,600 feet to a large pile of stones on the lower side of the road at Kakaulele
North 16° 10 East 985 feet to Ouli in the road at the extreme east corner of Olaa thence still along Olaa
South 85° 00 West 4200 feet
South 72° 20 West 26,800 . to a point in the woods, where the lands of Olaa and Waiakea join, thence along the land of Waiakea.
North 43° 30 East 36,800 feet to a well known place called Mawae in the woods on the Hilo and volcano roads 9122 feet along road from the ornament tree at the side of the road at the north side of the woods
North 41° 15' East 29,910 feet through the Panaewa woods, to sea shore at an old Heiau named Kamakaiwa thence along sea shore to point of commencement.
Containing an area of 64,275 acres

Containing 64.275 – Acres,
more or less; excepting and reserving to the Hawaiian Government, all mineral or metallic mines of every description.

To Have and to Hold the above granted Land in Fee Simple, unto the said William C. Lunalilo Heirs and Assigns forever, subject to the taxes to be from time to time imposed by the Legislative Council, equally upon all Landed Property held in Fee Simple.

In Witness Whereof, I have hereunto set my hand, and caused the Great Seal of the Hawaiian Islands to be affixed, this third day of January 1879

Kalakaua R.

By the King
the Minister of Interior
S. G. Wilder

Figure 27. Continuation of Royal Patent 7223 (kipukadatabase.com).

The Kuleana Act of 1850

As the King and his *ali‘i* and *konohiki* made claims to large tracts of land via the *Māhele*, questions arose regarding the protection of rights for the *hoa‘āina*. To resolve this matter, on August 6th, 1850, the Kuleana Act (also known as the Enabling Act) was passed, clarifying the process by which native tenants could claim fee simple title to any portion of lands that they physically occupied, actively cultivated, or had improved (Garovoy 2005). The Kuleana Act also clarified access to *kuleana* parcels, which were typically landlocked, and addressed gathering rights within an *ahupua‘a*. Lands awarded through the Kuleana Act were and still are, referred to as *kuleana* awards or *kuleana* lands. The Land Commission oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw) (Chinen 1958). Native tenants wishing to claim their lands were required to register in writing those lands with the Land Commission, who assigned a number to each claim, and that number (the Native Register) was used to track the claimant through the entire land claims process. The native tenants registering their *kuleana* were then required to have at least two individuals (typically neighbors) provide testimony to confirm their claim to the land. Those testimonies given in Hawaiian became known as the Native Testimony, and those given in English became known as Foreign Testimony. Upon provision of the required information, the Land Commission rendered a decision, and if successful, the tenant was issued the LCA. Finally, to relinquish any government interest in the property, the holder of an LCA obtained a Royal Patent Grant from the Minister of the Interior.

The work of the Land Commission was completed on March 31, 1855. A total of 13,514 *kuleana* were claimed by native tenants throughout the islands, of which 9,337 were awarded (Maly 2002). In Puna, very few claims for *kuleana* were submitted and Maly (1998:37) noted that, with the exception of the islands of Kaho‘olawe and Ni‘ihau, no other land division of comparable size, had fewer claims for *kuleana* from native tenants than the district of Puna. Only two *kuleana* were awarded within the Puna District and both were for parcels in Kea‘au Ahupua‘a. The first of these was for a 13.64-acre parcel in the *‘ili* of Halauloa to Hewahewa as LCAw. 8081:2 containing only a single cultivated garden. The other was a 0.34-acre parcel in the *‘ili* of Kalaihina to Barenaba as LCAw. 2327:1. Hewahewa’s parcel is located east of present-day Kea‘au Town and Barenaba’s parcel is within a forested area east of the present-day Pikake Street within the Hawaiian Acres Subdivision; neither are within or near the project area. These two *kuleana* awards are summarized in Table 4.

Table 4. Summary of Kuleana Awards in Kea‘au Ahupua‘a.

Awardee	*LCAw No.*	*Acres*	*Royal Patent No*	*Year Awarded*	*‘Ili name*	*Land Use*
Hewahewa	8081:2	13.64	4360	1859	Halauloa	Cultivated garden
Barenaba	2327:1	0.34	7602	1882	Kalaihina	Houselot
Total	**-**	***13.98***	**-**	**-**	**-**	**-**

Boundary Commission Testimony (1862-1876)

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Hawaiian Kingdom to legally set the boundaries of all the *ahupua‘a* 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 *ahupua‘a* 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, *ahupua‘a* boundaries were established by conducting surveys on adjacent *ahupua‘a*. In cases where the entire *ahupua‘a* 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 *ahupua‘a*. Although these surveys aided in establishing the boundaries, they lack the detailed knowledge of the land that is found in the Boundary Commission hearings.

As a result of an application submitted by C. R. Bishop for the settlement of the boundaries of the Kea‘au Ahupua‘a, a notice was published in *The Hawaiian Gazette* newspaper beginning on the fourth of May that year and ran for the entire month, soliciting individuals for testimony. In addition, agents and owners of the adjoining lands were also personally informed of the hearing (Boundary Commission 1874:195). Testimony regarding the boundaries of Kea‘au were provided to the Boundary Commission by five individuals, Uma, Puaa, Kanoi, Nailima, and Naipo, on June 4th, 1873, at the Hilo courthouse (Boundary Commission 1874:191-198). A sixth testimony was given the

following Monday, June 9th, 1873 by Keoki. Keoki's testimony is less detailed concerning Kea'au Ahupua'a and may have been the cause for the continuation of the hearing. Conversely, Uma and Puaa's testimonies provide insights regarding the traditional landscape and practices of Kea'au. Uma, a native of Keauhou, Kea'au, testified to the boundaries of Kea'au as learned from his parents. For readability, place names have been bolded; Hawaiian terms have been italicised, and cultural practices and resources have been underlined for emphasis. The testimonies are as follows:

> Uma K. sworn, says
>
> I was born at **Keauhou** at **Keaau**, **Puna** at the time of the return of Kamehameha from **Kaunakakai**, **Molokai** [ca. 1791], I have always lived there and know the boundaires between **Keaau** and **Waikahekahe**. My parents pointed them out to me when we went after birds and sandle wood. **Waikahekahe Nui** joins **Keaau** at sea shore at **Keauhuokaliloa**, a rock that looks like a human body, which is between two points; the point on **Waikahekahe** is called **Kaluapaa** and the one on **Keaau Keahuokaliloa**; thence the boundary runs *mauka* to place called **Koolauo**. The *pahoehoe* on the North side is **Keaau** and the good ground where cocoanut trees grow is on **Waikahekahe**. In past days there was a native village at this place. Thence *mauka* to **Halaaniani** (*he kupuna*) where the old road from **Kalapana**, used to run to **Koolauo**. Thence the boundary runs to **Wahikalau**, ...cave, the boundary runs to …thence *mauka*, to another cave called **Olioliana** and where people used to hide in time of war. At this cave **Waikahekahe Nui** ends and **Waikahekaheiki** joins **Keaau**. Thence the boundary runs along **Waikahekaheiki** *mauka* to **Laeopuula**; an old *kauhale he ahua pahoehoe*. **Keaau** on the **Hilo** side of the road running *mauka*. Thence to **Kikinui** an *old kauhale* for bird catchers thence to **Hoolapehu** another old village, thence to **Alaalakeiki**, which is the end of **Waikahekahe Iki** and **Kahaualea** joins **Keaau**. This place is at an old *kauhale manu* [bird catchers' compound] (opposite a rise of ground, above the seventeen mile post, on the **Volcano road**, about two miles above **Kanekoa**), thence *mauka* to **Palauhulu**, an *ahua* [rise] on the road to **Kilauea**, at the place where the road to **Panau** brancher off. The boundary between **Keaau** and **Kahaualea** is on the South east side of **Palauhulu** about as far away from Hilo Court House to seashore. Thence the boundary runs *mauka* to **Omaolaulau** (*he oioina* [a resting place] on *pahoehoe*) near the woods at Reed's bullock pen the boundary of **Keaau** is about as far from the **Government road** as from the Hilo Court house to the Government School house. Thence *mauka* to **Keekee**. *Kauhale kahi olona* in **Olaa**, the boundary is a short distance from the **Government road**, on the South East side. Thence to **Kauanahunahu** (*he oioina*) this place is on **Keaau**, and the boundary runs to the South East side of it. This is at the high ground where you can look down in the woods where the bullock pen is, thence to **Kawaioeoe**, a large water pond (South east side of the road.) The boundary of **Keaau** and **Kahaualea**'s close to the pond, on the South East side. Thence *mauka* to **Kalaninauli** the land on the land on the south east side being only about six chains wide thence to **Puuenaena** (large *ohia* trees on the road *makai* of the koa woods) a short distance South East of the **Government road**. Thence the boundary runs *mauka* to a place called **Pohakuloa**, a small cave south east of the **Government road**, and a very short distance above the *koa* woods, on the **Government road** to **Kilauea**. Thence **Keaau** is cut off by **Keauhou**. **Olaa** bound **Keaau** on the north west side. **Keauhou** cuts **Keaau** off to **Government road** to **Kilauea**, then runs *makai* along the **old Government road**, through the *koa* woods. **Olaa** being on the North side of the road and **Keaau** on the south east side. Thence down the road passing these points **Palauhulu** and **Kapueuhi**, thence *makai* to **Kahooku** thence to **Kanekoa**, the houses on the South East side of the road are on **Keaau**, those on the other side are on **Olaa**, thence to **Kamakihi** (14 mile post). Thence to **Kalehuapuaa** (where there is a *mauka* road which goes to Hawelu's) thence to **Kaahakanaka**, on the outer road passed Hawelu's thence to **Kaluakaiole** *mauka* of where Haanio road in **Kukulu** leaves the present traveled road, thence to **Mahinaakaaka** on the outer road, outside of **Kahuku**, thence down to where Kahopuaku's houses used to be (**Makaulele**) along the old road, this is as far as I know the boundaries between **Olaa** and **Keaau**. Kahopuaku's houses were on **Olaa**. Have heard that **Mawae** is the boundary between **Waiakea** and **Keaau**, on the **Government road** to Puna, and, along to **Olaa**, have heard that **Kau** to **Kawaa** is the boundary at the Sea shore between these two lands. I have not seen this place, the sea bounds **Keaau** on the *makai* side. Ancient fishing rights including the *Uhu* which was *Konohiki* fish, extending out to sea. (Boundary Commission 1874:191-193; Maly and Maly 2003:344-345; 2004:49-50)

Puaa sworn, says

I live on **Ponohawai**, was born in **Kau** at time of Heouamua, (one of Kamehameha 1st battles) I came to **Keaau** and lived there two years, when I was a boy. Have lived on **Waiakea** a great many years in 1860 returned to **Keaau** and had charge of the land for Nine years, … I heard what some of the boundaries were and went and saw them. Uma the last witness and Kalina-kaluuli now at **Keaau** and Hooao Kaunaana of **Waiakahekahe** who is (now …) went with me. I never heard of any dispute about boundaries between **Keaau** and **Waikahekahe** is the land of , …**Keauhouokaliloa**, thence *mauka* along **Waihakehake** to *pahoehoe*, on the **Hilo** side of a place called **Kukuikea**, where the natives collected food, and where had fruit trees grow. Thence to **Hilo** side of **Waiamahu** a large place that fills with water in the rainy season, thence to **Koolano** the *pahoehoe* on the **Hilo** side of it is **Keaau** the sail is on **Waikahekahe nui** thence *mauka* along the road to **Halaaniani**, **Keaau** is on the **Hilo** side of road **Halaaniani** is a *puupahoehoe*, in a grove of *ohia* trees, called **Keakui**, about as far as from Hilo Court House to Wailuku bridge, on **Hilo** side of **Halaaniani**, is **Keaau**, thence to two hole or caves, where people used to live the boundary running between these caves *mauka* to **Olieolimaneinei** *he oioina*, on **Puna** side of a cave called **Olioliana** where people used to hide in time of war, there **Waikahekahenui** end and **Waikahekahe iki** joins **Keaau**, and bounds it, I have been to a place on the boundary between **Waikahekahe iki** and **Keaau**, but I do not remember the name of the place, do not know where **Waikahe-kahe iki** ends. **Keaau** ends a little above the cave at **Pohakuloa**, and is cut off by **Keauhou**, Uma told me this. Nalima of **Olaa** told me **Keaau** ended at **Kalaninauli** . He told me this when …is *konohiki* of **Keaau**, …of the **Olaa** people told me, **Keaau** ended at **Palau-hulu**, Kara told me that **Kahaualea** cuts both **Waiakahekahe**'s off. I think at a point outside of **Kanekoa**, he did not tell me where, have heard that **Waikahekaheiki** runs close to **Kilauea**. Kaoo is a *kamaaina* of **Waikahekahe** have always been told that the road from **Hilo** is between **Keaau** and **Olaa**, until you get to **Makaulele** below Kahopunakui's house, to a place called **Kilohana** where oranges are growing, there the boundary of **Keaau** and **Olaa** leave the **Volcano road** and runs *mauka* above these orange trees, thence to an *ohia* grove called **Puaaehu**, thence to **Waiaele** a place in the woods on the **old road to Olaa** I have only been there once, **Olaa** is on the *mauka* side of this place, and **Keaau** on the *makai* side and **Waiakea** on the **Hilo** side at **Mawae** **Waiaele**, a water spring, with banana trees growing near it used to be an old *kauhale* **Mawae** is on the **Hilo** side of **Waiaele**, about as far as from here to **Kalepolepo**. It is a large crack that runs from the upper edge of the woods to shore and is the boundary between **Keaau** and **Waiakea**. **Keaau** is *makai* of the road from **Waiaele** to **Mawae**, and **Olaa** is *mauka*. **Mawae** is the boundary between **Keaau** and **Waiakea** a large crack running across the **Government road** to **Olaa**, and across the **Government road** (*makai* road) to **Puna**, and thence to **Kawaiakawa** a sort of *awaawa* at shore, point of **Kalipulu** at **Papai**, and point of **Paukupahu**, the *mawae* runs between the two **Kawiakawa**, is some distance on the **Puna** side of the cocoanut trees on **Pauku-pahu**, Alai and others whose names I do not remember, told me these boundaries when we used to travel over the **old road to Olaa** I went through there once, the road used to go from **Pooholua** to **Olaa**. The persons I went with are all dead. (Boundary Commission 1874:193-195)

Kanoi K. sworn, says

I was born at **Kapapala** in **Kau** , at the time of the building of **Kiholo** [ca. 1811] lived there until a few years since; know the land of **Keaau** and the boundaries on the mountain adjoining **Kahaualea**. The upper end of **Keaau** is bounded on the South East-side by **Kahaualea**, and on the *mauka* side by **Keauhou** and on the Northwest side by **Olaa**; **Kaheana**, **Kaihe Kaheana**, and **Makanui** my *kupuna* showed me some of the boundaries of these lands. Kaheana was from **Panau**, **Puna** and Kaihe was from **Kau**. These two men, with others from **Kapapala** showed me boundaries between **Keauhou** and **Kahaualea** where we went after the *oo* on **Keauhou**. Went after sandalwood on **Kahaualea**. **Keauhou** cuts **Keaau** off at **Pohakulao**, the *huina alanui* [road intersection], where the marks or sign board is at the junctions of the **Hilo and Puna roads** this side of the **Kilauea** House, the name of this place is **Halemaumau**. The boundary of **Keaau** runs *makai* along the Puna road to **Kaluaiki**, a small crater, at a place where the road runs between two craters. Onto the *mauka* side of crater **Kaluaiki**, said crater is on **Kahaualea** and **Keauhou** is on the South side of the road. **Keaau** and **Kahaualea** lay side and side, from **Kaluaiki** to **Nawailoloa**, a place on the road from

Palauhulu to **Panau**. **Kaluaiki** is about as far **Pohakuloa** as from Hilo Court House to Kaina's house at **Alenai**. **Nawailola** and **Kilohana**, two ponds of water, on the road to **Panau** from **Palauhulu**, from **Nawailola** the boundary between these two lands runs mauka to a grove of *Ohia* trees called **Namauuokalahili**, thence *mauka* to **Puukea** a hill in the woods where we used to go after sandalwood, thence *mauka* to **Namamokalei** where we used to catch *uwao*[ʻua'u]. This place is opposite to **Kauanahunahu**, *mauka* of **Keekee** about a mile. Thence to **Kaluaiki**. I have often been to these points from **Waiuli** to **Pohakuloa**. I have always heard that the **old Government road** to Kilauea is the Boundary between Keaau and Olaa, I do not know the *makai* boundaries. (Boundary Commission 1874:195-196; Maly and Maly 2004:50)

Nailima [K.] sworn, says:

(same witness as for Olaa) I was born at **Olaa**, and know the boundaries between **Olaa** and **Keaau**. My *kupuna*, now dead, showed them to me. **Keaau** ends at **Halemaomao** at the junction of the **Hilo** and **Puna road**. **Olaa** on the **Hilo** side of the road and **Keaau** on the **Puna** side. Thence *makai* to **Pohakuloa**, thence *makai* to **Puuenaena** (big *ohia* trees) thence to **Kalaninauli**, so called by Nahienaena. Thence to **Waiaiai**, thence to **Kohelehulehu**, thence to **Keanapapa** at the 24 mile post thence to **Kauanahunahu**, thence to **Keekee** thence to **Omalaulau** (at *ohia* woods and the bullock pen) thence to **Pohakuloa**, thence to **Palauhulu**, thence to **Kawaikahoohia**. Thence to **Kawaa** [**Kāwā**], thence to **Kaialuawai**, thence to **Kaluamanuahi**, to **Kaleinakeakua**, which is at the 18 mile post, thence to **Pahookui**, thence to **Pohakuloihi**, to **Punahaha**, 17 mile post, thence to **Kapuamau**. Thence to **Kawaiaiai**, thence to **Kapae**, 16 mile post, thence to **Kanekoa**, thence to **Mokuhaaheo**, thence to **Mahiki**, to **Kahau**, to **Puualae** , to **Kaleiki**, to **Kanukea**, thence to **Umihali** at the fifteen mile post, thence to the boundary runs to **Kalehuapuaa**, *mauka* of the road to Hawelu's house (thence to **Kaahakanaka**, outer road to Hawelu's house). Thence follow the outer road to **Popoiwi**, where Haanio's road branched off to go to **Kukulu**. Thence follow the outer road to **Mahinaakaaka**, opposite **Kahuku**, thence to **Kapuhu**, an *ohia* grove, where the road turns towards Hilo on the *makai* side, thence to **Ahuapuu**, a *puu hala* tree by the road, thence to **Makaulele**, a little *makai* of this place, **Keaau road** joins at this point the boundary leaves the **Hilo road**, and turns *mauka* along **Olaa**, to **Kilohana**, an *ahua* or mound with orange trees. Thence the boundary runs up *mauka* along *awaawa* on **Kau** side of **Kilohana**, up a hill covered with *puu hala*, thence to *pali* **Puaaehu**, the boundary of the brow of *pali*, this side of **Keaani**, which is the name of an *ohia* grove on the side of the *pali*, some distance *mauka* of Haanio's road, thence to **Kaanamanu** a place inside the woods. I have never been there and only heard of this place. Thence to **Kaaipuaa**, an old village, where people used to live. Thence to **Waiaele**, a pond of water with *aweoweo* growing in it. Said pond is on the old road from **Olaa** to **Pooholua**. Have heard **Waiakea** joins **Olaa** and **Keaau** at **Waiaele**, **Mawae** is near there and have always heard that it is the boundary between Keaau and **Waiakea** from the **Government road** to Olaa, seashore **Kawiakawa** is at sea shore. (Boundary Commission 1874:196-197; Maly and Maly 2004:51-52).

Naipo [K.] Sworn, says

Was born at **Waiakea** at the time of Peleleu. Have always lived on **Waiakea** and **Keaau**, Keliinohopuu, my father, Ku, his brother and Kapuli (all dead) showed me boundaries. They told me **Kapohakukau**, a large rock on the point at shore is the the boundary between **Waiakea** and **Keaau**; thence *mauka* along **Waiakea** to **Kawiakawa** a small cave where natives worhipped idols, the boundary runs up *mauka* in *awaawa*; **Keaau** on the Puna side and **Waiakea** on the **Hilo** side to **Mawae** on the **lower Government road** to **Puna**. Boundary at the bottom of the *pali*, thence up along the *mawai* to ***mauka* Government road** to **Olaa**, I have not been along this *mawai* but have always heard that is runs from lower to upper road, my parents told me **Keaau** ended at **Waiaele**. The sea bounds **Keaau** on the *makai* side and the land had ancient fishing rights extending out to sea. Do not know boundaries on the other side of the land. (Boundary Commission 1874:197-198; Maly and Maly 2003:344-345)

At the end of the day, the hearing was adjourned until the following Monday, June 9th with single testimony being given before the case was "continued until further notice" by R. A. Lyman. The testimony given on June 9th, 1873, is as follows:

> Keoki K. sworn, says
>
> Was born at **Keaau** at the time of Hoolulu collection of sandal wood at **Mokohai** I have always lived at **Keaau**, Uma pointed out the boundaries to me, when the *haole* went to survey land, I knew some of the boundaries before Uma told me. (Boundary Commission 1874:198)

Kea‘au and the Greater Puna Post Māhele

Although exposed to missionary presence since the 1820s, early pre-*Māhele* narratives portray Puna as a district still heavily rooted in tradition, being only marginally impacted by foreign influence. While earlier narratives describe the region as densely populated with settlements present at both coastal and inland settings, subsequent accounts reveal a sharp decline in the native population throughout the first half of the 19th century, with Hawaiians maintaining marginalized communities outside of the central population centers. Within a quarter of a century, Puna's population deteriorated by more than half from 4,800 in 1835 to 2,158 in 1860 (Anderson 1865), and continued decreasing to a mere 1,043 by 1878, reaching an unsurpassed low of 944 by 1884 (Thrum 1885, 1886).

While explicit references to Kea‘au are notably limited from all later historic accounts pertaining to Puna, many exist for the greater district itself. The anecdotes discussed by post-*Māhele* visitors (Bird 1875; Coan 1882; Twain 1913; Whitney 1875) emulate many of the earlier sentiments expressed by former sojourners, focusing primarily on descriptions of the verdurous forests and precipitous lava landscape. Additionally, these writings demonstrate a considerable transformation from the almost exclusive traditional native subsistence strategies discussed in earlier chronicles to a new way of life.

In 1868, a massive volcanic eruption emanating from Mauna Loa volcano shook Hawai‘i Island, bringing with it lava flows, earthquakes and a large *tsunami* that transformed the landscape of the southeastern part of island forever, and further contributed to the depopulation of Puna. Coan (1882) recorded that on April 2:

> …a terrific shock rent the ground, sending consternation through all Hilo, Puna, and Kau. In some places fissures of great length, breadth, and depth were opened… Stone houses were rent and ruined, and stone walls sent flying in every direction…the sea rose twenty feet along the southern shore of the island, and in Kau 108 houses were destroyed and forty-six people drowned…Many houses were also destroyed in Puna, but no lives were lost. During this awful hour the coast of Puna and Kau, for the distance of seventy-five miles subsided seven feet on average, submerging a line of small villages all along the shore. One of my rough stone meeting houses in Puna [Kapoho-Koa‘e], where we once had a congregation of 500 to 1,000 was swept away with the influx of the sea, and its walls are now under water. (Coan 1882:314-316)

The following passage, written by American author Charles Nordhoff and published in an 1873 edition of *Harper's Magazine,* describes the typical purlieus of Puna, and makes the first mention of commercial coffee production in the district. Nordhoff's narrative is of particular significance in that it presents a detailed explanation of native sweet potato planting methods in lava:

> For instance, the Puna coast of Hawaii is a district where for thirty miles there is so little fresh-water to be found that travelers must bring their own supplies in bottles; and Dr. Coan told me that in former days the people, knowing that he could not drink the brackish stuff which satisfied them, used to collect freshwater for his use, when he made the missionary tour, from the drippings of dew in caves. Wells are here out of the question, for there is no soil except a little decomposed lava, and the lava lets through all the water which comes from rains. There are few or no streams to be led down from the mountains. There are no fields, according to our meaning of the word. Yet formerly the people in this district were numbered by thousands: even yet there is a considerable population, not unprosperous by any means. Churches and schools are as frequent as in the best part of New England. Yet when I asked a native to show me his sweet-potato patch he took me to the most curious and barren-looking collection of lava you can imagine, surrounded too, by a very formidable wall made of lava, and explained to me that by digging holes in the lava where it was a little decayed, carrying a handful of earth to each of these holes, and planting there in a wet season, he got a very satisfactory crop. Not only that, but being desirous of something more than a bare living, this man had planted a little coffee in the same way, and had just sold 1600 pounds, his last crop. (Nordhoff 1873b:550)

Nordhoff expresses wonder at the notion of cultivating sweet potatoes in this manner, and further discusses agriculture and difficulties in cultivation attributed to insect infestation as well as deforestation caused by introduced species:

> It will surprise you to find people living among the lava, making potato patches in it, planting coffee and some fruit trees in it, fencing in their small holdings, even, with lava blocks. Very little soil is needed to give vegetation a chance in a rainy season, and the decomposed lava makes a rich earth. But, except the cocoa-nut, which grows on the beach, and seems to draw its sustenance from the waves, and the sweet-potato, which does very well among the lava, nothing seems really to thrive. This is true all over the islands. If you ask about oranges, you hear that, except in a very few favored localities, the orange-tree suffers from a blight. The coffee culture has almost perished, because of "the blight." The cacao is blighted. The mulberry makes a rank growth, but the black or white blight covers it. And so with almost all useful trees and plants. A lady said to me, "In truth, every thing which has been tried on our islands seems to have failed from this blight, or scale insect, except sugar-cane, and there is scarcely a plantation of sugar, even, which has not ruined the first, and in some cases the second, owners." Wheat and other cereals are not raised, but all imported. Even the forests are now perishing, partly because cattle eat the young shoots, and partly because an insect attacks the older trees. This is a serious inconvenience, because fuel is scarce, and as the woods disappear, the watercourses dry up, and the sugar-cane has of late, I am told, begun to suffer from a worm which eats out the pith, near the ground, and thus destroys the whole cane. For general agriculture the islands are worthless. A small or general farmer would not starve here, because he could always raise enough sweet-potatoes to live on; but he would never get on. (Nordhoff 1873a:401).

Concerning the change in ownership of Kea'au Ahupua'a in the decades after the 1848 Māhele, shortly before his death in 1874, Lunalilo's legacy to the Hawaiian people was expressed in his will dated June 7, 1871. Cahill (1996) writes:

> There he named as his executor…the Honorable Charles. R. Bishop, the husband of Princess Bernice Pauahi. The welfare of the Hawaiian people, especially the less priviledge, had always been close to the ruler's heart. In clear, concise, and legal language, his will spelled out how the income from the many lands he had owned would be used for the construction and maintenance of what is known today as Lunalilo Home. (The Lunalilo Trust still cares for, in the comfortable and spacious Lunalilo Home, those elderly Hawaiian the king felt were most in need.) His last will and testament read "and in case I shall die without issue lawfully begotten I give and devise all of the real estate… to three persons to be nominated and appointed by… the Supreme Court or the Court of highest jurisdiction in these Hawaiian Islands, to be held by them in Trust.. to sell and dispose of… to the best advantage at public or private sale, and incest the proceeds… in of poor, destitute and infirm people of Hawaiian (aboriginal) blood or extraction, giving preference to the older people." (Cahill 1996:126-127)

Lunalilo died in 1874, leaving the three appointed trustees in charge of managing the Lunalilo Trust. Charles Kana'ina, however, contended "that the will offered for probate is not the Will of the deceased; that at the time of the execution thereof he was incompetent and that the Codicil thereto was not executed according to law" (Cahill 1996:163). Within a month after the court hearing, Justice Harris made his ruling and validated the will and admitted it to probate. To fund the construction of the Lunalilo Home on O'ahu, the trustees first applied to the Supreme Court to determine whether they had the authority to lease the Kea'au tract, rather than selling it outright. The Supreme Court ruled that the trustees did not have the power to lease the said land and forced the trustees into disposing of the Kea'au tract in its entirety. The roughly 65,000-acre Kea'au Ahupua'a was put up for sale in an 1881 public auction. Three men, Willie (William) Shipman, Captain J. Elderts, and Samuel M. Damon saw new economic and ranching possibilities for Kea'au. With much determination, the three men formed a consortium and individually financed one-third equal share and thereby made a $20,000 offer for the parcel. On January 9, 1882 they became the owners of the entire Kea'au Ahupua'a, with an agreement that gave each of the signatories first right of refusal should one of them decide to sell their portion. However, by the following year, Elderts sold his interest to Shipman and Damon. Damon followed Elderts and shortly thereafter, sold his portion to Shipman. By 1883, Willie and his wife Mary were the sole owners of the entire Kea'au Ahupua'a (Cahill 1996). Ownership of this large tract of land allowed the Shipman family to expand their early ranching operations and subsequent agricultural endeavors.

In March of 1876, Reverent George Leonard Chaney of Salem, Massachusetts visited Puna. His narrative described the distinctive lava-blanketed landscape so often marveled at by previous visitors. Of the later historic accounts, Chaney makes explicit reference to Kea'au:

> Arrived at Kaau [Kea'au], we lunch on boiled eggs and taro, bait our horses and give them a brief nooning, at two o'clock start again for Puna. The student of lava will find every variety on this route,

> and an abundance of it. Beginning in a vast expanse of *pahoehoe* or satin-stone, it leads to a-a, pumice, and rotten-stone, it leads to a-a, pumice, and rotten-stone. *Lauhala* forests cover the *pahoehoe*, and now and then as we travel through them wild cattle make their appearance, and acknowledge Mr. L—'s ownership by running rapidly away. Some coco palms succeed the *lauhalas*. All the way the sound of a splendid surf attends us, and occasionally a lock of silvery spray tossed above the rocks hints the ocean beauty which we cannot see. All at once this iron barrier is removed, and we are opposite a beach where the surf rolls up magnificently. At the foot of the black lava sand-hills, beyond this beach, we stop to pick up olivine crystals scattered among the lava pebbles. Then we come to fresh green lands, with the finest specimens of coco palms which we have seen. Mr. Clemen's witty comparison of this palm to a "feather-duster struck by lightning" does not apply to these luxuriant jets of foliage. Each frond, with pinnæ of a vivid, glossy green and midrib of polished amber, was a piece of ideal vegetation. I did not wonder that Miss B—, who sojourned with us at Hilo, wished, above all things, to carry one of these palm leaves to America with her. It is the *chef-d'oeuvre of* tropical vegetation. No wonder this district was a favorite dwelling-place of the natives. A respectable settlement still remains. But the large old meeting-house, which stands among the little grass houses as an ostrich might stand with a brood of chickens about her, seems sadly in excess of the probable need of the place. Not many years ago it was filled with worshipping congregations. Dr. Coan tells me that he has preached there to an overflowing house; but there will be no crowd this year, altthough all the population around is convened. (Chaney 1880:135-136)

An account entitled *The Native Sandwich Islanders* written by Captain C. E. Dutton of the United States Ordnance Corps was published in an 1885 volume of *The Missionary Herald*. Dutton lived briefly in Puna while collecting scientific observations of volcanoes. During his time spent there, he noted the diminishing numbers of the native population, suggesting abandonment was caused at least in part by greater economic opportunities elsewhere:

> A little way off [from Puna] is a cluster of grass-houses, built in true native fashion except for the glazed windows, while among them is a white-painted board cottage and a little church, which also serves the purpose of a schoolhouse. It is hard to say whether these structures built in civilized fashion improved the prospect or not. They certainly seemed out of place in a region where everything else had the aspect of tropical barbarism. They served, however, to remind us that we were in a region where all that is horrible and hateful in barbarism has been supplanted by much that is good in civilization, by the reign of civil law, the security of life and property, and the establishment of peace.
>
> There is no portion of these islands where so much of the primitive character of the Hawaiians is retained by the people as in Puna. The district is seldom visited by white people, and I am informed that only two families of whites reside there. The native population is somewhat scanty and has undergone a great decrease within the present century, as in all other parts of the island. This decrease, however, seems to be due more to the emigration of the inhabitants to the large towns, like Honolulu and Hilo, than to the ravages of those diseases which are supposed to be the prime cause of the decay of the Hawaiian race. Many of the natives also go to other parts of the island, where they obtain employment upon the plantations and in other occupations. But those who remain retain considerable of their primitive character, spending the day in lounging, fishing, and visiting, living in grass-houses and subsisting principally upon fish and poi. On the other hand, they are amiable, hospitable, and peaceful to the last degree. They have civilized clothing, but often, as a matter of preference, go about wearing a shirt and malo. Probably in no part of the islands have the teachings of the missionary produced a deeper and more lasting impression. Their village has a church for its most conspicuous structure, and on Sunday all the natives go to church with *furore*. So intense is the Sabbatarianism that I found considerable difficulty in avoiding arrest and prosecution for riding through one of their villages on Sunday with a pack-train.
>
> I was much pleased at the comparative neatness and order of the grass-houses in which most of the natives still live. The furniture is simple in the extreme. The floor is covered with mats woven of lauhala (pandanus) leaves, and are scrupulously neat. Tables and chairs are seldom used, except as luxuries. Food is eaten *á la turque*, the family sitting cross-legged around the dish of poi. Most households possess crockery, knives, forks, and spoons, but calabashes made from large gourds are still used, and "fingers were invented before forks." I spent an hour watching an old kanaka making a calabash, with as much delight as when, an urchin of seven, I used to watch the cobbler mending a shoe or the wandering tinker grinding knives and scissors. Not a little suggestive were long rows

> of letters in their envelopes, stuck cornerwise into the slats to which the bunches of grass are tied to form the wall of the house. All natives of suitable age can read and write their own language, for education is compulsory. They correspond most vigorously, and the mail facilities are remarkably good, considering the scanty population and resources of the kingdom. Every week the postboy rides through from Hilo to Kau, via Puna and Kilauea, and back again. The saddlebags are full of letters and weekly newspapers from Honolulu, printed in the Hawaiian tongue. This does not sound very barbaric, and in truth the Hawaiian is in all essentials as well civilized as the poor people of England or America. He owns his property in fee; he makes laws, executes and obeys them; he reads and writes; he has but one wife; he tills the soil and tends flocks; sometimes he accumulates wealth and sometimes he does not; he makes his will in due form, dies, and receives a Christian burial. In no land in the world is property more secure; indeed, I have yet to learn of any other where it is equally secure from burglary, rapine, and thieving, or those subtler devices by which the cunning and artful succeed in getting possession of the property of the less astute without giving an equivalent. All this is seen in Puna, which is no doubt the most primitive district in all the islands. The few relics of barbarism remaining are of the most harmless description and probably as good for the Hawaiian as any civilized customs he might adopt in place of them, and certainly not inconsistent with all the comforts and blessings of good laws cheerfully obeyed and well administered. (Dutton 1885:385-387)

In 1898, Burton Holmes, famed travel writer of the late nineteenth century, journeyed to Hawai‘i. While writing of Puna, Holmes carefully describes his journey through the densely forested jungle and his interaction with two coffee planters as they introduce him to the 100-acre plantation upon which they work. Holmes’ account offers the most specifics on commercial coffee production in Puna:

> A few years ago the Puna district was an impassable tangle of fierce, savage, lovely vegetation, a wilderness of green, hundreds of square miles in extent. It was in 1898 the newest region in Hawaii, the latest land of promise to allure both the man who seeks to invest safely a fortune already made, and the man who seeks to make a new one. My companion is of the former class, and with the true American spirit is using his wealth to turn the lovely wilderness into a paying piece of property. I need not tell you of the beauty of this ride. Even the celebrated road to the volcano must yield the palm,—and in fact, the banana and everything else—to this new-cut road that penetrates almost to the heart of the promised land of Puna. The tall trees are the Ohia, and around their trunks are twined the serpent-like tendrils of the Ieie, a very strong creeping thing that seems with its knife-like leaves to be an armed protector of the tree that it entwines from root to very tip. Both the ohia and the ieie bear at certain seasons of the year a little blossom of intense red, as if the blades of the ieie-vine had actually drawn blood.
>
> A few miles farther on we meet our hosts, two coffee-planters of the younger generation; both are Americans, one born, however, in Hawai‘i and resident in the islands all his life; the other, he of the broad-brimmed hat, a self-exiled San Franciscan. Both of them wear the indispensable crude water-proof or pummel-slicker—for Puna is a place of drenching rains. We follow them along the corridor of verdure till the corridor comes to a sudden end. The road ends as abruptly as a shaft in a silver mine, bringing up against the solid wall of the apparently impenetrable jungle. And now, forsaking cart and buggy, we load our baggage on the horses, and mounting mules that have been sent from the plantation we boldly plunge into the tropic tangle. We feel as if all hope should be abandoned here; surely no human habitation can be hid in this labyrinth of rain-soaked vegetation. They must be leading us into the haunts of savage beasts or the abode of serpents,—only there are no wild beasts and no deadly reptiles in Hawaii. For a mile or more we struggle through the leafy tunnel—so green and damp as to appear unearthly, as if it were a forest at the bottom of the sea. The animals are up to their knees in rich black mud; a dozen times to every rod there is a log to clear or a swinging rope of the ieie-vine to avoid, but finally we come out once more into the world of men—of good, kind, cheerful, and hearty men, for the little group of fellows, who have been living here for three long years, waiting for their coffee-trees to grow, watching each budding berry as it slowly turns from green to ripened red,—are like a lot of college men on a prolonged and possibly perpetual picnic in the woods. Their home is of semi-native construction, its walls of leaves, its roof of corrugated iron. There are two rooms. In one they sleep and in the other they dine with appetites born of an outdoor life. A Japanese cook prepares for them far better meals than can be had at the hotel in Honolulu. The temperature is almost invariably of such degree that it is not noticed, and the

> drafts that filter through the leafy walls are not the kind that cause pneumonia. Twenty-four showers every day beat their tattoos upon the roof, and after every shower the sun comes out and smiles as if to say, "That little rainfall was nothing but a joke."
>
> The coffee-fields, of course, claim our attention. There are here about a hundred acres under cultivation in clearings of from five to ten acres each. Some of their coffee is already in its fourth year and promises a crop with a little profit for the present season. The planters estimate that a tract of seventy-five acres will in five years have paid expenses for clearing, planting, cultivating, picking, sorting, drying, and shipping, and thereafter it should yield a profit of from eight to ten thousand dollars annually.
>
> The labor is performed largely by the better class of Japanese (the offspring of whom is just as quaint and fascinating as in Japan itself), but there is no reason why white men could not find it profitable and pleasant. The most trying thing for the owners of a coffee-ranch is the four or five years' waiting while tender little trees are growing up, preparing to reward the men who cared for them in childhood. Men who love solitude and nature and are possessed of patience and a little capital may find in coffee culture an ideal existence in an ideal land. But as I ride with one of my hosts through the dense tangled forest that shuts in this little community of half a dozen white men and half a hundred Japanese, I am led to suspect that this peaceful novel life, so grateful to us who come as visitors for a brief season, is most monotonous to those who have to spend here twelve months of the year, with no diversion save an occasional ride to Hilo or a semi-annual trip to Honolulu. (Holmes 1908:104-111)

Up until the late 1890s, travel through Puna was via foot trails but in 1897, the government began improving and constructing roads, one of which included a new road connecting Hilo to Pāhoa. As articulated in the newspaper article, "when this is completed most of the Puna people will be connected by carriage road with Hilo, which will be of great advantage to both districts" (The Hawaii Herald 1897:5).

An American author named Henry Walsworth Kinney visited Hawai'i in the early part of the twentieth century and published a comprehensive historic account of his journey through Puna in his book entitled *The Island of Hawaii*. Kinney's description of Puna in the early 1900s is undeniably the most intensive and perspicuous historic account presented in this section, providing a virtual expedition through the district describing various locations such as Hawaiian villages, Hawaiian sites, natural geologic landmarks, and places of industry:

> The district of Puna may, for the sake of clearness, be divided into two sections, the Olaa region, the north half, and Puna proper. The former consists of the great Olaa sugar plantation, and forest which has been partially cleared, while some tracts are used for cattle. The middle part of the district, with Pahoa as the center, is used for extensive lumber operations. The remainder, Puna proper, is covered by forest and old lava flows, most of them covered with vegetation. In spite of its exceptional beauty and the fine opportunity it offers for seeing the typical Hawaii, which is so rapidly disappearing in the march of progress, it is comparatively little known. Still it is possible to see the greater part of Puna in one day's and practically all of Puna in two days' autoing, while the Hilo R. R. Co. trains pass through the main portions. The roads are almost all excellent.
>
> The main road into Puna is a continuation of the Volcano road which runs from Hilo town, the Puna boundary being about six miles out from Hilo. Hence an excellent road passes through forest and, further south, through cane, to Nine Miles, Olaa, the largest plantation camp on the Island. Near the boundary line may be seen clearings where awa is planted. Just north of the camp a road leads makai to the Shipman ranch headquarters at the beach. It is about four miles long, good and very pretty, passing through cane and then puhala forest. Right by the ocean is a large pond with very cold water. Small craft may effect a landing here in good weather.
>
> From the Nine Miles village another road leads makai to the great Olaa mill and the railway depot. The main road strikes west towards the Volcano and Kau (this being the belt road proper. See Volcano) while the road into Puna proper turns south. It passes through cane and past the homes of the principal plantation officers, and continues over an ancient lava flow, covered with stunted vegetation and used for cattle. (Kinney 1913:75)

This passage, written by John Ness seven years later, was published in the January 1920 edition of *The Mid-Pacific Magazine* and offers a glimpse into early twentieth century life in Puna. At this time, we see that while 'Ōla'a Sugar Co. is still highly visible, small-time farmers are cashing in too, taking advantage of Puna's fecund terrain:

> The district is by no means an entirely uncultivated forest and lava-clad area. Some of the most productive of the canefields of Olaa plantation and the holdings of many independent planters are found in Puna. Travelers interested in the agricultural and industrial development of the region will find here that the cultivation of cane is not all to which Hawaii's soil and climate are adapted. An interesting rubber plantation is located in this district, while more awa, the native root, is grown and dried in Puna than in any other district in the Islands.
>
> The homesteads of small farmers are scattered along the roads of the district, and vegetables and fruits, especially watermelons, are a feature of the output of Puna's fertile soil.
>
> At Pahoa is the mill of a lumber company, where the ohia and koa, two Hawaiian hardwoods taken from the virgin forests, are manufactured into various forms of lumber. . .(1920: 368)
>
> . . .The tropical forests will be the first to claim the attention of the visitor to Puna. Lining the roadway for many miles is the dense tropical growth. Great ferns and masses of undergrowth cluster in wild profusion about the base of magnificent groves of koa and ohia trees. Reaching far above the verdant and multi-colored undergrowth are the scraggly trunks of the ohia and koa with here and there palms and puhala. Thick vines have spread their long fingers in twisted and haphazard fashion over the tree trunks and a kaleidoscope profusion of color is spread through all by the many varieties of tropical flowers.
>
> As the road nears the seashore, here and there are clearings, the settlements and homesteads of natives. At the terminus of the road at the beach is Kaimu and just beyond is Kalapana, two villages whose population numbers no white men and is almost exclusively native.
>
> In this part of the district may be found the best examples of primitive Hawaiian life. Many grass huts, the primitive houses of the native, of which the visitor to the Island hears so much and sees so few, may be seen along the wayside. (Ness 1920:369)

It is evident from these accounts, especially ones composed closer to the turn of the century and shortly thereafter, that economic interests in Puna swiftly transformed from the traditional Hawaiian land tenure system of subsistence farming and regional trading networks to the more European based cash crops including coffee, sugar, rubber, timber, vanilla, pineapples, tobacco, and emphasized cattle ranching and even bottled mineral water production. As the population declined well into the twentieth century, the native agricultural system was largely abandoned in favor of these new economic ventures (Yent and Ota 1982). As mentioned by Dutton in the last quarter of the nineteenth century, large numbers of natives left Puna to seek employment elsewhere. By 1920, it seems by and large that the traditional lifeways of Puna natives were rapidly deteriorating, overwhelmed by increasing urbanization.

The Rise of Sugar Plantation and Ranching

While various agriculture-based industries were attempted in Puna during the late 19th century by the early 20th century, ranching and sugar emerged as the predominant sectors which were initially propelled by the sale of the *ahupua'a* to William Herbert (W.H.) Shipman, J. Eldarts, and Samuel Damon by the King Lunalilo Estate in 1882. Within two years time Shipman had bought out his fellow business partners, becoming the sole owner of the entire Kea'au Ahupua'a (W. H. Shipman 2022).

Large tracts of land in lower Puna were used for cattle grazing and sugarcane cultivation, with Shipman's purchase of the Kea'au Ahupua'a, the project area was utilized for cattle ranching and became part of the Kea'au ranch until being developed into the Hawaiian Paradise Park subdivision during the mid-twentieth century. While the project area never came under sugarcane cultivation, sugarcane cultivation and operations were centered mostly to the area north and northwest of the project area in the vicinity of present-day Kea'au Town.

Incorporated on May 3, 1899, a small group of investors (B.F. Dillingham, Lorrin A Thurston, Alfred W. Carter, and Samuel M. Damon) created and developed what they believed would become one of Hawai'i's largest sugar plantations, the 'Ōla'a Sugar Company. With a $5,000,000 investment, the promoters purchased 16,000 acres in fee simple and nearly 7,000 acres in long leasehold from W.H. Shipman. The plantation fields extended for ten miles along both sides of Volcano Road as well as in the Pāhoa and Kapoho areas of the Puna District. They also purchased 90% of the stock in the adjacent Puna Plantation, adding another 11,000 acres to their holdings.

'Ōla'a Sugar Company began as one of Hawai'i's largest sugar plantations with much of its acreage covered in trees. Unlike other plantations of this period, The 'Ōla'a Sugar Company was developed around the idea of fostering a class of small independent farmers who would grow cane on behalf of the mill on shareholder agreements (Campbell and Ogburn 1988). Prior to the commercial cultivation of sugarcane, coffee was the primary agricultural crop that was

grown in the region. An article published in the June 7th, 1893 edition of *The Daily Bulletin* noted two coffee plantations in Puna, the first, C.M. Coffee Plantation (Figure 28) located "18 miles from Hilo" and the Rycroft Coffee Plantation in Pohoiki (The Daily Bulletin 1893:3). The method of growing coffee in the forest of Puna amongst tall stands of *ʻōhiʻa* can be seen in a photo taken by Brother Bertram Bellinghausen ca. 1883-1905 (see Figure 28). However, with the purchase of these lands, the coffee was uprooted and cleared for the planting of sugarcane.

Figure 28. C.M. Coffee Plantation located 18 miles from Hilo ca. 1883-1905. Brother Bertram Collection, Ulukau.org.

On July 1, 1899, active operations at the ʻŌlaʻa Sugar Plantation began under the management of Frank B. McStocker. In his first report, he stated, "As soon as the planting of the main crop begins, which will be about the month of March [1900], arrangements will be made by which a large portion of the crop will be cared for by laborers on shares." From this early start of "share planting," (Campbell and Ogburn 1988) the company branched out into the leasing of land to individuals to raise cane and to making contracts to purchase cane from persons who owned or leased land from the sugar company. In most cases, the company carried the financial burden for the planter until the individual was paid for their cane and then recovered the advances made. Other independent cane farmers lived in their own homes, used their own work animals and tools, and supplied their own fertilizers.

The directors of the company realized early on that the lack of mass transportation would hinder the success of their business. As a result, they organized the Hilo Railroad Company and on April 8, 1899, were granted a 50-year charter (Best 1978). The railroad's infrastructure developed quickly, with service to ʻŌlaʻa (Keaʻau) from Hilo commencing on June 18, 1900. Another sugar company, the Puna Sugar Company, located near the village of Kapoho, had been organized within the Puna District on March 2 of that same year. Puna Sugar had cane fields scattered throughout lower Puna from Kapoho to Pāhoa Town. As with ʻŌlaʻa Sugar's early Keaʻau operations, the lack of a reliable transportation system made it expensive to collect and transport the cane from the scattered fields to the mill.

So, when Hilo Railroad proposed to lay 4 miles of track from Kapoho to Pāhoa, the Puna Sugar Company paid for half the cost. By March 1, 1902, the Hilo Railroad was making regular stops at the ʻŌlaʻa Sugar Mill (Figure 29), the town of Pāhoa, and extended through lower Puna and *mauka* to Mountain View. The route of the railroad across Keaʻau can be seen on a 1936 map prepared by J.N. Smith (Figure 30) which shows the railroad alignment east of the project area.

Figure 29. Hawaiʻi Consolidated Railway alignments at ʻŌlaʻa Sugar Mill.

By 1905, Puna Sugar Co. harvests were being ground at the ʻŌlaʻa Mill, and the company was operating as a division of the ʻŌlaʻa Sugar Co. (Dorrance and Morgan 2000). Two years later, the Hawaiian Mahogany Lumber Company incorporated and signed a five-year contract with the Atchison, Topeka, and Santa Fe Railroads for the delivery of 90,000,000 board feet of *ʻōhiʻa* railroad ties from the forest reserves of Puna (Clark et al. 2001). Subsequently, in 1908 the company erected a lumber mill at Pāhoa. A network of narrow-gauge railroad tracks, 3 feet wide, extended from the lumber mill to the forests above Pāhoa. On March 24, 1909, the Hawaiian Mahogany Company became the Pāhoa Lumber Mill, and James B. Castle, the former managing director of the mill, became the new owner. The company then negotiated a contract with the Santa Fe Railway Company for the delivery of 2,500,000 cross ties and 2,500 sets of switch ties. In addition to railway ties, the Pāhoa Lumber Mill produced products such as roofing shingles, flooring, paving blocks and lumber for cars, wagons, and carriages. On the night of January 28, 1913, a raging fire broke out in the mill and it was burnt to the ground along with most of the stock of milled lumber. In spite of this disaster, J. B. Castle rebuilt the mill, and by October the mill was operating again as the Hawaiʻi Hardwood Company, part of the Hawaiian Development Company. The Santa Fe Railroad found, ultimately, that *ʻōhiʻa* wood did not last as long as expected in the dry climate of the American Southwest. They did not renew their contract, and, in 1916, the Hawaiian Hardwood Company, Inc. closed (Burtchard and Moblo 1994).

When the lumber business moved out of Pāhoa in ca. 1916, the mill was leased to ʻŌlaʻa Sugar. Standard gauge railroad track replaced the old timber railroad grade tracks, and the timber producing forests were converted to sugarcane fields. The company used four mogul type Baldwin locomotives to haul cane from the Puna fields through Pāhoa to their processing plant in Keaʻau. Passenger rail service in the Puna District also started to increase around this time. In 1916 the Hilo Railroad was reorganized as the Hawaiʻi Consolidated Railway. The railroad used Baldwin locomotives and Hall-Scott motorcars with passenger trailers to haul freight and passengers. Then, in 1925 the Hawaiʻi Consolidated Railway ordered and received three rail busses from the White Motor Company, which they used in Puna and Hilo districts, making daily stops in the town of Pāhoa. The rail busses became an especially popular form of transportation during World War II when mandatory gas rationing was in effect for all residents (Best 1978).

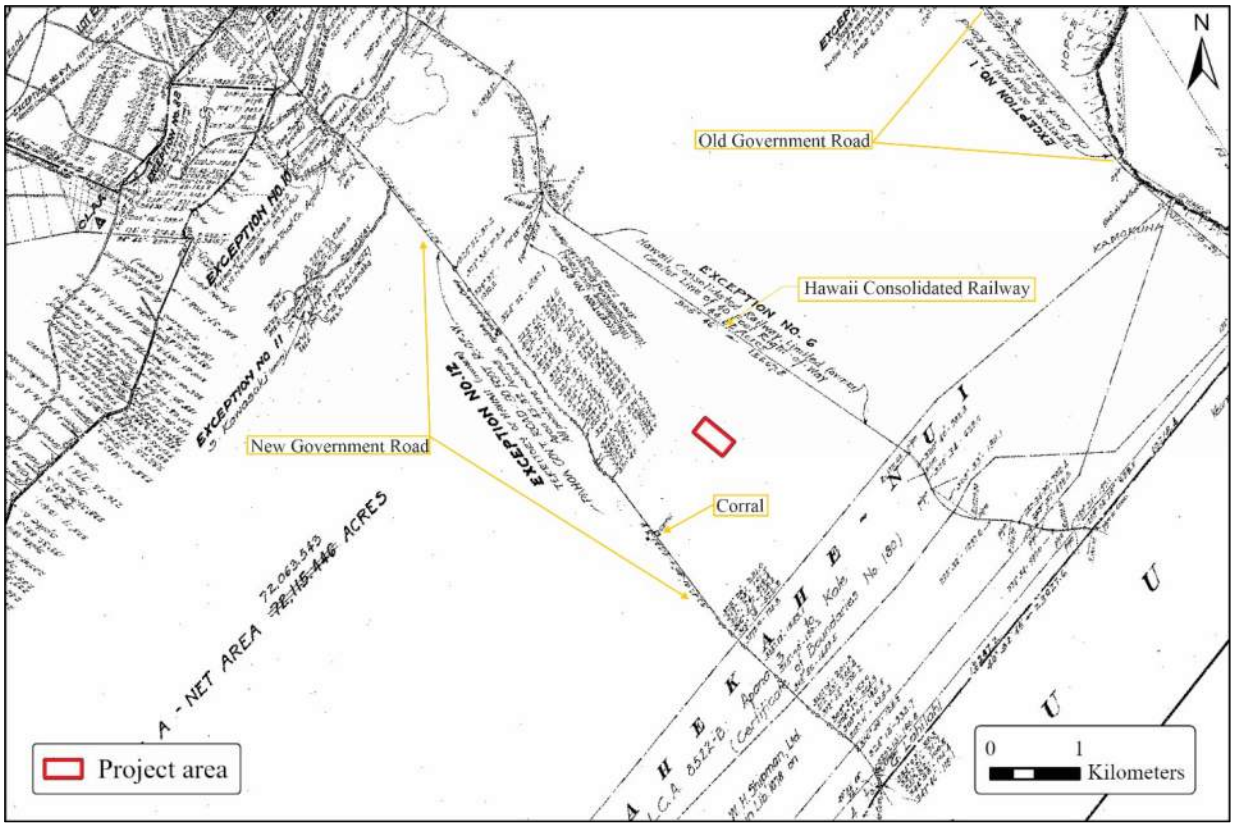


Figure 30. Portion of Land Court Application 1053 Map 1 from 1933 showing the coastal portion of Kea‘au and the locations of the Old and New Government Roads, HCR, the corral, and the project area.

The ‘Ōla‘a Sugar Company had many problems throughout its operation, ranging from difficult growing conditions to financial issues. The area was in the wet belt of Hawai‘i amid forests of fern trees and *‘ōhi‘a* with an average monthly rainfall of 18-30 inches. The wet conditions of ‘Ōla‘a made it difficult to grow sugarcane, and the company continuously experimented with finding varieties suitable for the climate. Transporting cane to their mill in what is now the town of Kea‘au was also difficult. The company initially used flumes and portable rail to bring cane from the fields to the Hilo Railroad. For the struggling company, however, the manpower and maintenance costs of these systems proved to be financially draining.

Beginning around 1938, the plantation management experimented with other transportation options in the fields, including the use of Athey Wagons pulled by tractors (‘Ōla‘a Sugar 1939). This year also marked the beginning of a program to build gravel field roads and acquire trucks. Roads were built to service plantation-owned lands as well as fields owned by their contract planters (who were to pay the company back over time). The road-building program was curtailed during 1941 due to a shortage of labor, and then terminated upon the onset of World War II when the United States Engineers commandeered the company’s equipment (‘Ōla‘a Sugar 1942). By that time, however, sufficient roads had been built to allow almost thirty-nine percent of that year’s crop—all the cane produced in Kapoho, Malama, and Kama‘ili and large parts of the cane produced in the plantation’s Pāhoa, ‘Ōla‘a, and Mountain View Sections—to be hauled by truck. The manpower and equipment shortages caused by the war paradoxically interrupted the plantation’s conversion to truck hauling while simultaneously stimulating management’s desire to rid itself of portable tracks and flumes. In 1943, the company reported that it was able to resume its road building efforts, and that it planned to add 37.94 miles of road to its existing 512.58 miles across the entire plantation(‘Ōla‘a Sugar 1944). By the end of 1945, the plantation’s conversion to truck hauling was completed when its final cane roads were built in the Mountain View section.

By 1946, rail travel was becoming less popular and less profitable, due to improved roads and increased trucking. In March of that year, stockholders of Hawai‘i Consolidated Railway voted to abandon all railroad operations. This decision was further reinforced on April 1, 1946, when a devastating *tsunami* destroyed Hilo Bay, including all the rail lines, a drawbridge in the bay, and part of the Waiākea freight yards. On November 20, 1946, the company shut down its remaining lines, including all Puna railroad operations, and began auctioning off all its assets. The ‘Ōla‘a

railroad line remained in operating condition and continued to be used for hauling sugar until December of 1948. In that year, the sugar industry began phasing out its operations in Puna and closed the tracks permanently.

During the second half of the twentieth century, ʻŌlaʻa Sugar continued to accumulate debt despite attempts to cut operating costs that included the introduction of mechanized harvesting in 1947. The boom in real estate following statehood prompted the company to sell some of its fee simple lands and offered employees the opportunity to purchase their own houses. On March 28, 1960, the company's shareholders decided that the name "'Ōlaʻa Sugar Company" was jinxed, and rechristened the company the Puna Sugar Company. By 1969, American Factors (AMFAC), the plantation's parent company brought out the minority shareholders, and the Puna Sugar Company, Ltd. was wholly owned by AMFAC. The company's profitability was shortlived as by 1982, AMFAC announced the closure of the Puna Sugar Company. Despite making what appeared to be a slight financial upturn after the name change, by the 1980s the company again fell onto hard times. Tax breaks and government subsidies disappeared, and competition from cheap artificial sweeteners such as high fructose corn syrup made continued operations unsustainable, and on January 7, 1982, it was announced that Puna Sugar Company would close its doors (Dorrance and Morgan 2000). The company disposed of equipment, sold its lease lands, and laid off employees with severance packages that included five acres of land for each employee. By December 1, 1984, the company had completed the closure and after eighty-five years, the Puna Sugar Company closed its doors indefinitely (Campbell and Ogburn 1988).

Kea'au During the Twentieth Century and the Creation of the Hawaiian Paradise Park Subdivision

Although cane fields dominated portions of the Kea'au landscape well throughout the early part of the 20th century, the project area remained unscathed by the commercial sugar industry and other types of development as reflected in a 1924 USGS map (Figure 31). While it is uncertain exactly when the Shipman family began their ranching operations in the area, the Shipman family's Kea'au Ranch extended from the coast in Puna, inland towards Mauna Loa as well as on Mauna Kea. In 1904, W.H. Shipman built their family home at Hā'ena beach. In addition to the ranch, the family also had a dairy and poultry farm (W. H. Shipman 2022).

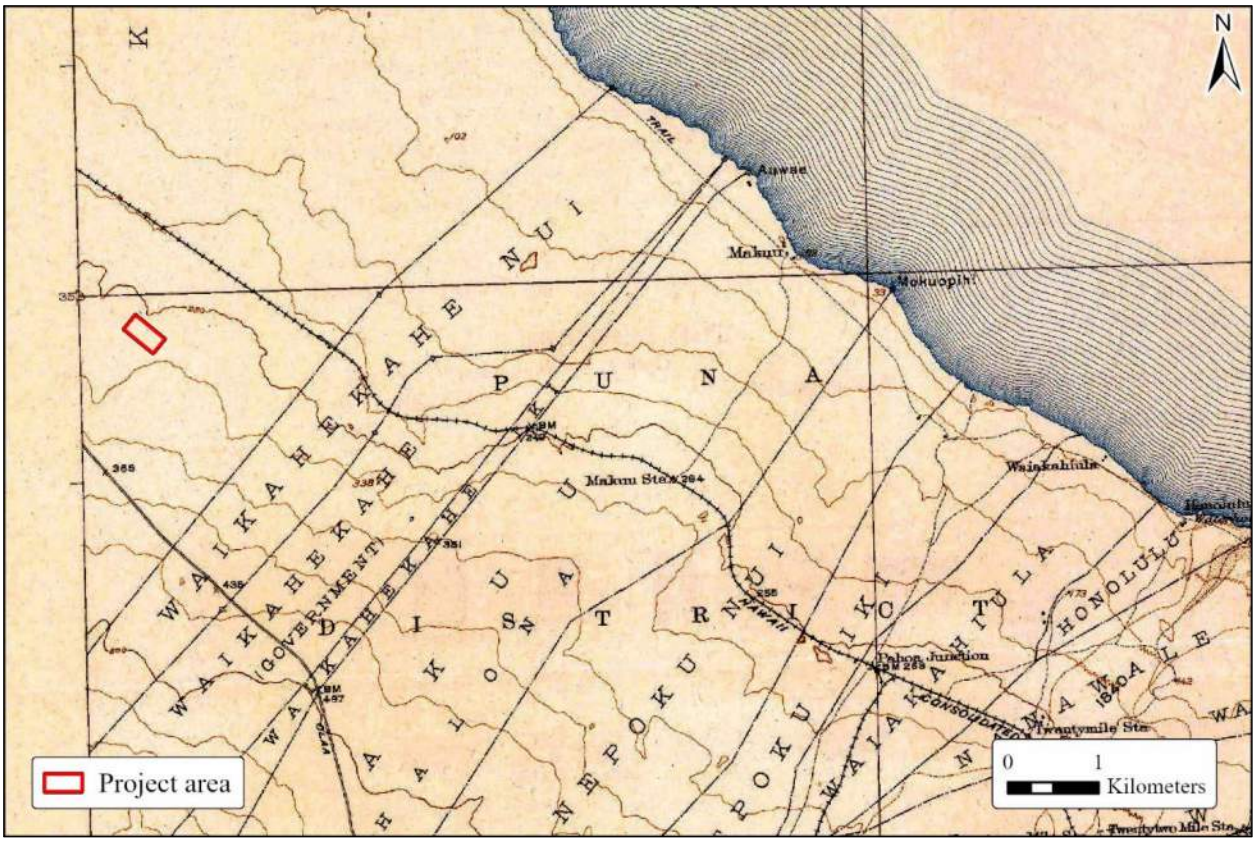


Figure 31. Portion of the 1924 USGS map showing project area.

In 1930, W.H. Shipman, Ltd. submitted Land Court Application 1053 to fix the boundaries of the 64,275 acre Keaʻau Ahupuaʻa more precisely than had been done by the Boundary Commission (Cahill 1996). The accompanying map created by surveyor J.N. Smith in 1936 (see Figure 30) depicts locations and routes of various infrastructure pertaining to sugar cultivation including a complex network of interlacing flumes, ditches, cane roads, and Hawaiʻi Consolidated Railway routes in addition to sections and limits of areas planted in cane. Examination of the 1936 map (see Figure 30) shows that the study area parcel remained untouched by the commercial sugar industry. While there is no evidence of development or cane cultivation within the project area, a corral is shown on the *makai* (east) side of the "New Government Road (see Figure 30), to the west of the project area; the HCR to the east and just north are a few buildings indicating the location of Waipāhoehoe Camp.

In 1933, John N. Smith, undertook a survey for the County of Hawaiʻi where he mapped the trails and roads in Keaʻau. Although no features or build infrastructure is shown within the project area, Smith's map (Figure 32) depicts a series of interconnecting *mauka-makai* trails that linked coastal locales (from north to south) at Haena, Paki, and Kuuwelu to the interior portion of the *ahupuaʻa* in the vicinity of present-day Keaʻau Town and ʻŌlaʻa. He also depicts the alignment of the major roads including the "Old Government Road" that for the most part extended along the coast, the "Hawaii Consolidated Railway", and the interior most "Puna Road." Lastly, his map shows a plethora of traditional place names within Keaʻau.

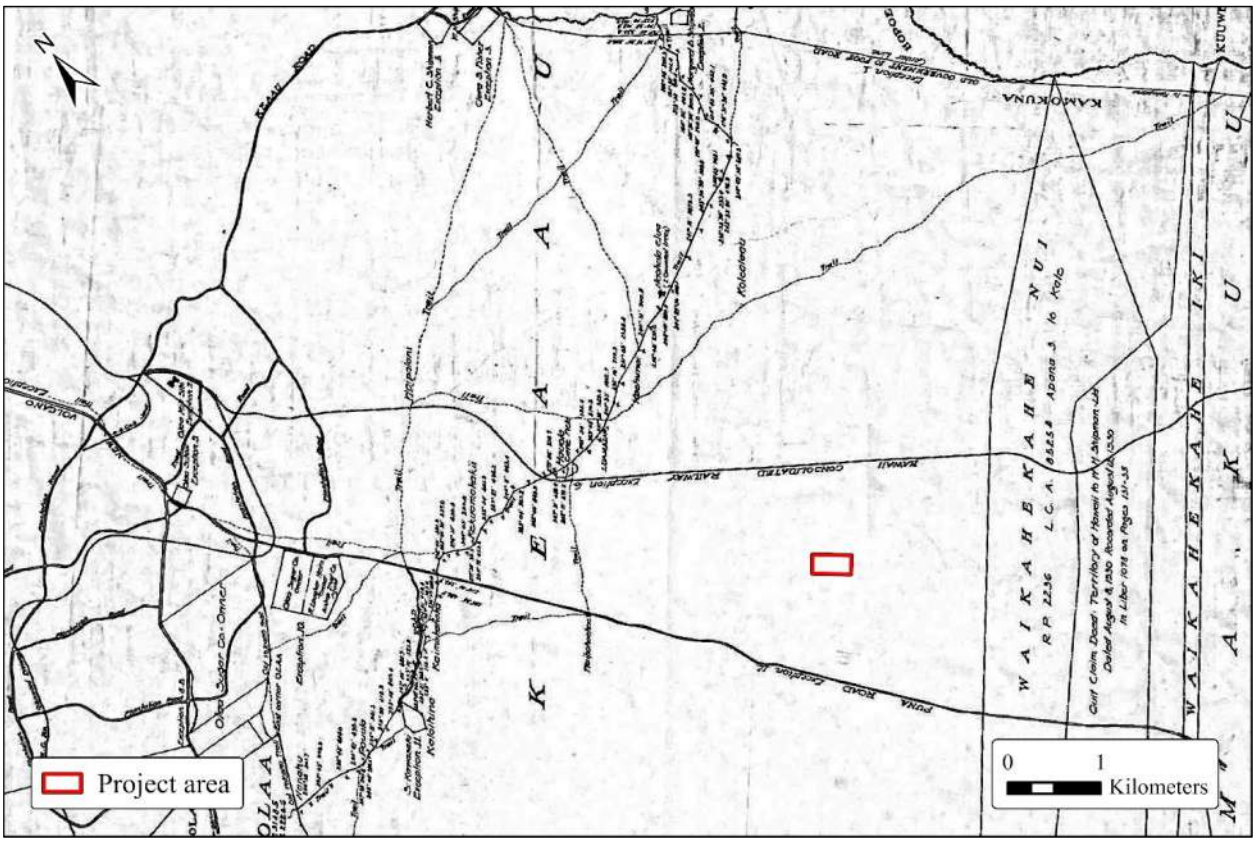


Figure 32. 1933 County of Hawaiʻi map showing "Trails in Keaʻau" prepared by John N. Smith.

In 1943, when William passed, his son, Herbert Shipman took over the family operations. As a conservationist, he took a particular interest in orchid cultivation and protection of the native *nēnē* goose (*Branta sandvicensis*) (W. H. Shipman 2022). Herbert is recognized as a pioneer in orchid development being awarded the American Orchid Society's Gold Medal. Additionally, he is recognized by the National Geographic Society and the State of Hawaiʻi as being responsible for "saving the nene goose . . . from extinction by raising them near Hāʻena Beach and on the family's volcano ranch" (W. H. Shipman 2022). When Roy Shipman Blackshear, the grandson of William, took over the family business in 1976, he continued to care for the *nēnē* and steward the lands; overseeing the change of their agricultural lands from sugarcane cultivation and production to more "diversified and productive agricultural operations" (W. H. Shipman 2022).

By the early 1950s Hawai‘i economic landscape was gradually shifting away from agriculture-based industries and the Shipmans soon realized “that they were land-rich and money-poor” (Cahill 1996:266). To keep W.H. Shipman Ltd. profitable, a survey was undertaken in the early 1930s (see Figure 30) of all Shipman-owned property. With a total of roughly 71,000 acres at hand and in the wake the post war era and Hawai‘i’s admission as a state in 1959, both of which resulted in a population surge, W.H. Shipman Ltd. began selling off portions of their unproductive lands to different investment firms.

It was during mid-20th century that the Puna District experienced a flurry of large-scale residential development created by outside investors and marketed largely to buyers in California and elsewhere in the United States. By 1960, the subdivision boom resulted in the creation of some 50,000 lots in Puna alone with an average selling price of $200 to $2,600 per one-acre (Black 1960). A map published in *The Honolulu Advertiser* (1959:21) shows the residential “wilderness” subdivisions that were in development in 1959 and it includes the 8,000 lot Hawaiian Paradise Park subdivision (Figure 33). The newly created subdivisions were heavily critiqued because they lacked basic infrastructure including roads and utilities and their locations made them particularly susceptible to volcanic eruptions. However, the developers of these subdivisions believed that the creation of tens of thousands of residential lots in Puna would help boost the island’s economy, particularly in the wake of the 1960 *tsunami*, and lay “the groundwork for future development and population increase” (Black 1960:26). Local reporter, Alan McNarie (2018:1), estimated that 12% of the lots were purchased by residents of Hawai‘i Island, 35% by O‘ahu residents, and the rest by non-Hawai‘i residents. By the 1970s, the County of Hawai‘i was forced to implement stricter ordinances to regulate subdivision development.

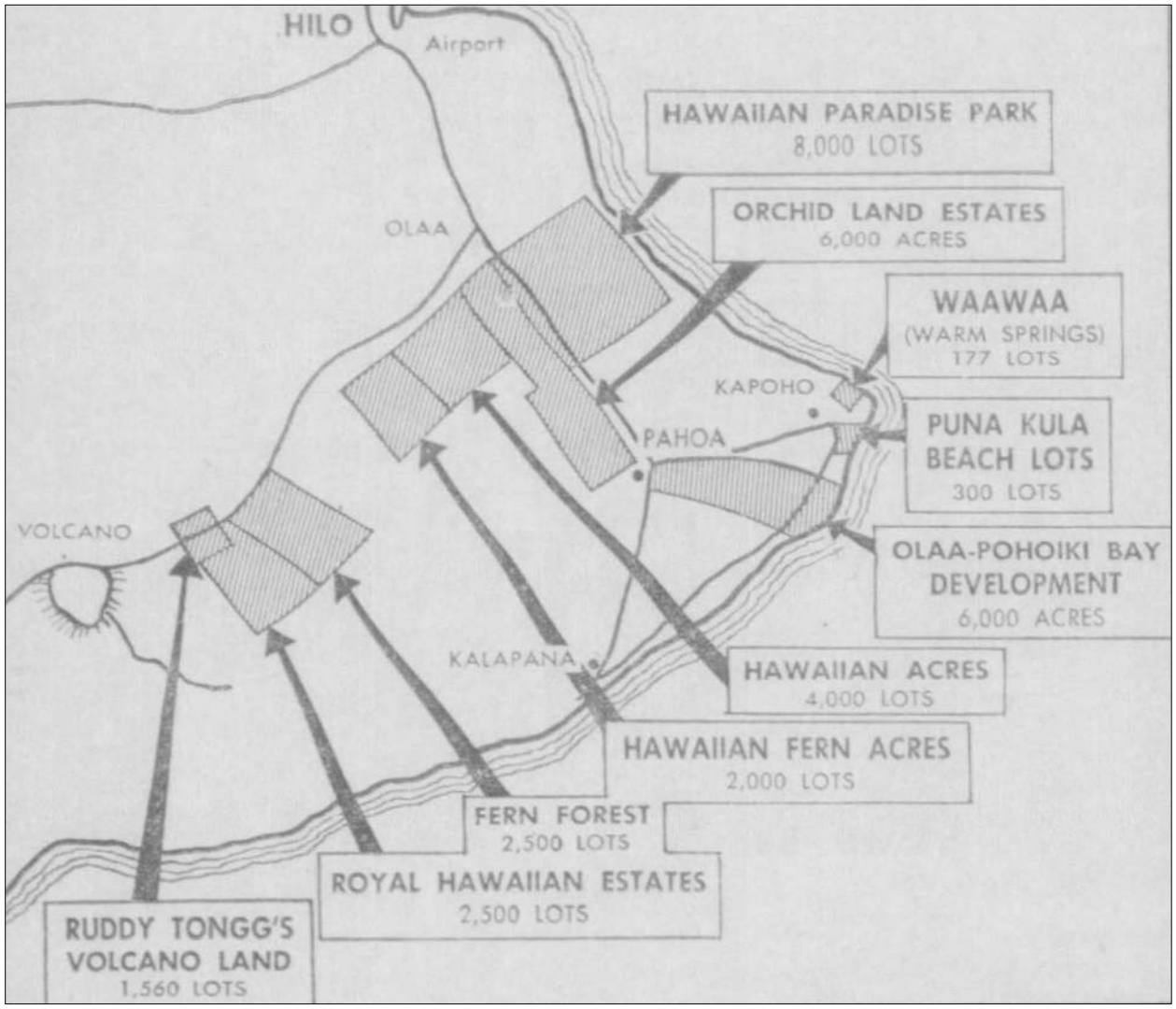


Figure 33. Planned residential subdivisions in Puna in 1959 (The Honolulu Advertiser 1959:21).

During the later part of the 1950s, W.H. Shipman Ltd. sold roughly 9,000 acres of their Keaʻau tract to the Honolulu-based Watumull Investment Co. who went on to create the Hawaiian Paradise Park residential subdivision (Cahill 1996). The subdivision consisted of 8,843, one-acre parcels originallys advertised for $795 each with a single access road, Paradise Drive (Edwards 2022). Herbert Shipman, however, retained 104 acres of coastal lands in Mākuʻu "out of respect for a small Hawaiian *heiau* on the property, as well as other archaeological sites and the belief that an ancient burial ground exists there" (Cahill 1996:266). Lots within the Hawaiian Paradise Park subdivision were marketed primarily to prospective buyers from California with some fifty real estate offices stretching from Santa Barbara to Chula Vista selling residential parcels on behalf of Watumull Investment Co (Hilo Tribune-Herald 1959). In addition to 9,000 acres of their Keaʻau land, W.H. Shipman Ltd. also sold another large tract along Volcano Highway (see Figure 33) to tract to Ruddy Tongg (Cahill 1996).

By the 1970s, the Shipman family slowly phased out their ranching operations which were spread around different areas of Hawaiʻi Island. However, the vast majority, nearly seventy percent of their profits came from lands they leased to the Puna Sugar Company. When AMFAC, the owners of Puna Sugar Company, announced the closure of their Puna operations in 1982, Blackshear who was heading W.H. Shipman Ltd. negotiated favorable terms and terminated their lease agreement several years before the original expiration date of 1994. Although lands leased for agriculture is still a mainstay of the organization, since the 1990, W.H. Shipman Ltd. has expanded their operations to include commercial development which led to the creation of the Keaʻau Shopping Center and the Shipman Industrial Center. As of 2022, W.H. Shipman, Ltd., holds an estimated 17,000 acres of land, primarily in Puna (Cahill 1996). According to the United States Census Bureau (2022), in 2020, Hawaiian Paradise Park was home to 14,957 individuals and between 2017-2021, consisted of 4,236 households.

The expansion of Hawaiian Paradise Park throughout the second half of the 20th century is clearly illustrated in historical USGS aerial photographs and maps spanning from 1961 through 1981. As shown in the 1961 aerial photograph (Figure 34), Paradise Drive is shown south of the project area along with a few side streets. By 1965 (Figures 35 and 36), portions of Kaloli Drive are shown along with additional side streets, which would ultimately form the grid-like layout of the subdivision; including 26th Street extending along the project area's western boundary. By 1976 (Figure 37), 25th Street was completed thus forming the eastern boundary of the project area and by 1981 (Figure 38) the Hawaiian Paradise Park community was completely laid out thus finalizing the build out of Puna's largest residential community.

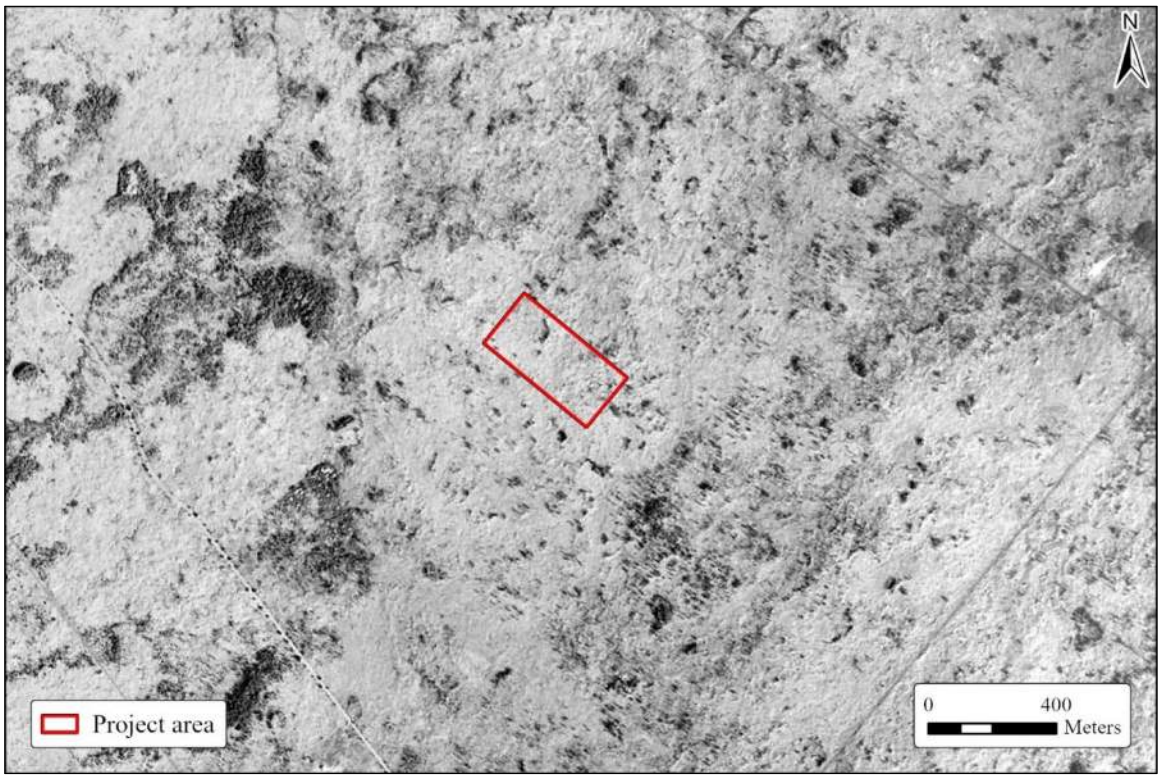


Figure 34. Portion of a 1961 USGS aerial photo showing project area shortly after the creation of the Hawaiian Paradise Park subdivision.

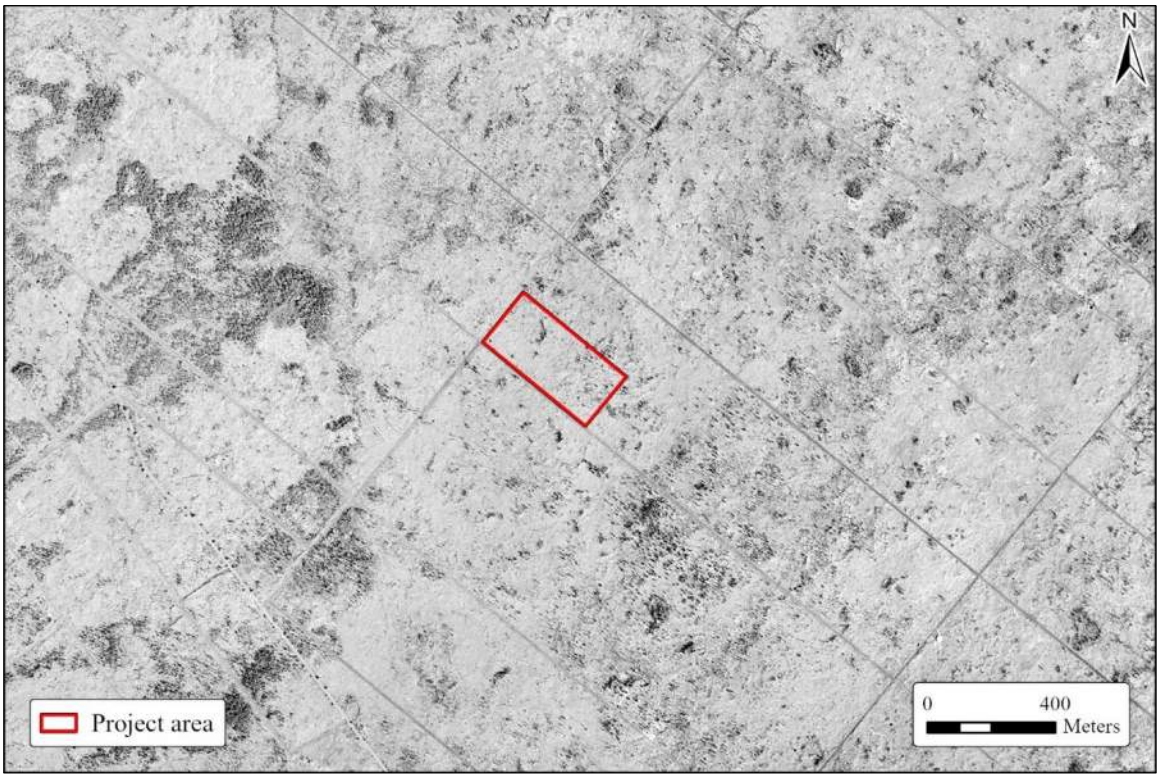


Figure 35. Portion of a 1965 USGS aerial photo showing project area and early infrastructure associated with the Hawaiian Paradise Park subdivision.

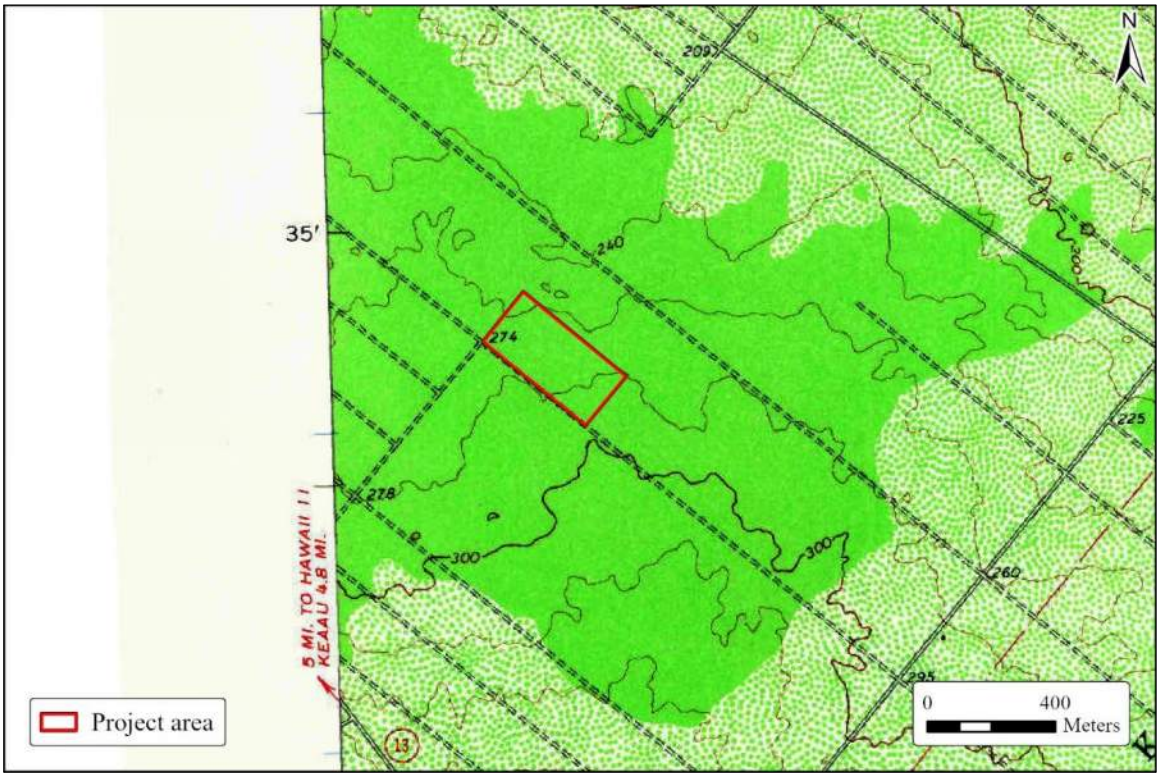


Figure 36. Portion of a 1965 USGS map showing project area and growth of the Hawaiian Paradise Park subdivision.

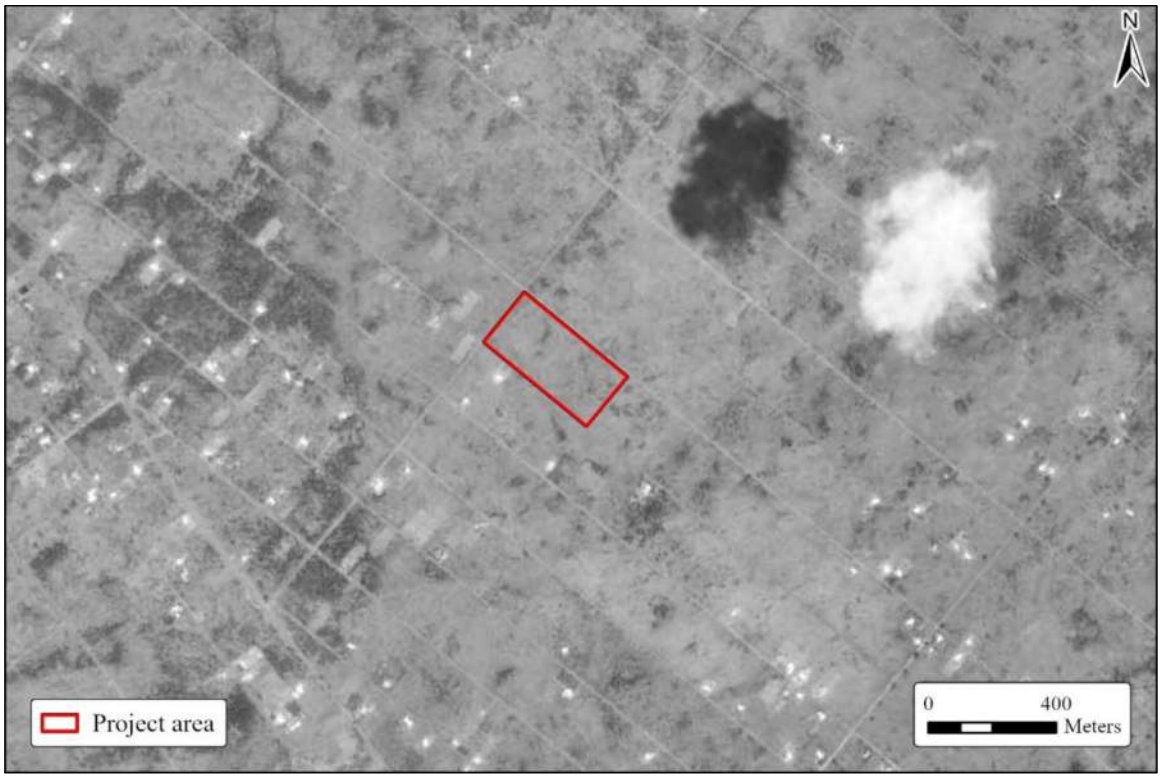


Figure 37. Portion of a 1976 USGS aerial photograph showing project area and steady growth of the residential subdivision.

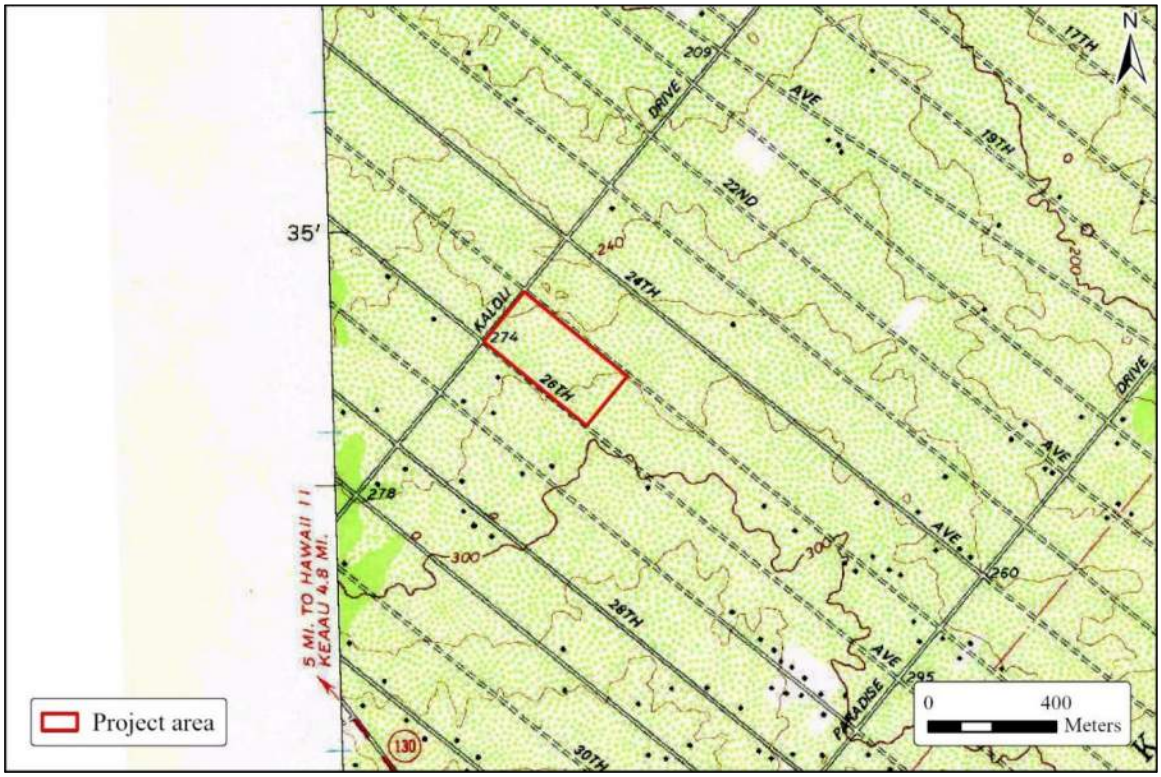


Figure 38. Portion of a 1981 USGS map showing project area and complete build out of the Hawaiian Paradise Park subdivision.

PREVIOUS ARCHAEOLOGICAL AND ETHNOGRAPHIC STUDIES

The following paragraphs summarize the findings of prior archaeological and ethnographic studies conducted within the immediate vicinity of Hawaiian Paradise Park. This section begins with a summary of studies conducted within the subdivision followed by a summary of studies conducted beyond the subdivision's boundaries. Given that the development of the Hawaiian Paradise Park subdivision occurred prior to the creation of state-mandated archaeological studies, coupled with County exemptions for single-family residences, very few archaeological studies have been undertaken within the residential portion of the community. As such, knowledge of the built cultural landscape within this part of Kea'au is somewhat fragmented and limited.

Summary of Studies Conducted within the Hawaiian Paradise Park Subdivision

Records on file at DLNR-SHPD indicate that twenty-five parcels within the Hawaiian Paradise Park subdivision (totaling 22 acres) have been previously surveyed for archaeological sites. Twenty-three parcels were surveyed by (Haun and Henry 2013a, 2013b, 2013c, 2013d) and one parcel was surveyed by Higelmire and Lash (2017); another by Clark (2018). Each of these parcel-level studies, conducted at locations in all directions surrounding the current project area, reported negative findings with regards to the presence of archaeological sites and features.

Aside from archaeological surveys conducted on individual parcels, most of the archaeological work within the subdivision has focused on a roughly 31-acre area situated between Maku'u and Paradise Drive (between 15th and 19th Streets) inclusive of TMK parcels (3) 1-5-023:001, 040, 074, 075, 117, 126, 147, and 184. When a park was proposed along 17th Street an archaeological field inspection of a 4.5-acre area was conducted in 1985 by Paul H. Rosendahl Inc. (Rosendahl 1985). Rosendahl (1985) identified numerous habitation and agricultural sites including "stacked stone walls, walled enclosures, low terraces and platforms, modified bed-rock outcrops, stone mounds and piles, and cleared areas" (Rosendahl 1985:1). All of the sites were found to be in good condition, retaining good integrity and thus determined significant for "scientific research and interpretive values"(Rosendahl 1985:2). Rosendahl recommended that the sites be physically protected to assure "to preserve the potential scientific research and values inherent in the remains" and that an inventory-level survey be undertaken to document the sites in greater detail and to determine the best course of action with regard to long-term protection.

The next study of this area occurred some thirty-five years later when the Hawaiian Paradise Park Owners Association (HPPOA) contracted Scientific Consultant Services Inc. (SCS) to conduct a limited archaeological inventory survey (Escott 2020) within a portion of the 31-acre preservation area along 17th Street. The archaeological field inspection encompassed a 22,445 square foot (0.515-acre) portion of the roadway parcel (TMK (3) 1-5-023:253). The inspection was done in preparation to improve approximately 80 meters by 22.5-meter-wide area of 17th Street. A pedestrian survey was conducted and "no features, feature remains, or artifacts [were] located" and it was determined that the road improvement project would have no effect to historic properties (Escott 2020:4).

Two years later, SCS returned to the 31-acre preserve area, this time to conduct a GPS survey within a portion of parcel (TMK [3] 1-5-023:126) (Escott 2022). The purpose of the GPS survey was to establish the outer boundary of the archaeological features that were previously identified by Rosendahl (1985). SCS recommended "if fencing is erected around the archaeological site, you should consider er[e]cting it at least 30 feet outside of the outer site perimeter" (Escott 2022:2).

Later that same year, the HPPOA formed its Cultural Preservation Committee and with the assistance of Kumu Pono Associates, an ethnohistorical study of the Hawaiian Paradise Park area was completed (Maly and Maly 2022). While the sites have been deemed significant in the past with preservation as the recommended treatment, aside from the limited archaeological study, no preservation measures have been implemented. Recognizing the limited resources Maly and Maly (2022:197) stated that "these biocultural landscape resources have become even more threatened, and they represent a few surviving fragments of the ancient Hawaiian history on the land," making the preservation of these sites even more important almost forty years after they were first documented.

As part of the current project, in 2023, ASM Affiliates conducted an archaeological inventory survey (ASM Affiliates 2023; in prep) of the project area. A pedestrian surface survey with 100% coverage was conducted and no historic sites were identified. The survey did identify the illegal dumping of household waste in different portions of the project area as well as a pig trap.

Summary of Studies Conducted Outside of Hawaiian Paradise Park

Beyond the boundaries of the Hawaiian Paradise Park subdivision, several studies have been conducted including one of the extensive Puna Cave System. Paul H. Rosendahl, Inc., conducted a study documenting the Puna Cave System (Olson 1984), Site 50-10-45-10001, and discussed its correlation to ancient Hawaiian tradition. The cave system is

described as an extensive lava tube system that includes the Kazumura—or Puna—Cave. First documented by researchers in 1982, the cave complex is located approximately 4.5 miles inland at Kalapana and extends in a northeast direction for over fourteen miles (Figure 39) and is recognized as the longest lava tube in the world (Allred and Allred 1997; National Park Service 2021). Olson (1984:1) described "six separate, but seemingly related, major archaeological sites" utilized for the "religious practice of sorcery" and may be the birth place of the goddess Kapokohelele, Kapo of the flying vagina. The site includes features of "underground temples, altars, platforms, walls, fire hearths, ceremonial areas, ancient burial tombs of *ali'i* (chiefs), human sacrifices, stone images of ancient gods, and extensive deposits of prehistoric Hawaiian artifacts," (Olson 1984:1). Five of the six sites are located within the Kea'au Ahupua'a: Site 10001-01 Kapo; -02 Kahuna Living Quarters; -03 Burial Chamber I; -04 Kuni Ceremonial area; and -05, Burial Chamber II. Although not located within the project area, the Puna Cave extends to the south of the project area (see Figure 39).

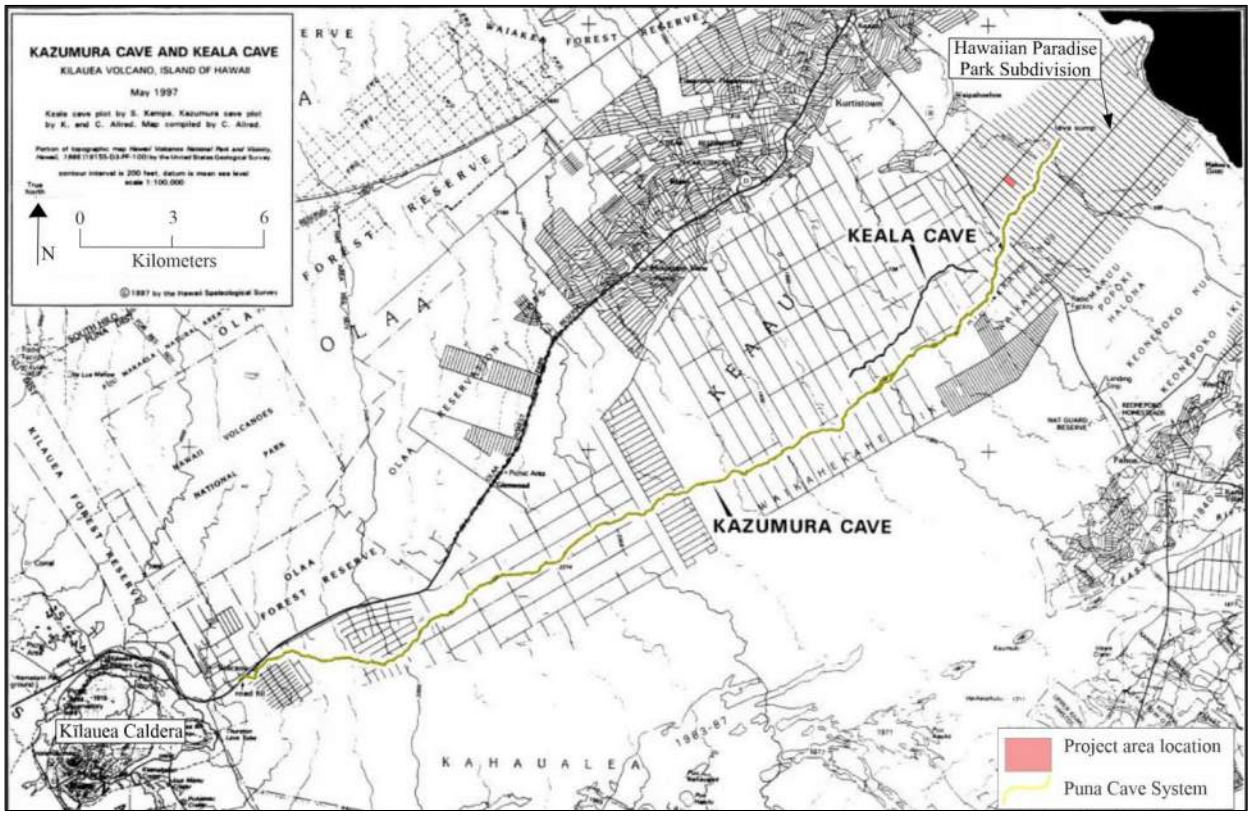


Figure 39. Map showing the extent of the Puna Cave with project area indicated.

With the growth of the district's population since the 1960s and need for new and improved roadways, several studies have been conducted along portions of the Old Government Road (east of the project area) as well as the current Kea'au-Pāhoa Highway (State Route 130; west of the project area). The earliest of such studies was a1972 inventory survey (Bevacqua and Dye 1972) conducted by the Bishop Museum. The study focused on a 15-mile portion of the proposed Kalapana-Keaukaha Highway corridor, between Kalapana to Kapoho. Two years later, the second half of the proposed highway corridor (portion of TMK (3) 1-6-001:003) between Kea'au to Waiakahi'ula was surveyed by the Bishop Museum (Ewart and Luscomb 1974). A total of 118 sites were identified with thirty being in Kea'au Ahupua'a. These sites consisted of six enclosures, three small complexes, ten rock walls, two standalone rock mounds, one L-shape, five complexes, one occurrence of isolated stacked facing, a single roofed shelter, and a platform. Most of the sites were determined to be of little to no significance, however of the thirty identified sites, two were determined to be significant (HA1-17 and -30, complexes) and full documentation including mapping was recommended. A single site (HA1-33, roofed shelter) was considered significant due to it being a "unique architectural feature in Hawaiian archaeology" (Ewart and Luscomb 1974:19).

Two decades later, a reconnaissance survey, conducted by Lass (1997) examined the coastal lands within Kea'au. The survey area, located along the route of the Old Government Road to the northeast of the Hawaiian Paradise Park Subdivision in the vicinity of Paki Bay, identified fifteen sites including the Old Government Road/Puna Trail (Site

50-10-36-21273) (Figure 40), along with numerous rock walls, enclosures, rock piles, modified bedrock features, and several concrete structures (Sites 50-10-36-21259 to 21273) (see Figure 40). These sites were interpreted as having been used for Precontact to early Historic Period habitation, burial, and agricultural purposes, Historic ranching purposes, and World War II-era coastal defense purposes.

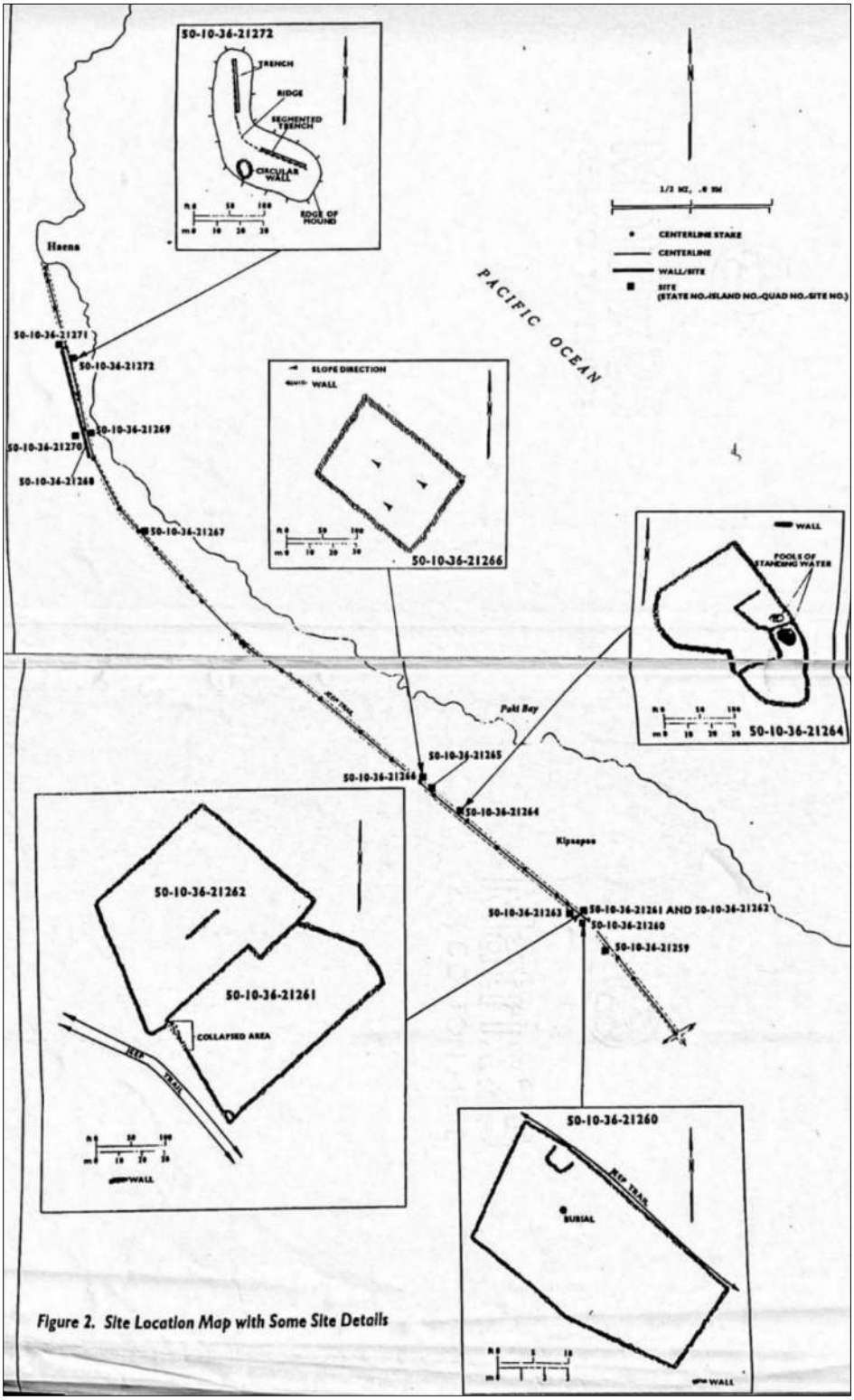


Figure 40. Lass (1997:Figure 1) site location map.

Two years later, Kumu Pono Asssoicates completed an ethnographic study and site preservation plan (Maly 1999) for the Puna Trail/Old Government Road for the Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife, Trails and Access Program. The study included historical and archival research as well as community consultation with three *kamaʻāina* from Keaʻau. A limited site preservation plan was a developed with recommendations regarding protection and interpretation of the trail and surrounding features. The recommendations included involving the community at all levels of engagement with the trail; educating the public of the trail's significance, and surrounding natural and cultural resources, and the responsibilities associated with access and use of the trail.

Several studies have been conducted along the Keaʻau-Pāhoa Highway (State Route 130). In support of an Environmental Assessment for the proposed highway improvement, Cultural Surveys Hawaiʻi, Inc. conducted a cultural impact assessment (Farias et al. 2009) and an archaeological inventory survey (Wilkinson et al. 2010). The cultural studies included culture-historical context as well as consultation with well over four dozen community organizations and individuals. Although the cultural impact study did not identify any valued cultural resources or practices within the project area, some of the consultees expressed concern over the possibility of encountering sites just outside the project area as well as safety concerns, and changes to the feel of Puna. Farias et al. (2009) recommended monitoring for all construction activities and that all existing access points to W.H. Shipman agricultural lands and the Aha Pūnana Leo School be maintained. As a result of the archaeological survey, Wilkinson et al. (2010) identified a single site (Site 50-10-44-26874), a bridge constructed in the 1930s. The site was assessed as significant under Criterion d and recommend as eligible for inclusion in the National and Hawaiʻi Historic Register. Due to the site's eligibility, Wilkinson et al. (2010) concluded that the proposed road improvement project would have an adverse effect on historic properties and thus mitigation was recommended. The recommended mitigation included documentation of the site, archeological monitoring, and avoidance of roadside memorials as goodwill to protect community relations.

3. CONSULTATION

Gathering input from community members with genealogical ties and long-standing residency or relationships to the study area is vital to the process of assessing potential cultural impacts to resources, practices, and beliefs. It is precisely these individuals that ascribe meaning and value to traditional resources and practices. Community members often possess traditional knowledge and in-depth understanding that are unavailable elsewhere in the historical or cultural record of a place. As stated in the OEQC (1997) *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 identified traditional cultural properties. 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. This section of the report begins with a description of level of effort undertaken to identify persons believed to have knowledge of the study area, followed by the interview methodology. This section of the report concludes with a presentation of the interview summaries that have been reviewed and approved by the consulted parties.

In an effort to identify individuals knowledgeable about traditional cultural practices and/or uses associated with the current project and study area, a public notice containing (a) locational information about the project area, (b) a description of the proposed project, and (c) contact information was printed in a newspaper with state-wide readership. The public notice was submitted to the Office of Hawaiian Affairs (OHA) on October31, 2023, for publication in their monthly newspaper, *Ka Wai Ola*. This notice was published in the December 2023 edition of *Ka Wai Ola* and a copy of the public notice is included in Appendix A of this report. From the public notice, zero responses were received.

Additionally, ASM staff contacted twenty-seven individuals and organization (Table 5) via phone and email: Lauae Kekahuna, Luana Jones, Hawaiian Paradise Park Owners Association, Leila Kealoha, Leialoha Ilae-Kaleimamahu, Keone Kalawe, Faye Hanohano, Iopa Maunakea, Drew Kapp, Peggy Farias, Travis Agbayani, Jordan Kea Calpito and Christian Omerod of the State Historic Preservation Division, Office of Hawaiian Affairs, Mililani Trask, Hidi Boteilho, Piʻilani Kaʻawaloa, Kuʻulei Cooper, Leslie Līhau Enriquez Rosehill, Nainoa K. Rosehill, Leah Goulker, Colleen Thomas (Paio), Leilani Waldron, Kaniu Kinimaka-Stockdale, Kalena Blakemore, Annamarie Kon, Clarence Medeiros, and Kepā Maly. These individuals were identified as persons who were long-time residents of the area and or were believed to have knowledge of past land use, history, or cultural information. Each of the persons contacted was provided with a consultation packet that contained maps of the project area, a description of the proposed project, and the proposed plans. Of the twenty-seven people contacted, six, Lauae Kekahuna, Peggy Farias;

Hidi Boteilho; Annamarie Kon, and Larry Torres and Barbara Lively of the Hawaiian Paradise Park Owner's Association, agreed to be interviewed for this study.

Table 5. Persons/organizations contacted for consultation.

Name	*Organization/Affiliation*	*Contact Date(s)*	*Results*
Lauae Kekahuna	Maku'u Farmer's Association	10/27/2023	See interview summary below
Luana Jones	Puna resident, Puna	10/27/2023	No response
	Hawaiian Paradise Park Owners Association	10/27/2023	No response
Leila Kealoha	Puna resident, Kealoha ʻĀina LLC, Cultural Resilience Capacity Areas	10/27/2023	No response
Leialoha Ilae-Kaleimamahu	Puna resident	10/27/2023	No response
Keone Kalawe	Puna resident	10/27/2023 10/30/2023	No response
Faye Hanohano	Puna resident, Puna representative 2007-2015	10/27/2023	No response
Iopa Maunakea	Puna resident, Men of Pa'a	10/27/2023	No response
Drew Kapp	Puna resident	10/27/2023	No response
Peggy Farias	W. H. Shipman LLC	10/27/2023	See interview summary below
Travis Agbayani	Puna resident	10/27/2023	No response
Jordan Kea Calpito and Christian Omerod	State Historic Preservation Division-Burial Sites Specialists	10/30/2023	Provided name of registered descendant
Office of Hawaiian Affairs	Compliance department	10/30/2023	No response
Mililani Trask	Puna resident, Hawai'i Island OHA trustee	10/30/2023	No response
Heidi Botelho	Puna resident	10/30/2023	See interview summary below
Pi'ilani Ka'awaloa	Puna resident	10/30/2023	No response
Ku'ulei Cooper	Puna resident	10/30/2023	No response
Leslie Līhau Enrigquez Rosehill	Puna resident	10/30/2023	No response
Nainoa K. Rosehill	Puna resident	10/30/2023	No response
Leah Goulker	Puna resident, Cultural Resilience Capacity Areas	10/30/2023	No response
Colleen Thomas (Paio)	Puna resident	10/30/2023	No response
Leilani Waldron	Puna Resident; Hui Aloha ʻĀina	10/30/2023	No response
Kaniu Kinimaka-Stocksdale		10/30/2023	No response
Kalena Blakemore	Hawai'i Island Burial Council Puna representative	10/30/2023	No response
Annamarie Kon	Puna resident, descendant	10/30/2023	See interview summary below
Clarence Mederios	Cultural Descendant	10/31/2023	No response
Kepā Maly	Puna Resident, Ethnographer	11/13/2023	No response

INTERVIEW METHODOLOGY

Prior to the interview, ASM staff provided information about the nature and location of the proposed project and informed the potential interviewees about the current study. The potential interviewees were informed that the interviews were completely voluntary and that they would be given an opportunity to review their interview summary prior to inclusion in this report. With their consent, ASM staff then asked questions about their background, their knowledge of past land use, and the history of the project area, as well as their knowledge of any past or ongoing cultural practices. The informants were also invited to share their thoughts on the proposed development and offer mitigative solutions. All interviews were conducted in the manner determined by the interviewee which included phone, in-person, as well as Zoom video communication. Below are the interview summaries that have been reviewed and approved by the consulted parties.

LAUAE KEKAHUNA

On October 27, 2023, Lauae Kekahuna contacted ASM staff, Mrs. Candace Gonzales via email, in response to an October 27, 2023, email sent by Mrs. Gonzales regarding the proposed project and the nature of the current study. An interview with Ms. Kekahuna was conducted via phone on November 3, 2023. Miss Kekahuna was born and raised in the Makuʻu Homesteads to the south of the current project area and is an active community member through her position as the executive director of the ʻO Makuʻu Ke Kahua Community Center, Makuʻu Farmers Market. Through her work and passion for culture and community, Ms. Kekahuna works with the County of Hawaiʻi frequently.

When asked about cultural resources in the project area's vicinity, Miss Kekahuna states that *iwi kūpuna* are abundant throughout the Puna District and is the reason for many of the "untouched lots." However, she goes on to mention that even if there are known burials, there is not enough time for the community to share their *ʻike* to guard and protect known and unknown burials. Ms. Kekahuna states that the County is not up to date with the unknown ancient burial grounds/sites and needs support in outreaching to the lineal descendant and long-term residents of the *ʻāina*.

PEGGY FARIAS

On October 30, 2023, Mrs. Peggy Farias contacted ASM staff, Mrs. Candace Gonzales via email, in response to a October 27, 2023 email sent by Mrs. Gonzales regarding the proposed project and the nature of the current study. An interview with Mrs.Farias was conducted via Zoom on November 1, 2023. Mrs. Farias is a descendent of the Shipman *ʻohana* and the current president of W.H. Shipman Limited. The Shipman *ʻohana* has large landholdings in the Puna District, with the majority of their lands are situated in Keaʻau Ahupuaʻa. Mrs. Farias expressed support for the park, stating that she is happy to see the 20-acre lots that had been set aside for community use finally being put to use. She recalled a conversation with her husband about back when the subdivision was originally marketed; there were several 20-acre parcels that were nonresidential, for community use, to provide services. Mrs. Farias likes the idea of having services within the subdivision and lessening the need to get on the highway.

When asked about her knowledge of the past land uses of the area, she admits not knowing what was done in the area prior to her family purchasing the land in 1882. When her great-great grandfather, William Herbert Shipman, purchased the land it was utilized for cattle ranching and was part of their Keaʻau Ranch until around the 1950s/60s when the Hawaiian Paradise Park subdivision began to be developed. Mrs. Farias confidently stated that the area was never under sugarcane cultivation, going on to recall family anecdotes that speak of periodic controlled burns in the area to control unwanted trees and such from coming into the grazing fields. Due to this practice, it is highly unlikely that the area is used for gathering of cultural resources.

In conclusion, Mrs. Farias thinks the park is great, stating that any kind of development that provides the community with healthy recreation and give the children the opportunity to participate in sports is "always good." However, she does express concerns over traffic safety. She goes on to explain that while it is easy to argue that the park users would be residents already living in the subdivision and thus not increasing traffic coming into the subdivision; in reality this would be the only park between Keaʻau and Pāhoa towns and has the potential to draw users from all the areas in-between. Mrs. Farias hopes there are plans to improve the intersection at Kaloli Drive and HWY 130 with the development of the park. Lastly, Mrs. Farias recommends the pool that is being proposed be put in at the Herbert C. Shipman Park in Keaʻau Town, which is more centrally located and would serve more individuals. Additionally, Mrs. Farias is curious about the pool's water supply with no piped water available to the project parcel.

HIDI BOTEILHO

On October 30, 2023, Mrs. Hidi Boteilho contacted ASM staff, Mrs. Candace Gonzales via email, in response to an October 30, 2023, email sent by Mrs. Gonzales regarding the proposed project and the nature of the current study. An interview with Mrs. Boteilho was conducted over the phone on November 2, 2023. Mrs. Boteilho is a lineal descendant of ʻOpihikao and Kalapana in Puna and was born and raised in the Makuʻu Homestead. For almost eight years now she has lived in the Hawaiian Paradise Park subdivision. She is also an active member of the Makuʻu Farmer's Association and is currently the Vice Principle at Keonepoko Elementary. As a descendent and educator, she has come to know the past uses of the area through her life experiences and family stories.

When asked about the cultural resources in and around the current project area, Mrs. Boteilho was unaware of any, stating that there are a lot more things of historical value near the coast. As a resident of the subdivision, with her home on the same street as the proposed park, Mrs. Boteilho is happy to see the parcel being developed. She explained that it has been utilized as a dump site consistently for some time now and that the parcel sits on top of a hill concealing the perpetrators from surrounding neighbors. While the HPPOA is fast to clean it up, within hours new rubbish will be deposited. Mrs. Boteilho explained, often times, abandoned vehicles are part of the waste being deposited, with a ninety percent chance that these will be set on fire, threatening surrounding homes.

While the development of a park in the parcel will hopefully put an end to dumping in the area, Mrs. Boteilho, expresses concerns over security and access. Mrs. Boteilho is concerned that having a park facility in the area will draw homeless to the area and unwanted teenage activities. She also expresses concern over the increased traffic in the area and maintaining the privacy of the neighboring residents, stating that with increased traffic comes an increase in wandering eyes that can lead to increased crime such as break-ins and burglaries.

Mrs. Boteilho fully supports the development of the park within Hawaiian Paradise Park subdivision, stating that as an educator she is highly in support of athletics and recreation however, warned the County to do better planning. She referenced the mistakes made with the Billy Kenoi District Park, and the money being wasted to fix things that could have been avoided with better research and planning. She also recommended security be implemented on site to ward off homeless and illegal activities. Lastly, to ensure the privacy of the neighboring residents, the main entrance to the park should be along its eastern boundary (25th avenue) with additional parking area put in the parcel across the street. Additional parking is something that Mrs. Boteilho sees as vital, stating that many parks, like the Panaewa Park, do not have adequate parking, causing people to park along the road. Parking along the road can be dangerous to vehicles and pedestrians. Additionally, the roadways in the subdivision are fairly narrow and the park sits on a hill thus, making it difficult to see cars parked along the road that could possibly make it very difficult if not impossible to pass.

In conclusion, Mrs. Botelho supports the park, stating that the community "deserves more" but is concerned about the "very ambitious" plans that could result in wasting more money if it is rushed and not well thought out. Mrs. Boteilho hopes development of the park will not only take into consideration the community's needs but also that the County will learn from their past mistakes and avoid repeating them with this project.

ANNAMARIE KON

On October 31, 2023, Ms. Annamarie Kon contacted ASM staff, Mrs. Candace Gonzales via email, in response to an October 30, 2023, email sent by Mrs. Gonzales regarding the proposed project and the nature of the current study. An interview with Ms. Kon was conducted over the phone on November 1, 2023. Miss Kon is the director of Nā Maka Hāloa o Waipiʻo, a nonprofit based in Puna working to perpetuate the Hawaiian culture through traditional land practices, traditional fishing practices, *hula*, and other Hawaiian arts. Ms. Kon is a lineal descendent of Puna and currently resides on Hawaiian Homelands in the Popokī-Makuʻu area.

When asked about the cultural resources of the area, she stated that most of the past settlements and traditional activities occurred along the coast, based on resource availability. In a conversation she had with her uncle years ago, he told her that "nobody lives over there" which he supported by pointing out that when the train was running, there were no stops from "after Waʻawaʻa to Keaʻau [town] was the next stop."

Ms. Kon went on to recall her time working with the Edith Kanakaʻole Foundation (EKF) and how Nā Maka Hāloa o Waipiʻo became the stewards of the *Kohe* feature (SIHP # 50-10-45-10001, Puna Cave System) located within the Puna Cave System. Ms. Kon has worked with EKF for over thirty years. The parcel that the *Kohe* is located on was once owned by Paul Mitchell, the hairstylist. Mr. Mitchell would give tours of the cave in the fifties and sixties, with most of his clients coming from Canada and elsewhere. When Mr. Mitchell passed away about twenty years ago

his grandson inherited the parcel which the *Kohe* is located on and gifted it to EKF to care for. While not located in Kea‘au, Ms. Kon spoke of the cave’s vastness stating that it is, “huge, so huge in areas… can drive two rigs side by side” with “veins of other lava tubes connecting” to the *Kohe* cave. Ms. Kon expresses concerns over potential access to the cave through these veins, stressing the abundance of settlements within the cave systems she has personally experienced in Waikahekahe Ahupua‘a and the district of Ka‘ū. She told of the rock structures and fire pits that indicated the different settlements within the cave and expressed regret for the things lost to “cave robbers” of the past. The cave, cave access, and associated cave dwellings are the only cultural resources that Ms. Kon identified, stressing the lack of a full understanding of their disbursement and just how abundant they were in the past; stating that “there were a lot more than we think.” Thus, emphasizing the need to be conscious of their existence and proactive in their protection.

While Ms. Kon did not offer any mitigation recommendations specific to the cave settlements, she did recommend that the county take into consideration how the park accommodates the Hawaiian community and Hawaiian recreation. She went on to stress the need to implement community spaces that support Hawaiian activities. Some of the recommendations made by Miss Kon included the use of native plants and edible plants in the landscaping, with at least 90% of the plants being native. Through the implementation of native and useful plants, the County can support native practitioners and native ecosystems while also contributing to food sovereignty. Some of the plants that were mentioned by Ms. Kon were *kukui* (*Aleurites moluccana*) and *hala* (*Pandanus tectorius*). Additionally, a community greenhouse and community gardens would provide space for the community to cultivate and educate others on the plants that are useful and needed specifically for that community. It is also important that parking allow access for all to all areas. Central parking is nice but can be challenging for some when trying to access areas along the outskirts; parking at various locations should be considered to allow for use of park facilities as well as quick access to plants for gathering materials. Additionally, regarding supporting the Hawaiian community, the practice of *kilo* is very important and thus, a star compass should be incorporated at, not only this park, but all public parks. Lastly, Ms. Kon mentioned the importance of supporting the local community through hiring at least 25-50% local Puna businesses for construction and stewardship of the park.

LARRY TORRES AND BARBARA LIVELY

On November 2, 2023, Mr. Larry Torres contacted ASM staff, Mrs. Candace Gonzales via email, in response to an October 27, 2023, email sent by Mrs. Gonzales regarding the proposed project and the nature of the current study. An interview with Mr. Torres and Mrs. Barbara Lively was conducted in person at the HPPOA Office on November 6, 2023. Larry Torres was born and raised in the subdivision and is a current resident and homeowner within the subdivision as well as recently becoming the general manager of the HPPOA. Within the last year the HPPOA has experienced major changes that include an almost 100 percent turnover in staff. With almost no one remaining on staff with the knowledge of the things of the past in regard to the HPPOA and the subdivision, Mrs. Lively, being a current staff member and longtime resident of the area, was asked by Mr. Torres to join in on the interview. Mrs. Lively once lived in the subdivision, relocating to the Ainaloa subdivision to the southwest of the Hawaiian Paradise Park Subdivision a number of years ago.

Both individuals admit to not knowing exactly what types of land uses were employed in the area other than ranching by the Shipman family. Mrs. Lively recalled hearing of the periodic controlled burns that were conducted during that time and went on to state that since the land was purchased, the parcel was never officially utilized for anything by the HPPOA but that does not mean that the community has not made use of it. Mrs. Lively stated that complaints have been received by their office regarding the possibility the project area being used as a homeless encampment or for the production of methamphetamine without the knowledge or consent of the HPPOA.

When asked about cultural resources within the current project area and its vicinity both individuals did not identify any such resources and shared that the reason for their willingness to participate in consultation is to be fully informed of the happenings in the subdivision and to be of support in any way they are able. Much of the discussion focused on questions from Mr. Torres and Mrs. Lively regarding the process of identification, documentation, and preservation of cultural resources as well as how consultants are identified and contacted. There were also questions as to who can make recommendations.

Both individuals care deeply about the Puna community and the subdivision and are doing their due diligence to stay proactive in the future of the subdivision. Mr. Torres is now raising children of his own in the subdivision, the community which he works for and serves, which has increased the importance of doing his best, stating “this is my

legacy." Both individuals are looking forward to having the district park that Mr. Torres feels "will benefit everybody" in the community.

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" (OEQC 1997:1). The guidelines also identify the types of cultural resources, associated with cultural practices and beliefs that are subject to assessment. These include other types of historic properties, both man made and natural, submerged cultural resources, and traditional cultural properties. The origin of the concept and the expanded definition of traditional cultural property is found in National Register Bulletin 38 published by the U.S. Department of Interior-National Park Service (Parker and King 1998). An abbreviated definition is provided below:

> "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.

"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.

It is however with the definition of "Property" wherein there lies an inherent contradiction, and corresponding difficulty in the process of identification and evaluation of potential Hawaiian traditional cultural properties, because it is precisely the concept of boundaries that 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 on it. To limit a property to a specifically defined area may actually partition 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 of 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 Ka ʻĀina* 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/or past or ongoing traditional customary practices; 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 mitigative actions to be taken to reasonably protect native Hawaiian rights if they are found to exist.

IDENTIFICATION OF TRADITIONAL AND CUSTOMARY PRACTICES, VALUED CULTURAL RESOURCES

The culture-historical background in conjunction with the results of the consultation process, revealed that the project area (and much of the Hawaiian Paradise Park subdivision) was used historically for ranching by the Shipman family between 1882 to about the late 1950s when the subdivision was created. As the project area was used as grazing land for cattle, no specific ranching infrastructure was ever developed within the project area and no such resources were identified during the archaeological inventory survey of the parcel.

The historical records predating Shipman's acquisition of Kea'au Ahupua'a indicate that the project area was a part of the vast lowland "pandanus forest" of Kea'au, which according to traditional accounts, was a forest comprised of plants including but not limited to *hala*, *'ōhi'a*, and *maile.* Although no *hala* or *maile* was observed within the project area, small stands of *'ōhi'a* and *uluhe* were observed in the project area. Furthermore, no Precontact or Early Historic Period cultural sites or features were identified in the project area.

The background research and consultation also identified the nearby Puna Cave system (Site 50-10-45-10001), the main branch of which is located to the south of the project area. This vast cave system is known to contain various types of cultural remains including burials and has been associated with Kapokohelele, an ancestral deity belonging to the Pele clan.

Findings, Recommendations, and Conclusion

It is the findings of this study that the proposed project would not have any impact on the resources and practices associated with ranching. Conversely, the proposed project has the potential to impact the remaining native plant resources including the culturally valued *'ōhi'a* as well as the Puna Cave System. To mitigate impacts to extant native plant resources and the Puna Cave system, the following recommendations are offered.

Concerning extant native plant resources, it is recommended that the County investigate the extant stands of *'ōhi'a* within the project area to determine whether Rapid 'Ōhia'a Death (ROD) is present or not. If ROD is present, then cautionary measures including those that have been put forth by the Department of Land and Natural Resources, the University of Hawai'i College of Tropical Agriculture and Human Resources, the Department of Agriculture (and other agencies), should be undertaken to reduce the spread of this fungus. Furthermore and as articulated by one of the consulted parties, any future landscaping plans for the proposed park should incorporate ecologically appropriate native plants and or plants that may be used for cultural and or subsistence purposes.

As articulated by some of the consulted parties and presented in the background research, impacts on the Puna Cave system or other undocumented caves were of concern. While none of the consulted parties were aware of any caves or cave openings within the project area, the use of heavy machinery for grubbing and or grading activities during the park's construction has the potential to expose subterranean lava tubes that may contain cultural material and human remains. While the archaeological inventory survey prepared for the proposed project in compliance with Hawai'i Administrative Rules Chapter 13-276 did not identify any cave openings (or any other historic properties) within the project area, it does recommend that that if significant archaeological resources (such as cave openings) are discovered during the proposed ground disturbing activities, that the work in the area of the discovery should cease and the State Historic Preservation Division be contacted pursuant to HAR 13§13-275-12. To help minimize the potential for inadvertently disturbing cultural resources as part of the park development, it is recommended that the archaeological inventory survey prepared for the project be submitted to the State Historic Preservation Division for Chapter 6E-8 review, comment, and acceptance prior to the start of any ground-disturbing work, and that the construction personnel involved in the project be made aware of what to do (and who to notify) if cave openings or other undocumented historic properties are identified during the construction activities.

In addition to the recommendations provided above, the following is intended to convey the thoughts and concerns of the consulted parties. While there was no strong objection to the proposed project by those interviewed for this study, they did raise concerns over increased traffic to the areas, the potential for illegal activities, challenges with those who are unhoused, and burglaries, and the need for inclusivity of Hawaiian and non-western forms of recreation in the proposed park.

Regarding the potential for increased traffic, it was suggested by the consulted parties that the Kaloli Drive and Pāhoa-Keaʻau intersection be improved, and that the main entrance to the park be placed along the eastern boundary of the parcel on 25th Avenue across from the undeveloped lot (away from the private residential lots on 26th Avenue). It was also suggested that security be implemented at the park to deter illegal activities.

Furthermore, one of the consultees spoke about the lack of County water infrastructure on the parcel and the viability of developing a swimming pool. It was recommended that the pool be developed at one of the County's Keaʻau facilities where there is existing water infrastructure, rather than at the proposed project location. This consultee felt that building a pool in the vicinity of Keaʻau town would better serve the community.

Additionally, one of the consultees expressed concern for the exclusiveness of the activities supported by the proposed park and recommended that the County and its planners incorporate and support Hawaiian and other non-western forms of recreation. Examples that were shared included developing a greenhouse, incorporating plants commonly used for gathering, open spaces to carry out traditional practices such as *kilo*, construction of a star compass, and decentralizing parking to allow for easy access to various parts of the park. Lastly, it was recommended that the County of Hawaiʻi make efforts to provide benefits to local community members and residents of Puna as part of the development, construction, and stewardship of the park.

In conclusion, the culture-historical background, consultation, and recommendations provided above are intended to ensure the activities associated with the proposed park do not adversely affect any of the above-identified valued cultural resources or associated traditional customary practices. The concerns and recommendations offered above are intended to help the County remain mindful of the cultural and environmental uniqueness of this land. Conducting background research, consulting with community members who so willingly gave their time and knowledge, and recommending feasible actions to mitigate potential cultural impacts are done so with the utmost *aloha*, for both the land and the people whose heritage is connected to the lands of Keaʻau. If the County proceeds with this project, we recommend that it be done in the same spirit and practice.

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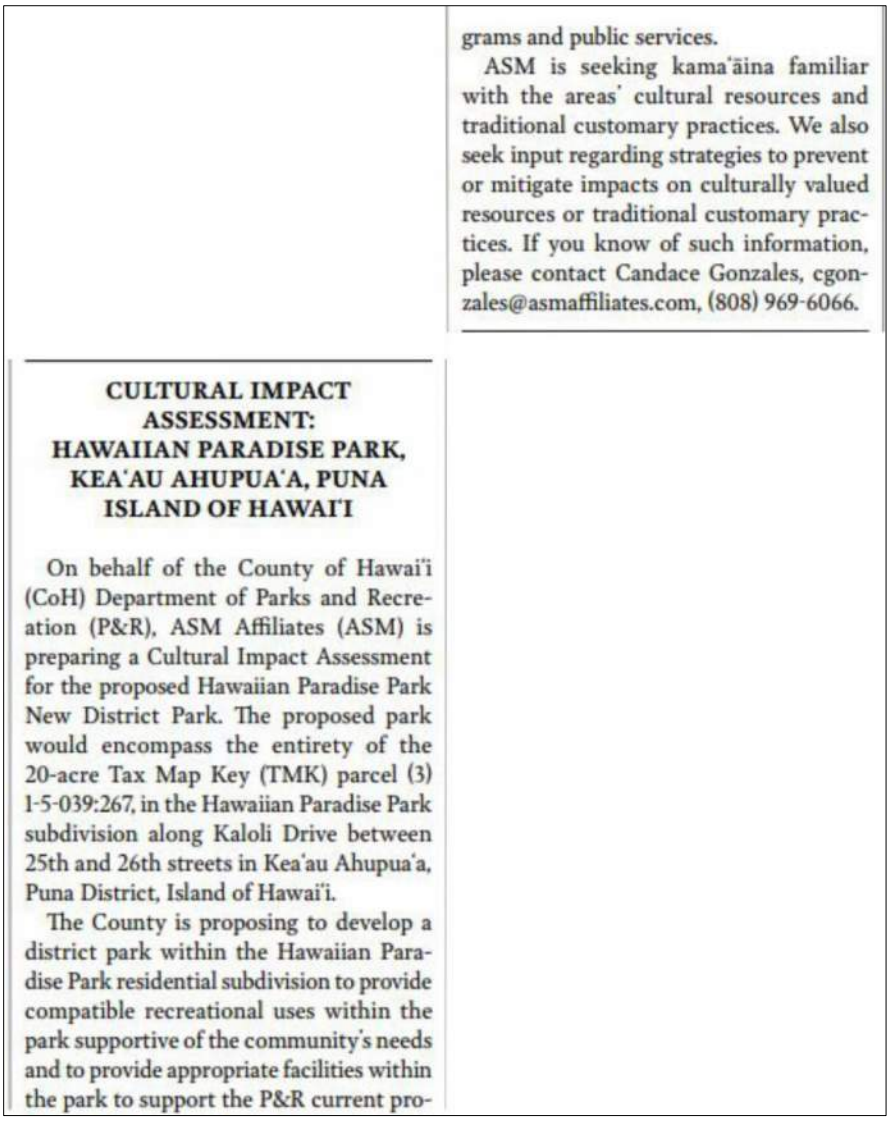
APPENDIX A. KA WAI OLA PUBLIC NOTICE



grams and public services.

ASM is seeking kama'āina familiar with the areas' cultural resources and traditional customary practices. We also seek input regarding strategies to prevent or mitigate impacts on culturally valued resources or traditional customary practices. If you know of such information, please contact Candace Gonzales, cgonzales@asmaffiliates.com, (808) 969-6066.

CULTURAL IMPACT ASSESSMENT: HAWAIIAN PARADISE PARK, KEA'AU AHUPUA'A, PUNA ISLAND OF HAWAI'I

On behalf of the County of Hawai'i (CoH) Department of Parks and Recreation (P&R), ASM Affiliates (ASM) is preparing a Cultural Impact Assessment for the proposed Hawaiian Paradise Park New District Park. The proposed park would encompass the entirety of the 20-acre Tax Map Key (TMK) parcel (3) 1-5-039:267, in the Hawaiian Paradise Park subdivision along Kaloli Drive between 25th and 26th streets in Kea'au Ahupua'a, Puna District, Island of Hawai'i.

The County is proposing to develop a district park within the Hawaiian Paradise Park residential subdivision to provide compatible recreational uses within the park supportive of the community's needs and to provide appropriate facilities within the park to support the P&R current pro-

December 2023 edition of *Ka Wai Ola*

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APPENDIX F

Archaeological Assessment

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An Archaeological Assessment for the Hawaiian Paradise Park New District Park Master Plan

TMK: (3) 1-5-039:267

Keaʻau Ahupuaʻa
Puna District
Island of Hawaiʻi

DRAFT VERSION

Prepared By:

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Matthew R. Clark, M.A.,

Prepared For:

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Proposing Agency:

County of Hawaiʻi
Department of Parks and Recreation

September 2024

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ASM Project Number 44440.00

An Archaeological Assessment for the Hawaiian Paradise Park New District Park Master Plan

TMK: (3) 1-5-039:267

Kea‘au Ahupua‘a
Puna District
Island of Hawai‘i

ASM affiliates

EXECUTIVE SUMMARY

At the request of SSFM International, Inc., on behalf of the County of Hawai‘i (CoH) Department of Parks and Recreation (P&R), ASM Affiliates conducted an Archaeological Inventory Survey of Tax Map Key: (3) 1-5-039:267, a 20-acre County-owned parcel located in the Hawaiian Paradise Park residential subdivision in Kea‘au Ahupua‘a, Puna District, Island of Hawai‘i. The CoH is proposing to construct the Hawaiian Paradise Park New District Park within the 20-acre project area, which amongst other recreation facilities, would include a community center.

Fieldwork for the current study was conducted on October 6, 2023, by David Morris-King, M.Sc., Colsen Balai, B.A., Jonas Leon, B.A, and Olivia Crabtree, B.A, under the supervision of Matthew R. Clark, M.A. (Principal Investigator). As a result of the current fieldwork, no archaeological historic properties of any kind were identified within the current project area. With respect to the historic preservation review process of the Department of Land and Natural Resources–State Historic Preservation Division (DLNR–SHPD), given the negative findings of the current study, the recommended determination of effect for the proposed development of a park on TMK: (3) 1-5-039:267, pursuant to HAR §13-284-7, is “no historic properties affected.” No further historic preservation work is recommended prior to permit issuance or during any subsequent development activities within the project area. In the unlikely event that significant archaeological resources are discovered during the future ground disturbing activities, work should cease in the area of the discovery and DLNR-SHPD contacted pursuant to HAR 13§13-275-12.

CHAPTERS

Page

FIGURES

Page

FIGURES

Page

TABLES

Page

1. INTRODUCTION

At the request of SSFM International, Inc., on behalf of the County of Hawai‘i (CoH) Department of Parks and Recreation (P&R), ASM Affiliates (ASM) conducted an Archaeological Inventory Survey (AIS) of Tax Map Key (TMK): (3) 1-5-039:267 (referred to hereafter as the "project area"), a 20-acre County-owned parcel located in the Hawaiian Paradise Park residential subdivision in Kea‘au Ahupua‘a, Puna District, Island of Hawai‘i (Figures 1, 2, and 3). The CoH is proposing to construct the Hawaiian Paradise Park New District Park (referred to hereafter as the "proposed project") within the project area, which amongst other recreation facilities, would include a community center. As the proposed project is set to be carried out by the CoH on County-owned lands, it necessitates review under Hawai‘i Revised Statutes (HRS) Chapter 6E-8 by the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD). This AIS has been undertaken in accordance with the Hawai‘i Administrative Rules (HAR) §13-275, and complies with the *Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports* contained in HAR §13-276, which states that an AIS shall "determine if archaeological historic properties are present in the project area and, if so, identify all such historic properties." When no archaeological sites are found during an AIS, HAR §13-275-5(b)(5)(A) states that the results of the survey shall be reported through an Archaeological Assessment. Compliance with the above standards is sufficient for meeting the historic preservation review process requirements of the DLNR–SHPD. This report contains a project area description, a brief culture-historical background, a description of the survey methodology, results of the current fieldwork, and recommendations based on those results.

PROJECT AREA DESCRIPTION

The project area is located between 78 and 89 meters (256 to 292 feet) above sea level, approximately 6.34 kilometers (3.94 miles) inland of the coast in Kea‘au Ahupua‘a, Puna District, Island of Hawai‘i (see Figures 1 and 2). It is situated in the west central portion of Hawaiian Paradise Park (HPP), a residential subdivision situated east of the Kea‘au-Pāhoa Highway (Highway 130), and west of the Pacific Ocean. The 20-acre project area is bound to the southwest by 26th Avenue (‘Ōlena Avenue), to the northeast by 25th Avenue (‘Okika Avenue), to the northwest by Kaloli Drive, and to the southeast by two privately owned parcels, one of which is developed with a single family residence (see Figure 3).

Terrain within the project area is characterized by gently *makai* (northeast) sloping undulating *pāhoehoe* bedrock. The *pāhoehoe* is classified as Puna Basalt (Sherrod et al. 2007) that originated from Kīlauea Volcano between A.D 1410-1460 (labeled Qp4 in Figure 4). Soil overlying these lava flows is classified as Keaukaha highly decomposed plant material on two to ten percent slopes (Figure 5). These shallow well drained soils are formed from a thin layer of organic material and contain small amounts of volcanic ash (Soil Survey Staff 2022a).

The climate at this elevation in Puna is moderately cool throughout the year, with a mean annual temperature between 69 and 75 degrees Fahrenheit (Giambelluca et al. 2014). Rainfall averages 3,493 millimeters (137 inches) a year, with the highest rainfall typically occurring during the month of November, and the least amount of rainfall occurring during the months of May and June (Giambelluca et al. 2014). Vegetation in the project area is dominated by thick ground weeds and sporadic canopy trees (Figures 6, 7, and 8). Interspersed are thickets of strawberry guava (*Psidium cattleyanum*), glory bush, *(Tibouchina urvilleana*), guinea grass (*Urochloa maxima*), and young albizia trees (*Albizia julibrissin*). Native plant species include *‘ōhi‘a lehua* (*Metrosideros polymorpha*) and *uluhe* (*Dicranopteris linearis*). Mechanical disturbance is present in the form of grid-like access roads that have been grubbed across the subject parcel both in an east/west direction and in a north/south direction. Most of these access roads are obscured with overgrown vegetation, but some are currently being used to access the parcel for illegal dumping of pig carcasses and trash (Figure 9). One of these paths also leads to a pig trap located near the northwest boundary along 26th Street (Figure 10).

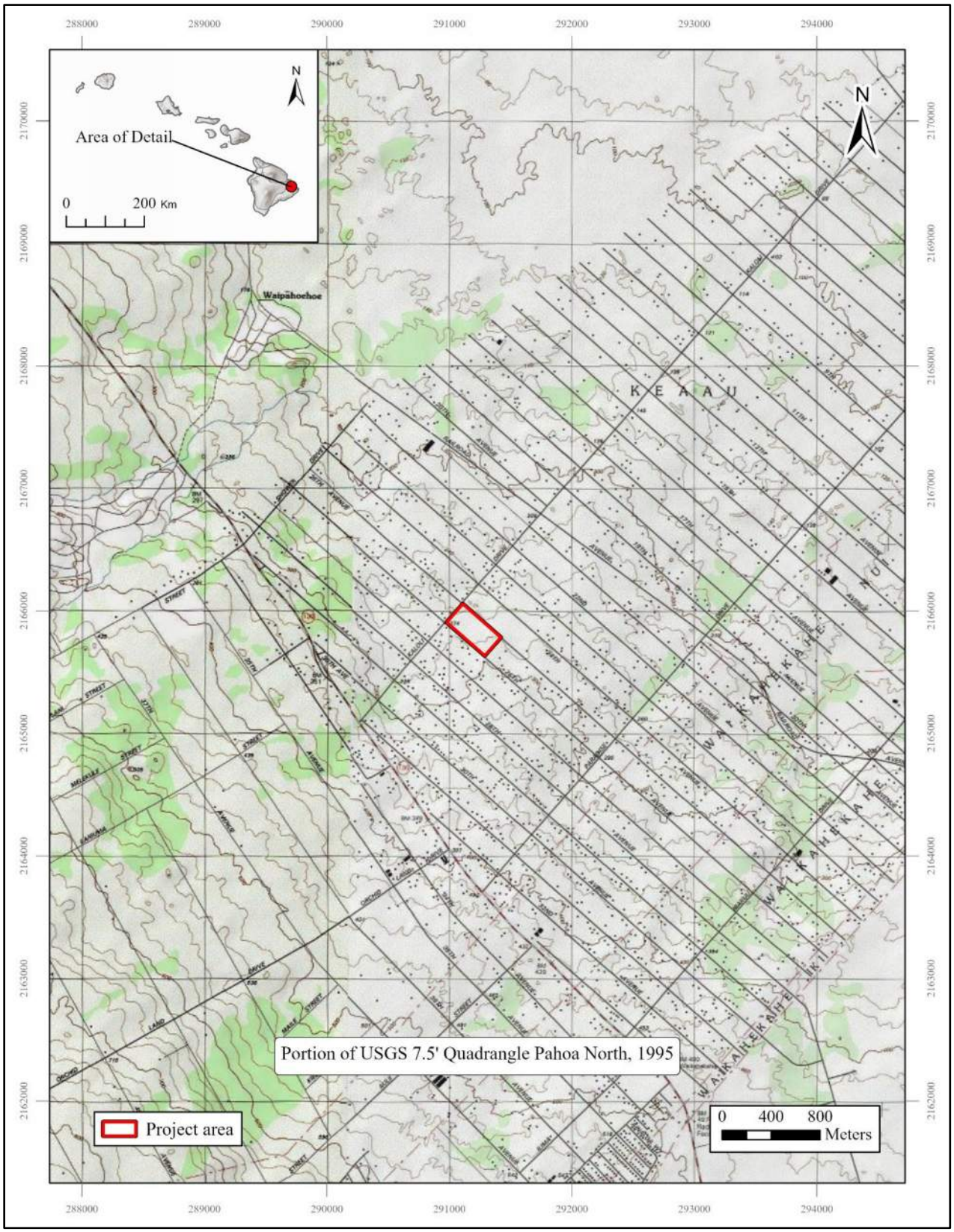

Figure 1. Project area location.

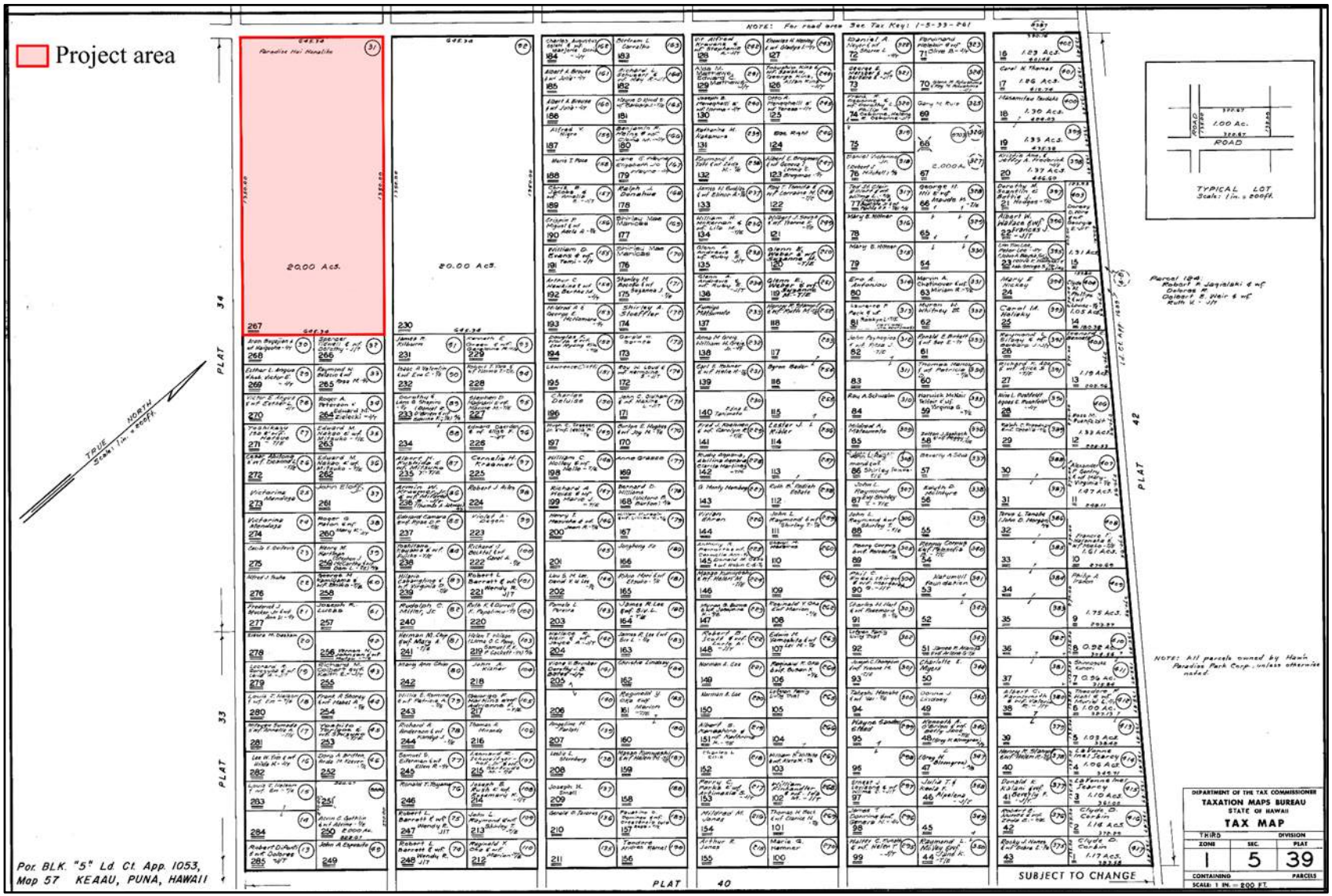

Figure 2. Tax Map Key (3) 1-5-039 showing the current project area (Parcel 267).

Figure 3. 2017 Google Earth image showing the current project area.

Figure 4. Geological units in the current project area (Sherrod et al. 2021).

Figure 5. Soils within the project area (Soil Survey Staff 2022b).

Figure 6. Vegetation within the project area, view to the north.

Figure 7. Vegetation within the project area, view to the east.

Figure 8. Thick strawberry guava forest in the project area, view to the northwest.

Figure 9. Illegal dumping of modern rubbish within the project area, view to the southwest.

Figure 10. Pig trap within the project area, view to the southwest.

PROPOSED PROJECT DESCRIPTION

Due to rapid population growth in the Puna District, especially in the Hawaiian Paradise Park residential subdivision, the need for a district park in this specific residential area was recognized in the *Puna Community Development Plan* (CDP) (County of Hawaii 2008). Stakeholder meetings involving the Hawaiian Paradise Park Owners Association, the Department of Parks and Recreation Maintenance and Recreation Division, the Department of Planning Long-range Planning Division, and the Department of Parks and Recreation Elderly Assistance Division were conducted between November 7th and November 22nd, 2017. These sessions identified current needs, assessed the park's alignment with the Puna CDP, and examined potential senior activity and program requirements (County of Hawaii 2018). In the subsequent year, public meetings held on January 7th and February 19th, 2018, at the Hawaiian Paradise Park Owners Association Activity Center presented three park development alternatives. The first meeting involved a presentation introducing the alternatives, followed by breakout sessions focusing on each site. Participants provided input on opportunities, issues, constraints, and additional recreational amenities for consideration. The second meeting featured the presentation of the preliminary master plan and a question-and-answer segment.

Through these meetings it was decided that a district park capable of accommodating all ages and physical capabilities was necessary to provide a safe space for recreational opportunities and organized sports. The park plans include a base plan (Figure 11) as well as a base plan + options (Figure 12). These plans are conceptual and may change. The base plan includes a community center, baseball field, football field, playground, skatepark, comfort station, and covered play court, and parking and picnic areas. The base + options model includes all facilities noted in the base plan as well as a pool and pool building, sand volleyball court, dog park, and pickle ball and tennis courts. Due to the estimated high cost of the project, it is likely that a park construction phasing plan will be developed.

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Figure 11. Master Plan (Base).

Figure 12. Master Plan (Base + Options).

2. BACKGROUND

To generate a set of expectations regarding the nature of archaeological resources that might be encountered within the current project area, and to establish an environment within which to assess the significance of any such resources, a general culture-historical context for the Puna region that includes specific information regarding the known history of Kea‘au Ahupua‘a and the project area is presented. This is followed by a discussion of relevant prior archaeological studies conducted in the vicinity of the project area.

The culture-historical context and summary of previously conducted archaeological and cultural research presented below are based on research conducted by ASM Affiliates at various physical and digital repositories. Primary English language and Hawaiian language resources were found at multiple state agencies, including the State Historic Preservation Division, Hawai‘i State Archives, and the Department of Accounting and General Services Land Survey Division. Digital collections provided through the Office of Hawaiian Affairs Papakilo and Kīpuka databases, Waihona ‘Āina, the Ulukau Hawaiian Electronic Library, the Hawai‘i Genealogical Indexes, and Newspapers.com provided further historical context and information. Lastly, secondary resources curated at ASM Affiliates’ Hilo office offer general information regarding the history of land use, politics, and culture change in Hawai‘i, enhancing the broad sampling of primary source materials cited throughout this cultural impact assessment.

CULTURE-HISTORICAL CONTEXT

The chronological summary presented below begins with the peopling of the Hawaiian Islands and includes a presentation of a generalized model of Hawaiian Prehistory containing legendary references to and a discussion of the general settlement patterns for Puna. The discussion of prehistory is followed by a summary of historical events in the district that begins with the arrival of foreigners in the islands and then continues with the history of land use in Puna in the vicinity of Kea‘au after contact. The summary includes a discussion of the changing lifeways and population decline during the early Historic Period, a review of land tenure in the study *ahupua‘a* during the *Māhele ‘Āina* of 1848, and the gradual transition into a residential subdivision in the last half of the twentieth century.

A Generalized Model of Hawaiian Prehistory

While the question of the timing of the first settlement of Hawai‘i by Polynesians remains unanswered, the current archaeological consensus derives from various sources of information (i.e., archaeological, genealogical, mythological, oral-historical, radiometric). With data from advances in palynology and radiocarbon dating techniques, Kirch (2011) and others (Athens et al. 2014; Wilmshurst et al. 2011) have argued that Polynesians arrived in the Hawaiian Islands, sometime between A.D. 1000 and A.D. 1200 and expanded rapidly thereafter. Other versions of the peopling of the islands, including various native Hawaiian traditions, place the event earlier in time—and as early as the creation of the world (e.g., Beckwith 1951; Liliuokalani 1978; Malo 1951). 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 establishing a uniquely Hawaiian culture. The initial migration to Hawai‘i is believed to have occurred from Kahiki (the ancestral homelands of Hawaiian gods and people) with long-distance voyages occurring fairly regularly through at least the thirteenth century. It has been generally reported that the sources of the early Hawaiian populations originated from the southern Marquesas Islands (Emory in Tatar 1982). In these early times, Hawai‘i’s inhabitants were primarily engaged in subsistence-level agriculture and fishing (Handy et al. 1991). This was a period of widespread 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). According to Fornander (1969), the Hawaiians brought from their homeland certain Polynesian customs and belief: the major gods Kāne, Kū, Lono, and Kanaloa; the *kapu* system of law and order; and the concepts of *pu‘uhonua* (places of refuge), *‘aumakua* (ancestral deity), and *mana* (divine power).

As currently understood, the settlement of the islands involved a gradual shift in residential patterns from seasonal, temporary habitation to the permanent dispersed habitation of both coastal and upland areas. Following the initial settlement period, areas with the richest natural resources became populated and perhaps crowded, and the population began expanding to the Kona (leeward side) and more remote areas of the island (Cordy 2000). As the population grew, 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 eventually settled, and the more marginal leeward areas were being developed. During this expansion period, additional migrations to Hawai‘i occurred from Tahiti in the Society Islands. Rosendahl (1972) has proposed that

settlement at this time was related to the seasonal, recurrent occupation in which coastal sites were occupied in the summer to exploit marine resources, and upland sites focused on agriculture were occupied during the winter months. An increasing reliance on agricultural products may have caused a shift in social networks as well, which increasingly supported the exchange of upland agricultural products for marine resources. Hommon (1976) argues that kinship links among coastal settlements became less important than those with the *mauka-makai* (upland-coastal) settlements. This shift is believed to have resulted in the establishment of the *ahupua'a* system sometime during the A.D. 1400s (Kirch 1985), which added another component to an already well-stratified society.

Kea'au Ahupua'a and the Puna District

The current project area is in Kea'au Ahupua'a on the windward slopes of Kīlauea Volcano within the traditional *moku* of Puna, one of six *moku* on Hawai'i Island (Figure13). Kea'au is one of roughly 50 *ahupua'a* in Puna and extends inland from the coast to the Kīlauea summit region where it terminates at Keauhou *ahupua'a*. The *ahupua'a* was traditionally the principal land division that functioned for taxation purposes and furnished its residents with nearly all of the fundamental necessities. *Ahupua'a* are land divisions that typically incorporated all of the ecozones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base (Hommon 1986). Although the *ahupua'a* land division typically incorporated all of the ecozones, their size and shape varied greatly (Cannelora 1974). At its *mauka* reaches, Kea'au Ahupua'a encompasses areas of dense overgrowth of *'ōhi'a lehua* (*Metrosideros polymorpha*) trees, indicating the existence of the *wao akua* region before transitioning to the cultivatable lands, the *wao kanaka* (Kamakau 1976), before terminating at the *kahakai* or coastal lands.

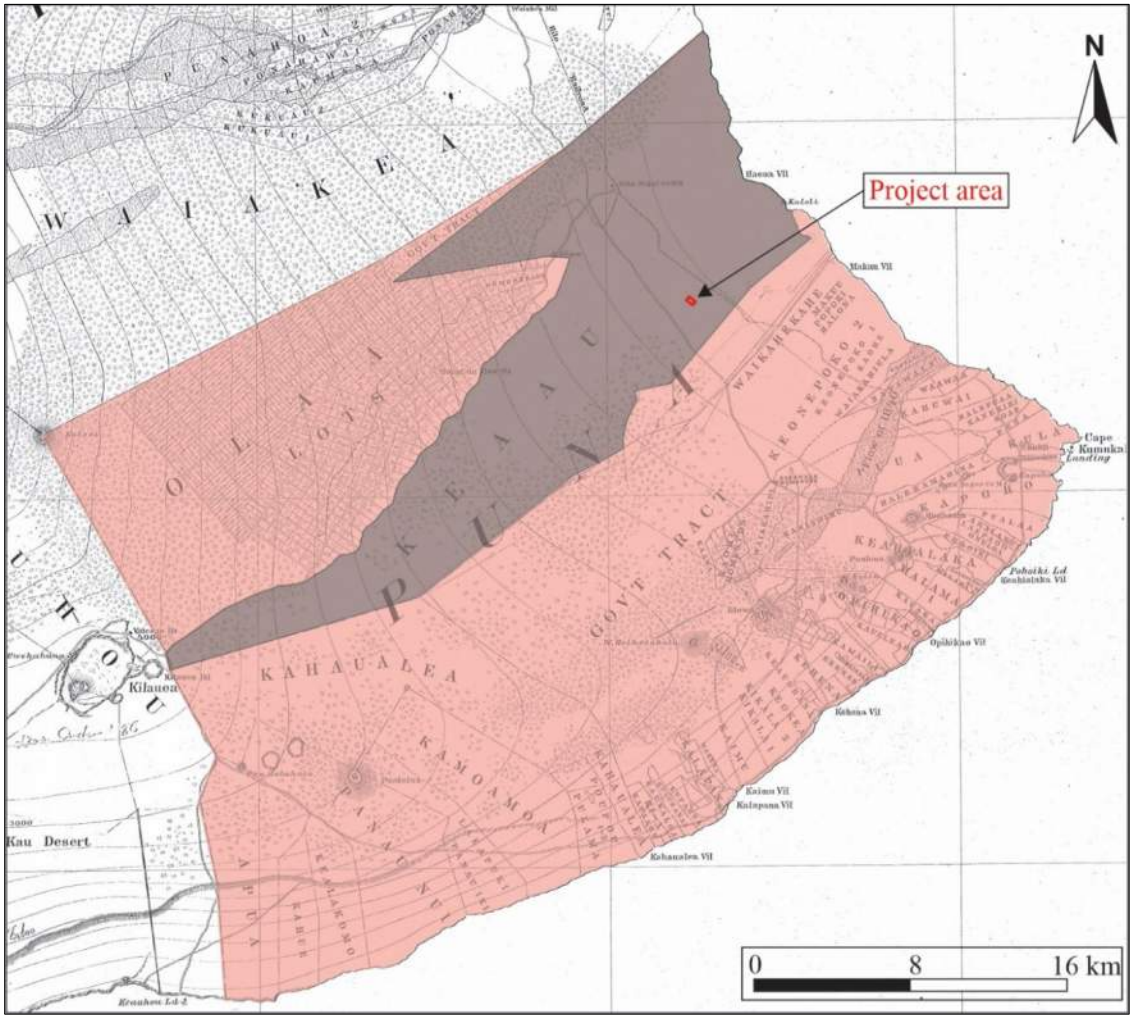

Figure 13. Portion of Hawai'i Registered Map No. 2060 (Donn 1901) showing Kea'au Ahupua'a (shaded gray) within the *moku* of Puna (shaded pink).

Moʻolelo for Keaʻau Ahupuaʻa and the Greater Puna District

As the Hawaiian people had no written language until after the arrival of the first Protestant missionaries in 1820, traditional *moʻolelo* (stories, tales, and myths), *mele* and *oli* (songs and chants), and *ʻōlelo noʻeau* (proverbs and sayings) were passed down orally from one generation to the next. Traditional *moʻolelo* associated with Keaʻau Ahupuaʻa abound with references to Kāne, the god of sunlight, fresh water, verdant growth, and forests as well as the majestic female fire goddess, Pele (Beckwith 1970; Pukui 1983). Legendary sources indicate that Puna was, among other things, renowned for its rain and fertility, fragrant breezes, and potent *ʻawa.* Additionally, many legends associated with Puna feature not only humans, gods, goddesses, and *kupua* (demi-gods), but *moʻo* (guardians of fresh water with reptilian features), *pōhaku* (stones), and *ʻaumakua* (family or personal ancestral gods). The reader is directed to the Cultural Impact Assessment prepared for the current project (ASM 2023 in Prep) for a more in-depth presentation of *moʻolelo* that references Keaʻau Ahupuaʻa and the greater Puna District.

Early Hawaiian Life in Keaʻau Ahupuaʻa and the Puna District

As Keaʻau encompasses both *mauka* agricultural and forest resources and *makai* fisheries, residents were once able to procure nearly all that they needed to sustain their families and contribute to the larger community from within the land division while also supporting the ruling *aliʻi* of the *moku*. In Puna, a few small communities were initially established along sheltered bays with access to fresh water and rich marine resources. The communities shared extended familial relations, and there as an occupation focus on the collection of marine resources, and the Precontact population of the *moku* resided in small settlements clustered around sheltered bays along the coastline where they subsisted on marine resources supplemented by agricultural products. According to McEldowney (1979), there were six villages present along the coast between Hilo and Cape Kumkahi (Keaʻau or Hāʻena, Makuʻu, Waiakahiʻula, Honolulu, Kahuwai, and Kula or Koaʻe). The current project area is located *mauka* of the coast, between the villages of Keaʻau (or Hāʻena) and Makuʻu. Villages in Puna were similar to those of the Hilo District, and they:

> . . . comprised the same complex of huts, gardens, windbreaking shrubs, and utilized groves, although the form and overall size of each appear to differ. The major differences between this portion of the coast and Hilo occurred in the type of agriculture practiced and structural forms reflecting the uneven nature of the young terrain. Platforms and walls were built to include and abut outcrops, crevices were filled and paved for burials, and the large numbers of loose surface stones were arranged into terraces. To supplement the limited and often spotty deposits of soil, mounds were built of gathered soil, mulch, sorted sizes of stones, and in many circumstances, from burnt brush and surrounding the gardens. Although all major cultigens appear to have been present in these gardens, sweet potatoes, ti (*Cordyline terminalis*), *noni (Morinda citrifolia*), and gourds (*Lagenaria siceraria*) seem to have been more conspicuous. Breadfruit, pandanus, and mountain apple (*Eugenia malaccensis*) were the more significant components of the groves that grew in more disjunct patterns than those in Hilo Bay. (McEldowney 1979:17)

The project area falls within the inland portion of McEldowney's (1979:18-25) Upland Agricultural Zone (Zone II) (Figure 14), dubbed the Windward Inland Terrain subzone by Burtchard and Moblo (1994). While McEldowney's zones of early Historic land use are largely shaped by early historical accounts and loosely determined by topographic elevations, environmental variables and human resource needs were also considered, offering insight into the prehistoric past (Burtchard and Moblo 1994). In their refinement of the model as it applies to Puna, Burtchard and Moblo elaborate on McEldowney's concept of the Windward Inland Terrain subzone:

> The inland portion of the [Upland Agricultural Zone] includes low to moderate elevation landforms (circa 200 to 700 ft) extending to approximately five miles inland from the coast. Because of relatively easy access and reliable rainfall, this zone is expected to have been linked to the coast, providing agricultural support throughout the prehistoric period. Land-use intensity should have increased as volcanic destruction of arable ground and/or late prehistoric population demands increased to exploit agricultural land. Agricultural feature density should be moderate and decrease with distance to the coast. (Burtchard and Moblo 1994:26)

Burtchard and Moblo, go on to explain that "[l]arger settlements and resource acquisition areas may have been connected by cross-terrain trail networks" (1994:26). These trails would have allowed those populations living inland access to the marine resources at the shore as well as allowing those residing along the coast access to the agricultural lands and forests. In addition to *mauka-makai* trails, one of the primary trail networks utilized during the Precontact to early Historic Period was the *alaloa* (literally meaning the long road or trail), which is thought to have circled the

entire island. The *alaloa* provided access to all of the island's districts and their respective *ahupua'a*, facilitating commodity exchange between otherwise isolated adjacent coastal communities such as those in the vicinity of the current project area, as well as more upland regions (Mills 2002). The concept of the *alaloa* as a trail that circled the entire island likely developed over time as local trails in different areas connected to each other to form a cohesive trajectory of travel. Kirch (1985) notes that while heavy loads could be carried by canoe between coastal areas, the 175-mile long *alaloa* and the expansive terrestrial trail network that it accessed, allowed people, information, and material goods to travel overland to virtually any location on the island, providing an important network of Precontact/early Historic Period communication. As related by Cordy in Mills (2002:151) long-distance travel between *ahupua'a* was rare until post-1800, as communities relied heavily on resources procured from their own land unit. Over time, as the populations of desirable coastal locations increased, early Hawaiians expanded their settlements into upland regions and more marginal areas of Puna. As competition for resources intensified, so too did political competition that resulted in conflict and further expansion into upland areas as political exiles sought asylum in remote places and hidden lava tubes (Burtchard and Moblo 1994).

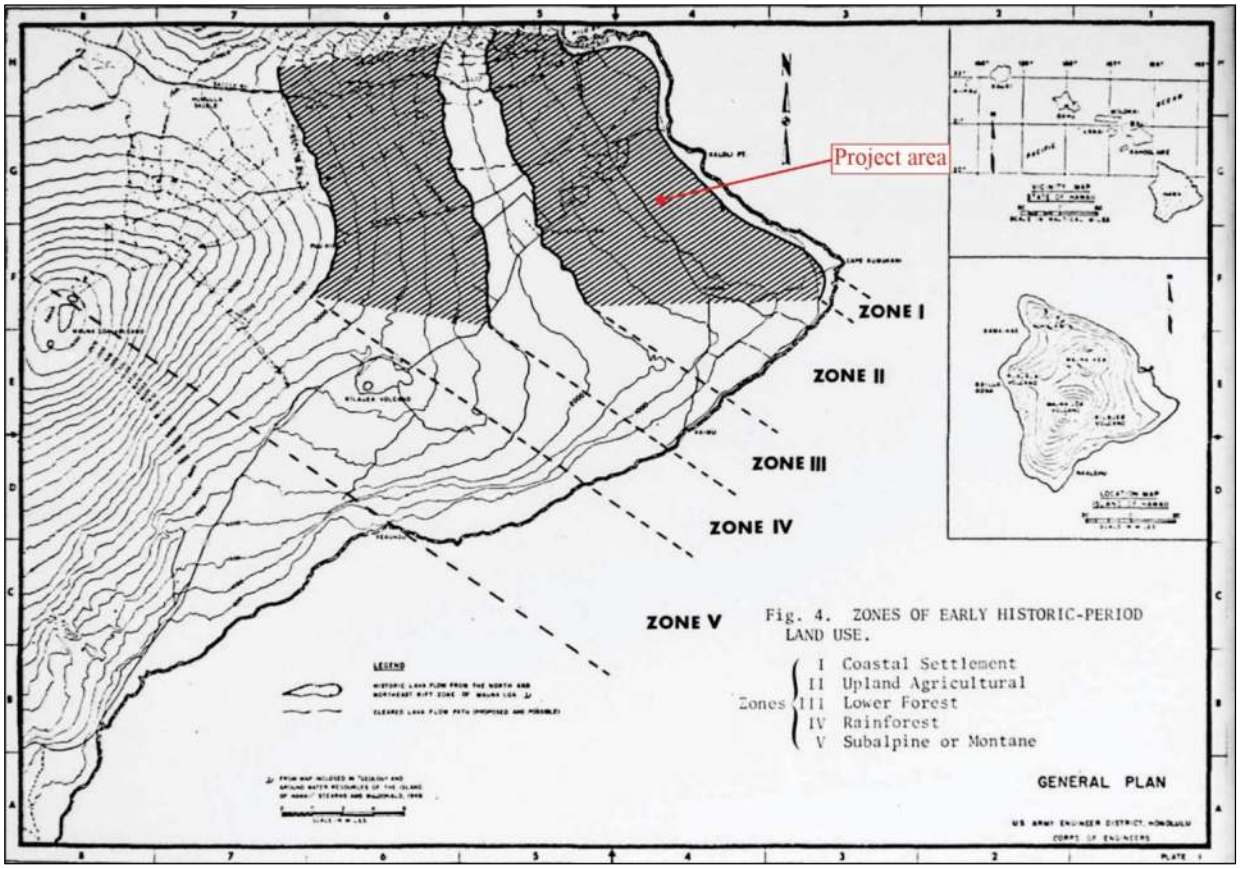

Figure 14. Land use map showing project area within Zone II, Upland Agricultural Zone (McEldowney 1979:64).

Traditional Agricultural and Gathering Practices of Kea'au Ahupua'a and Puna

Despite its appearance as a desolate landscape under constant threat of the fires of Pele, Puna remained a dynamic land of rebirth that was capable of sustaining an abundance of life through traditional farming practices of crops like *kalo* and the collection of various forest resources. Gathering practices conducted in woodland areas included the collection of bark from *māmaki* (*Pipturus* sp.), *wauke* (*Broussonetia papyrifera*), and *olonā* (*Touchardia latifolia*), whose fibers were prepared and fashioned into *ahu'ula* (feathered cloaks), *lei hulu* (feathered *lei*), and *mahi'ole* helmets that were used exclusively by those of royal bloodline. The forested areas of Puna also provided habitat for several now-extinct birds including the *mamo* (black Hawaiian honey creeper; *Drepanis pacifica*) and *'ō'ō* (black honey eater; *Moho nobilis*). Feathers of these birds are known to have been obtained through *kāpili manu* (bird-catching) by *ka po'e lawai'a manu* (the people who fished for birds) and *po'e kia manu* (those who caught birds with *pīlali*, or birdlime made from the hardened *kukui* sap).

In more coastal areas, other crops such as *ʻuala* (sweet potato; *Ipomoea batatas*) were cultivated. The barrenness of surrounding lava flows was not a limiting factor for the cultivation of *ʻuala*, which requires practically no soil to flourish. Abbot (1992:30) relates that typically "*ʻuala* were grown in *puʻe* (mounds) that formed a *māla* (patch), usually surrounded by stone walls" and planted during the full moon, or during the six first days of the new moon. Handy (1940) relates that throughout Puna, the *maka koali* variety grew wild and served as sustenance during famine and also served raw to pigs. The typical preparation of *ʻuala* for consumption was similar to *kalo* and entailed either steaming in an *imu* and eaten whole or mashed as *poi ʻuala* (Abbott 1992; Handy 1940). Although *poi ʻuala* soured quickly, it was "regarded by Hawaiians as dietetically superior to taro poi, but it is less relished" (Handy 1940:149). Additionally, a dish known as *palula* was also made from the green leaves of the *ʻuala* plant after being cooked. Although *ʻuala* was cultivated widely, Handy suggested that it did not appear to have been a staple food of Puna, a district which was "most famous for its breadfruit" (Handy 1940:190). Handy (1940:165) opined:

> At Keaau, the northernmost settlement on the coast of Puna below Waiakea in Hilo, Ellis. . . saw sweet potatoes cultivated in plantations together with taro and sugar cane. We may infer that similar cultivations were typical of the other sections along this northeast section of Puna. The sandy soil southeast of Honolulu must have been utilized for sweet potatoes. . . Despite the fact that sweet potatoes were planted almost universally and many patches still maintained, the Puna natives seem to regard this vegetable with little interest, probably because Puna people prided themselves upon and relished their breadfruit, and also because potato was nowhere and at no time the staple for this rainswept district.

Breadfruit (*ʻulu*; *Artocarpus sp*.) is a *kinolau* (physical manifestation) of the goddess Haumea, the "patron of childbirth," and served as the principle staple food of Puna where it was most famous (Beckwith 1970; Handy et al. 1991). Careful and gentle propagation was required, which entailed the removal and replanting of the root sucker cutting while ensuring it remained within its original, undisturbed soil casing. With respect to *ʻulu* as a sustainable food source, it was surmised that "except in Puna, Hawaii, breadfruit was wholly secondary to taro and sweet potato as a staple. I am told that in Puna in a good year, breadfruit may be eaten for 8 months of the year, beginning with May " Handy et al. (1991:152).

Although *ʻulu* appears to have been the preferred source of sustenance for residents of Puna, *kalo* (taro; *Colocasia esculenta*) rivaled it as a staple food source. Puna produced several cultivars of *kalo* including *Oʻopu Kai*, *Ipu o Lono*, *Makaʻōpio*, *Lehua Kuikawao*, *Lehua ʻEleʻele*, *ʻAla o Puna*, and *Uahi a Pele* (Handy 1940; Pukui and Elbert 1986). Puna's lack of flowing streams made growing wetland *kalo* impossible; however, despite this freshwater stream deficit, Puna received plentiful rainfall throughout the year which made the cultivation of dryland *kalo* possible, especially in clearings (*waena*) within *ʻōhiʻa* forests (Handy 1940). Handy et al. (1991:541) related that, "the wet and sometimes marshy pandanus forests from Kapoho through Poho-iki to ʻOpihikao used to be planted with taro in places." The method of planting dryland *kalo* in the lowland forests of Puna was described by Handy et al. as the "*pa-hala* (pandanus clearing) method" (Handy et al. 1991:104) and was advantageous for it did not require the constant weeding necessitated in better soils. The *pa-hala* planting process was described as follows:

> . . .Make holes in the *ʻaʻa* (broken lava) by taking out some of the stones. Be sure that the place chosen is in a *pu hala* grove, to save the labor of hauling *hala* branches into the patch later on. Fill the hole with whatever weeds can be found and leave them there for six weeks or more. The weeds will rot and make soil. When the weeds have rotted away, the taro *huli* are wrapped in *lau hala* (*hala* leaves) to keep them moist and are planted. When there or four leaves have appeared on each *huli*, then that is the tame to cut down the *pu hala* to let in the sun. The branches of the *hala* are cut off and the patch covered with them until this is not a trace of the taro to be seen. This is left until sufficiently dry to set on fire. The fire does not hurt the taro much as the *huli* are already well rooted. The *hala* reduced to ashes, give the taro the needed nourishment and they grow so tall that a man can be hidden under their leaves. (Handy et al. 1991:104-105).

The *pa-hala* method of cultivating dryland *kalo* in Puna could also be practiced on grass-covered slopes rather than directly atop lava; however, cultivation in grassy areas did require burning off the surface organics prior to planting (Handy 1940). Additionally, *kalo* could be opportunistically planted in depressions left by toppled over *hāpuʻu* fern trunks found at higher elevations, such as lands *mauka* of the current project area Handy et al. (1991).

The pandanus tree known as *pū hala* or *hala* (*Pandanus odoratissimus*; Figure 15) was valued for its fragrance and harvested for more utilitarian purposes. The inhabitants of Puna were recognized for their skilled *lauhala* (pandanus leaf) weaving. The dried leaves were used to plait *lauhala* mats for thatching onto house rafters and walls

in a method typically employed in Puna and the neighboring district of Hilo in the absence of *pili* grass. Plaited *lauhala* was also used for pillows, fans, floor coverings, canoe sails, baskets, and occasionally as clothing (Handy 1940; Handy et al. 1991; Summers 1999). According to Fornander (1918-1919), two styles of *lauhala* mats were traditionally associated with Puna; the *makali'i*, a braided, small-stranded mat, and the *puahala* or *hīnano*, made from the male pandanus blossom. The latter was highly valued, and ". . .is only made in Puna where the hala tree is very abundant. It is a regular article of trade among the natives who greatly prize it as a choice mat to sleep on" (Summers 1999:17).

Figure 15. Man standing in a Puna *pū hala* grove in 1888 (Brigham and Stokes 1906:28).

William T. Brigham, former Director of the Bernice Pauahi Bishop Museum, described witnessing the natives of Puna weaving the mats for which the district was famous, as follows:

> Puna was a famous region for hala mats, and in 1864, the author, when journeying through the district with that noble missionary the Reverend Titus Coan, saw many a party in the curious open caves (caused by a breakdown of the lava crust in some of the many streams of lava, ancient and recent, that form much of the surface of Puna) busily engaged in weaving mats, a work for which the comparative coolness and dampness of the caves was most suited. (Brigham and Stokes 1906:29).

Hala was significant on a spiritual level as well. Handy and Pukui (1998) conveyed the significance of the *hala*, which played a role in the protection of a newborn baby's placenta (*'iewe*). *Hala* groves were abundant in Puna and concealing the *'iewe* high up in the leaves thereby preventing it from being pilfered. The people of Puna were sometimes referred to as *maka kōkala* (thorny eyes) by the inhabitants of the neighboring *moku* of Ka'ū, correlating the spiny leaves of the *hala* with the long eyelashes of the baby whose *'iewe* it was sheltering, providing a "bright keen look" (Handy and Pukui 1998; Pukui and Elbert 1986:160). Maly related, "to this day, Puna is known for its growth of *hala*, and the floors and furniture of some of the old households are still covered with fine woven mats and cushions. Weaving remains an important occupation of many native families of Puna." Maly (1998:6).

In addition to these resources, other crops such as *niu* (coconut) thrived in coastal Puna and "has always had the greatest continuous planting area for coconuts in the Hawaiian islands; today old coconut groves are scattered everywhere along the wet lava-covered coastal plain" (Handy 1940:193). With respect to varieties, Handy et al. (1991) listed only two: the *niu hiwa* (particularly used for ceremony, medicine, and cooking), and the *niu lelo* (used primarily for nonreligious purposes). Water from the *niu* was palatable and flavorful. It was also utilized on a spiritual level by priests practicing divination. The raw meat was edible and could be scraped out of the shell with a large *'opihi* (limpet)

to be eaten as is or incorporated into the preparation of various sweets including *haupia* (*haukō*), *kūlolo, and pi'epi'e 'ulu*. Besides being utilized for human consumption, coconut meat could also be used to feed animals:

> In some localities in Puna, pigs were taught to open their own coconuts. When the owners of the pigs expected to be absent for some time, they husked a quantity of the nuts, leaving a strip of husk on each one about two inches in width. When a pig wanted to open a nut, he grasped it by this strip of husk and dashed it against a rock. Thus the pigs were assured of fresh food until the owners returned. (Handy et al. 1991:174).

Uhi (yam; *Dioscorea alata*) was cultivated throughout Puna and served to supplement more primary sources of sustenance such as *kalo* and *'uala* during times of famine. Unlike *kalo*, the *uhi* did not make fine *poi*, and as such was steamed in an *imu* and consumed in its whole form rather than being mashed. Handy (1940:169-170) describe a method of planting *uhi* in ʻŌlaʻa, Puna:

> The following old Hawaiian method of planting *uhi* in Hamakua and Olaa was described to me by Judge George Tucker of Olaa whose Hawaiian forbears taught him yam culture. On the ground in the forest a great bin of tree-fern trunks (*hapuu*) was built 3 to 4 feet high on the sides, the fern trucks being laid horizontally. The bin was filled with decaying fern leaves and other rubbish. The seedling tubers (*hua uhi*) were then stuck in the rubbish a few inches below the surface. No earth was put in, but as the rubbish in the bin decayed and sank, more rubbish was heaped on top. Fully matured tubers grown by this method are said to have weighed up to 50 pounds. . .
>
> . . . Another interesting practice in planting yams on steep hillsides and the sides of gulches on the Hamakua coast and in North Hilo was to dig a vertical hole in the side of the slope, 2 to 3 feet deep, and place a large flat stone in it. The hole was then filled with earth and decaying leaves, and the seed yam planted near the top of the hole. The rock at the bottom of the hole prevented the tuber, which grew downward, from growing deep into the ground and forced it to spread out. When time for digging, the earth on the side of the hill or gulch was simply dug away and the tubers extracted.

Early Historical Accounts of Puna

The earliest account of the Puna region and Keaʻau come from the Journal of William Ellis, a member of the London Missionary Society. Six months following Kamehameha I's death in 1819, through a series of events, the *kapu* system was overthrown and the kingdom found itself in a time of extreme religious and political change. When the American missionaries arrived in 1820 (ʻĪʻī 1983), many *aliʻi* converted to Christianity with others following their lead. When the British Reverend William Ellis arrived in 1822, Kamehameha II allowed him to stay in Hawaiʻi. The following year Ellis and the American Board of Commissioner for Foreign Missions (ABCFM) made their way around Hawaiʻi island in search of communities needing to hear the word of God. During the tour Ellis wrote of the things he saw, providing the earliest written accounts of the lifestyles of the Hawaiian people and their environments as well as a map (Figure 16) depicting many of the placenames of Hawaiʻi island.

Ellis entered into the Puna district from the south, along the *ala loa* (long trail), leaving from Honolulu Ahupuaʻa (spelt Honoruru) early, before moving onto Waiakahiʻūla where Ellis rested "under the shade of a canoe-house near the shore (Ellis 1963:224). At around noon Ellis continued to the village inland, where Mr. Thruston and Mr. Bishop had gone to preach. Mr. Bishop had left earlier, desiring to reach Waiakea before night fall. Ellis and Thurston continued on to Keaʻau. The following is Ellis's description of Kea'au (spelt Kaau):

> Soon after five p.m. we reached Kaau, the last village in the division of Puna. It was extensive and populous, abounding with well-cultivated plantations of taro, sweet potatoes, and sugar-cane; and probably owes its fertility to a fine rapid stream of water, which, descending from the mountains, runs through it into the sea. It was the second stream we had seen on the island.
>
> Having quenched our thirst, we passed over it by stepping on some large stones, and directed our way to the house of the head man, where we put up for the night. He was absent in the mountains, with most of his people, and Makoa could procure us no provisions. WE, however, succeeded in purchasing a fowl and some potatoes, and made a comfortable supper. While our boys were preparing it, Mr. Thurston preached to a considerable number of people who had collected outside of the house. We were afterwards joined in evening worship by the family, who at nigh furnished us with a comfortable and clean mat for our bed, an accommodation we did not always enjoy.
>
> Early on the 9th the house was crowded with natives, and a little before sun-rise morning worship was performed as usual.

> Some of natives observed, in conversation, "We shall never obtain the things of which you have told us, for we are a wicked and unbelieving people."
>
> …Before we left the place, the people offered for sale some curious deep oval baskets, with covers, made of the fibrous roots of ie. We purchased two, intending to preserve them as specimens of native ingenuity.
>
> Leaving the village of Kaau, we resumed our journey, and after walking between two and three hours, stopped in the midst of a thicket to rest, and prepare some breakfast.
>
> The natives produced fire by rubbing two dry sticks, of the hibiscus tiliaceus, together; and having suspended over it a small iron pot, in gipsy style, upon three sticks, soon prepared our food. At half-past ten we resumed our walk, and passing about two miles through a wood of pretty large timber, came to the open country in the vicinity of Waiakea. (Ellis 1963:224-225).

Despite Keaʻau being described as "populous" by Ellis (1963:224), in 1835, 4,800 individuals were recorded as residing in the district of Puna in the missionary census conducted that year (Schmitt 1973); the smallest total district population on the island of Hawaiʻi. In 1841, missionaries documented the population of Puna at 4,371 and noted that most of the inhabitants lived near the coast (Holmes 1985). That same year, the United States Exploring Expedition under the direction of Commander Charles Wilkes, toured Hawaiʻi Island and traveled through the Puna District. Wilkes produced a map of Puna, which illustrates the coastal trail but shows only a large "Pandanus Forest" covering the lands of the project area (Figure 17). Wilkes described walking along the coast between Mākuʻu and Keaʻau as well as the trail between Hilo and Nānāwale (Nanavalie) as follows:

> We passed several houses here [Nānāwale], and then proceeded on our way through Makuu Wekahika [Waikahekahe] to Keaau, where we arrived at sunset.
>
> In some places they have taken great pains to secure a good road or walking path; thus, there is a part of the road from Nanavalie to Hilo which is built of pieces of lava, about four feet high and three feet wide on the top; but not withstanding this, the road is exceedingly fatiguing to the stranger, as the lumps are so arranged that he is obliged to take a long and short step alternately; but this the natives do not seem to mind, and they pass over the road with great facility, even when heavy laden… (Wilkes 1845:188-193).

James J. Jarves, editor of the *Polynesian* newspaper, penned a series of articles in 1840 describing his journey through the Puna District. In one such article, Jarves speaks about traveling on a coastal Puna trail from Honolulu Ahupuaʻa (south of the project area) to Keaʻau:

> July 10. [1840] – Our course led us along the shore, formed by a wall of twenty feet in height, on which the surf rolled heavily, and loudly. The country bordering it was very picturesque with native hamlets amid shady groves. They were in primitive style, and the inhabitants appeared poor and destitute. Civilization had evidently made but little progress in this direction, and the whole scene, probably different but little from what it appeared in the days of Cook, excepting that we saw no *heiau*, or signs of idolatrous worship, or any rudeness or incivility among the people. It has the air of repose and happiness which was very gratifying, particularly in contrast with the dreary spectacle we had recently left. The men were mostly employed in fishing, but assembled readily at the sound of a conch, to attend meetings which Mr. L [Lyman] discoursed at every village we passed through. From the traces of cultivation, the numerous stone pavements, and the care bestowed in the erection of their houses, now old and out of repair, this was once no doubt a populous district. It is so now in comparison with others, but the inhabitants appear to be borne down by oppression and slavery. This cannot be attributed to missionary enterprise, for they seldom see a preacher, or attend meetings. Their labors being limited to an occasional tour through the district, and the attempt to form schools among the children, which are, however, dependent upon native teachers… (Maly 1999).

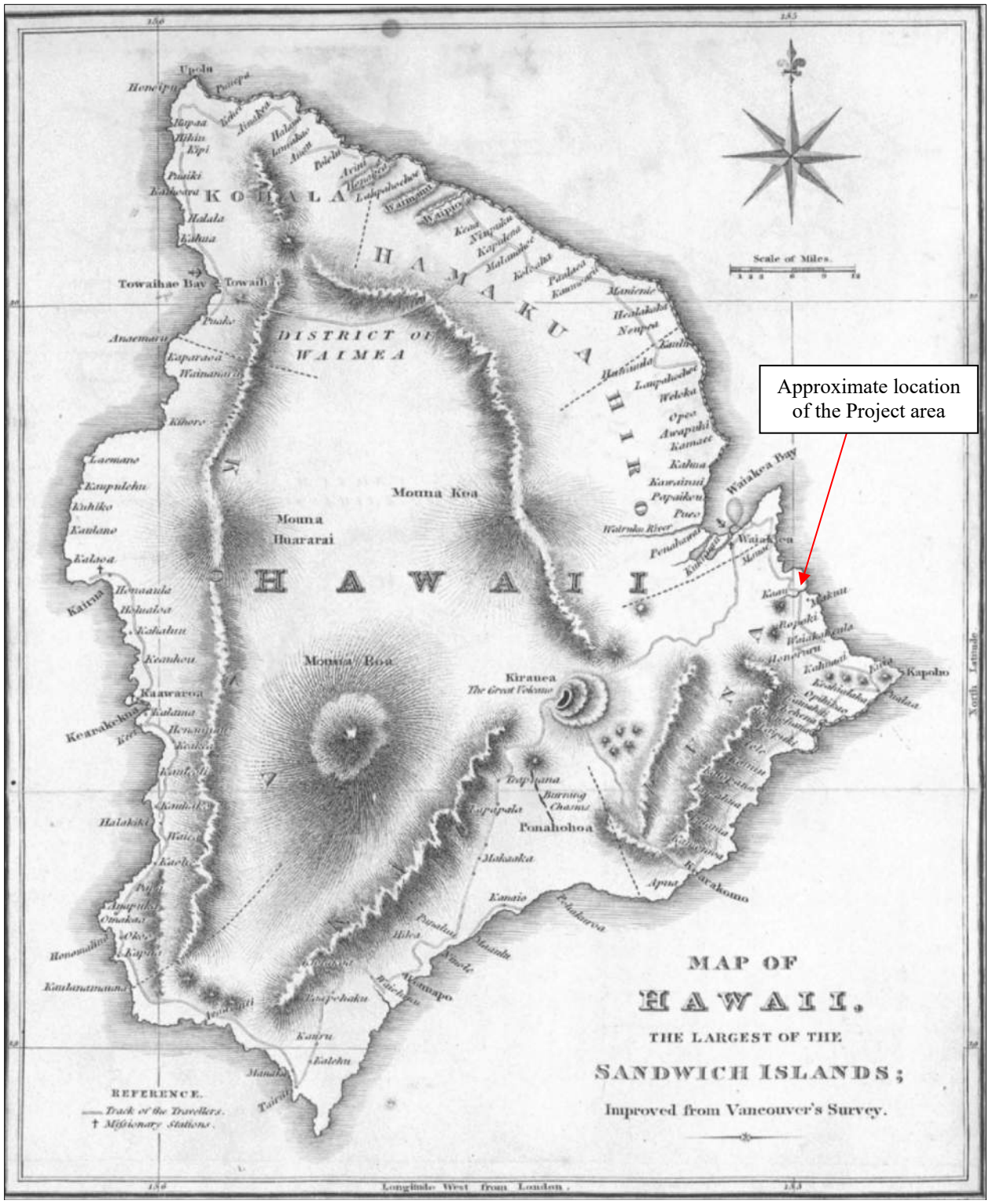

Figure 16. The island of Hawai‘i showing the route taken by Ellis in 1823 from Ellis’ Narrative – English Edition 1825; in (Fitzpatrick and Moffat 1986:87).

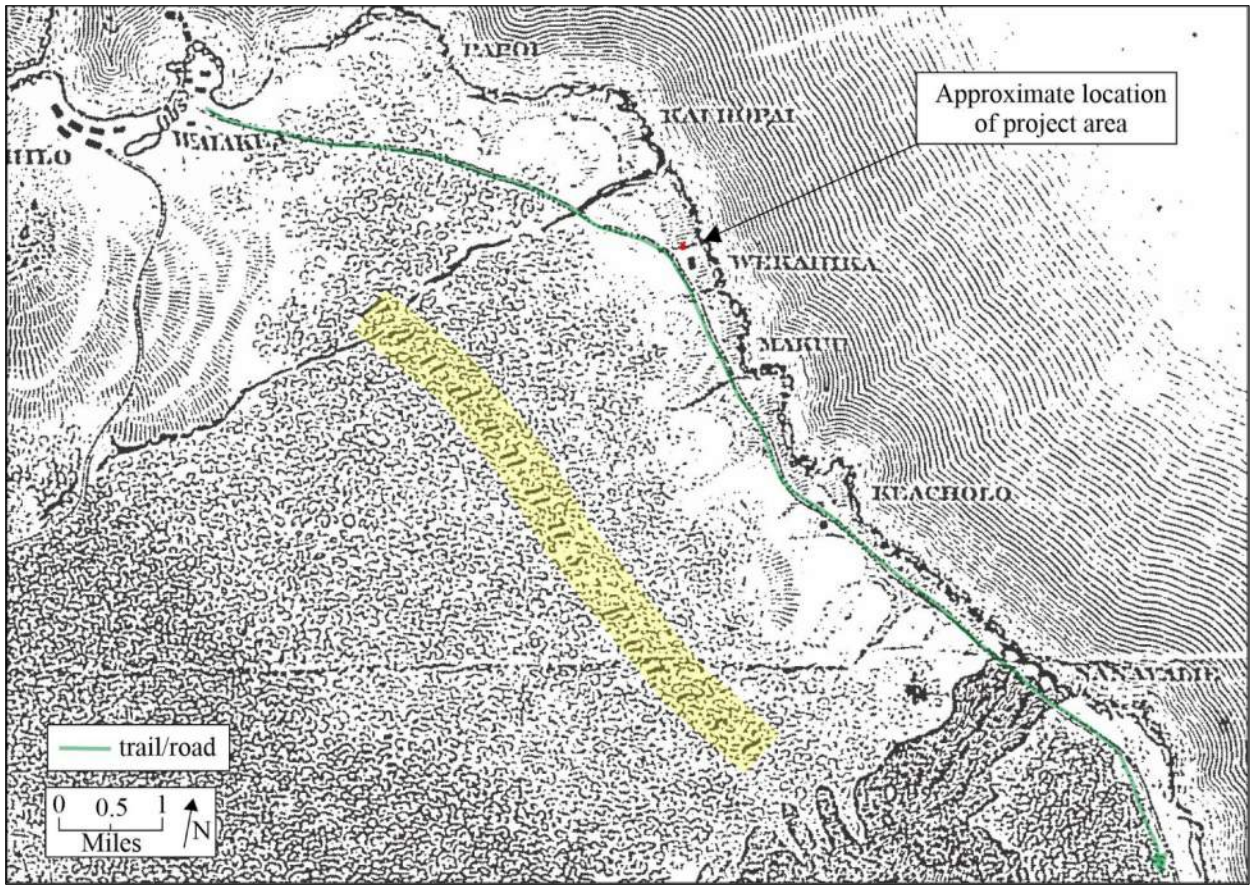

Figure 17. Portion of map titled "Part of the Island of Hawaii, Sandwich Islands, showing the coastal trail and pandanus forest (Wilkes 1845).

In 1846, Chester S. Lyman, visited Hilo and stayed with missionary Titus Coan and reported that the district of Puna had somewhere between 3,000 and 4,000 inhabitants (Lyman ms. Book III:3 in Maly 1998:35). Thus, less than fifty years after the arrival of the first Europeans, the population of Hawai'i was in decline. In addition to providing population estimates, Lyman also describes walking along the coastal trail between Kea'au and Maku'u, which he describes as:

> . . . walked two miles to a few houses on the shore, where we breakfasted in the school house …The path most of the way was on a lava bed immediately on the margin of the sea-the surf dashing beautifully at our feet. Five miles further on we came to Makuu, a small scattered village at 9 o'clock A.M. (Lyman ms. Book III in Maly 1999:37)

By 1850, the population of Hawai'i Island had dropped to 25,846 individuals (Schmitt 1973:8). Maly summarizes the reasons for the rapid decline of native populations thusly:

> Overall, historic records document the significant effect that western settlement practices had on Hawaiians throughout the islands. Drawing people from isolated native communities into selected village parishes and Hawaiian ports-of-call, had a dramatic, and perhaps unforeseen impact on native residency patterns, health, and social and political affairs. In single epidemics hundreds, and even thousands of Hawaiians died in short periods of time (Maly 1998:36).

The *Māhele 'Āina* of 1848

By the mid-nineteenth century, the ever-growing population of Westerners in the Hawaiian Islands forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership. By 1840 the first Hawaiian constitution had been drafted and the Hawaiian Kingdom shifted from an absolute monarchy into a constitutional government. Convinced that the feudal system of land tenure previously practiced was not compatible with a constitutional government, the King (Kamehameha III) and his high-ranking

chiefs decided to separate and define the ownership of all lands in the Kingdom (King n.d.). This change was further promoted by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that could be taken from them at any time. After much consideration, it was decided that three classes of people each had one-third vested rights to the lands of Hawai‘i: the King, the chiefs and *konohiki*, and their tenants (the *maka‘āinana* or common people). In 1845, the legislature created the "Board of Commissioners to Quiet Land Titles" (more commonly known as the Land Commission), first to adopt guiding principles and procedures for dividing the lands and granting land titles, and then to act as a court of record to investigate and ultimately award or reject all claims brought before them. All land claims, whether by chiefs for entire *ahupua‘a* or by tenants for their house lots and gardens, had to be filed with the Land Commission within two years of the effective date of the Act (February 14, 1846) to be considered (this deadline was extended several times for chiefs and *konohiki*, but not for commoners; (Soehren 2005).

The King and some 245 chiefs (Kuykendall 1938) spent nearly two years trying unsuccessfully to divide all the lands of Hawai‘i amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (King n.d.). Once the King and his chiefs accepted the principles of the Privy Council, the *Māhele ‘Āina* (Land Division) was completed in just forty days (on March 7, 1848), and the names of all of the *ahupua‘a* and *‘ili kūpono* (nearly independent *‘ili* land division within an *ahupua‘a*, that paid tribute to the ruling chief and not to the chief of the *ahupua‘a*) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the *Māhele* Book (Soehren 2005). As this process unfolded King Kamehameha III, who received roughly one-third of the lands of Hawai‘i, realized the importance of setting aside public lands that could be sold to raise money for the government and also purchased by his subjects to live on. Accordingly, the day after the division with the last chief was recorded in the *Buke Māhele* (*Māhele* Book), King Kamehameha III commuted about two-thirds of the lands awarded to him to the government (King n.d.). Unlike the King, the chiefs and *konohiki* were required to present their claims to the Land Commission to receive their awards (LCAw.). The chiefs who participated in the *Māhele* were also required to provide to the government commutations of a portion of their lands in order to receive a Royal Patent giving them title to their remaining lands. The lands surrendered to the government by the King and chiefs became known as "Government Land," while the lands retained by Kamehameha III became known as "Crown Land," and the lands received by the chiefs became known as "*Konohiki* Land" (Chinen 1958:vii; 1961:13). All lands awarded during the *Māhele* 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.

As a result of the *Māhele*, Kea‘au Ahupua‘a in its entirety was awarded as *Konohiki* Land to William C. Lunalilo as *‘āpana* (lot) 16 of LCAw. 8559B. The Royal Patent (no. 7223) award, which conveyed an absolute fee simple title to Kea‘au Ahupua‘a was not issued until 1879 by King Kalākaua, some five years after Lunalilo's death. Kea‘au Ahupua‘a was one of sixty-five *ahupua‘a* maintained by Lunalilo following the *Māhele* (Kame‘eleihiwa 1992). The sixty-five *ahupua‘a* that he maintained as part of his personal land holdings were spread across six islands; Hawai‘i (n=31 *ahupua‘a*) of which, eight were in Puna; Maui (n=15 *ahupua‘a*); Lāna‘i (n=1 *ahupua‘a*); Moloka‘i (n=2 *ahupua‘a*); O‘ahu (n=9 ahupua‘a); Kaua‘i (n=7 *ahupua‘a*) (Kame‘eleihiwa 1992:236-237). Next to the *mō‘ī*, Kauikeaouli, Lunalilo ranked second for having the most lands as a consequence of the *Māhele*. Fearing that his son's drinking habit and wasteful spending would lead to a total loss in the new capitalist system, in 1858, Lunalilo's father, Charles Kana‘ina petitioned the court to appoint guardians to manage his son's estate. The court concurred and subsequently appointed Kana‘ina, Armstrong, and J.W. Austin as guardians of his estate (ibid.).

Lunalilo died in 1874, leaving the three appointed trustees in charge of managing the Lunalilo Trust. Charles Kana‘ina, however, contended "that the will offered for probate is not the Will of the deceased; that at the time of the execution thereof he was incompetent and that the Codicil thereto was not executed according to law" (Cahill 1996:163). Within a month after the court hearing, Justice Harris made his ruling and validated the will and admitted it to probate. To fund the construction of the Lunalilo Home on O‘ahu, the trustees first applied to the Supreme Court to determine whether they had the authority to lease the Kea‘au tract, rather than selling it outright. The Supreme Court ruled that the trustees did not have the power to lease the said land and forced the trustees into disposing of the Kea‘au tract in its entirety. The roughly 65,000-acre Kea‘au Ahupua‘a was put up for sale in an 1881 public auction. Three men, Willie (William) Shipman, Captain J. Elderts, and Samuel M. Damon saw new economic and ranching possibilities for Kea‘au. With much determination, the three men formed a consortium and individually financed one-third equal share and thereby made a $20,000 offer for the parcel. On January 9, 1882 they became the owners of the entire Kea‘au Ahupua‘a, with an agreement that gave each of the signatories first right of refusal should one of them decide to sell their portion. However, by the following year, Elderts sold his interest to Shipman and Damon. Damon

followed Elderts and shortly thereafter, sold his portion to Shipman. By 1883, Willie and his wife Mary were the sole owners of the entire Kea‘au Ahupua‘a (ibid.). Ownership of this large tract of land allowed the Shipman family to expand their early ranching operations and subsequent agricultural endeavors.

The *Kuleana* Act of 1850

As the King and chiefs made claims to large tracts of land during the 1848 *Māhele ‘Āina*, questions arose regarding the protection of rights for the native tenants. During the *Māhele*, native tenants of the lands that were divided up among the Crown, *Konohiki*, and Government were able to make claim to, and acquire title to, *kuleana* parcels that they actively lived on or farmed. The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw.). Claims for *kuleana* had to be submitted during a two-year period that expired on February 14, 1848 to be considered. All of the land claimants were required to provide proof of land use and occupation, which took the form of volumes of native registry and testimony. The claims and awards were numbered, and the LCAw. numbers, in conjunction with the volumes of documentation, remain in use today to identify the original owners and their use of the *kuleana* lands. The work of hearing, adjudicating, and surveying the claims required more than the two-year term, and the deadline was extended several times for the Land Commission to finish its work (Maly 2002). In the meantime, as the new owners of the lands on which the *kuleana* were located began selling parcels to foreigners, questions arose concerning the rights of the native tenants and their ability to access and collect the resources necessary for sustaining life. The “Enabling” or “*Kuleana* Act,” passed by the King and Privy Council on December 21, 1849, clarified the native tenants’ rights to the land and resources, and the process by which they could apply for fee-simple interest in their *kuleana*.

The work of the Land Commission was completed on March 31, 1855. A total of 13,514 *kuleana* were claimed by native tenants throughout the islands, of which 9,337 were awarded (Maly 2002). In Puna, very few claims for *kuleana* were submitted. Maly (1998:37) notes that, with the exception of the islands of Kaho‘olawe and Ni‘ihau, no other land division of comparable size, had fewer claims for *kuleana* from native tenants than the district of Puna. Only two *kuleana* were awarded within Kea‘au Ahupua‘a (Table 1), none of which are in close proximity to the current project area. The first of these was a 13.64-acre parcel in the *‘ili* of Halauloa to Hewahewa as LCAw. 8081:2 containing only a single cultivated garden. The other was a 0.34-acre parcel in the *‘ili* of Kalaihina to Barenaba as LCAw. 2327:1.

Table 1. *Kuleana* Awards in Kea‘au Ahupua‘a

Awardee	*LCA No.*	*Acres*	*Year Awarded*	*‘Ili name*	*Land Use*
Hewahewa	8081:2	13.64	1859	Halauloa	Cultivated garden
Barenaba	2327:1	0.34	1882	Kalaihina	Houselot

Current Project Area During the Twentieth Century

During the latter part of the nineteenth century and into the twentieth century, land use within the District of Puna began to change. The native agricultural system was largely abandoned as the population declined (Yent and Ota 1982), and ranching, sugar cane, coffee, and lumber became the dominant industries. The Kea‘au Ranch began grazing cattle on nearby lands as early as the 1850s (Maly 1999), and the Olaa and Puna Sugar Companies began operations in 1900, lasting until the 1980s (Dorrance and Morgan 2000).

Amid these economic changes, the government surveyed and began to lay out a new inland road between Maku‘u and Kea‘au in 1889. Details of this effort were provided as an attachment to a letter written in 1892 from the government surveyor A. B. Loebenstein to George Wilcox and W.D. Alexander (excerpted in Maly 1999:105-108). The attachment describes the route of the road, the surrounding terrain, vegetation, land use, and mentions *mauka-makai* trails and the possibility of using them to connect the coast with the new inland road.

In a second attachment to his letter, Loebenstein describes arable land that could be accessed from the new road. While the attachment only tabulates arable acreage along the coast, between 400- and 1,500-feet elevation, Loebenstein again mentions the presence of *mauka-makai* trails:

> It was originally intended to incorporate with the list, those lands which beginning at the sea coast extend but a short distance inland, but are more or less out of reach except by ancient trails which can be followed from the new road. Only a few of these lands however, are other than small and

> worthless, and what little decent land there is, is taken up by grants scattered here and there. (quoted in Maly 1999:107)

The numerous trails mentioned by Loebenstein probably included some of the routes that were later described by two elder *kamaʻāina* witnesses in a 1932 Land Court hearing for lands owned by W.H. Shipman in Keaʻau (Maly and Maly 2004). One of the witnesses was a man named David Malo who was born at Makuʻu in 1852. Malo testified that there was only one "main trail or Public Highway that was used by everybody" in his youth, which started "from about 12 miles Olaa, and goes down to Waipahoehoe, and on to Makuʻu where it meets the King['s] Highway" (Maly and Maly 2004:70). From the main highway, he added, "there were may other trails runing down to the king's highway and the beach, some of them were made by cowboys or driving cattle, and some of them were made by cows" (Maly and Maly 2004:70). The other witness was a man named George Mai or Mai Keoki, born in 1868 in Keaʻau. Mai mentions there being "another small trail from Olaʻa to Keakuamakakii, passes Hilo of the stone crusher, makai of Puna highway then on to Lapaiki, two coconut tress at Kaikoo where it branches," with one branch going to Keauhou and the other towards his place at Keaʻau (quoted in Maly and Maly 2004:70). Mai also noted that a fence was put up along the Pāhoa road around 1910 or 1911, and that nobody used the trail anymore.

Beginning in 1900, railroad tracks for hauling the unprocessed cane and passenger travel were laid by the Hawaiʻi Railway Company from the sugarcane fields in lower Puna to the mills in Pahoa and Keaʻau, and then continuing on to Hilo (Clark et al. 2001). The railroad passed through Keaʻau Ahupuaʻa *makai* of the current project area. In 1916, the railroad company was reorganized as the Hawaiʻi Consolidated Railway (HCR).

During the early twentieth century, the privately-owned lands surrounding the current project area were primarily used for ranching. Roughly 14,000 acres of the Keaʻau Ahupuaʻa and neighboring Government Lands became part of Shipman Ranch (General Lease No. 854) before being sold to the Watumull *ʻohana* in the 1950s (Edwards 2022) and the Hawaiian Paradise Park residential subdivision was developed.

Today, HPP consists of 8,843 one-acre parcels which were originally marketed for $795 each. In a photograph captured in 1954, the roadways making up HPP with only a few houses present near the Keaʻau-Pāhoa Road. By 1967, all the parcels within HPP were sold, with the final parcel selling for just under $2,000. Throughout this period of industrial growth and decline in Puna, the project area vicinity remained largely undeveloped as demonstrated by an aerial photograph from 1961 (Figure 18). However, by 1977, there is an abundace of development in the parcels closest to the New Government Road (Hwy 130, the Keaʻau-Pāhoa Highway) with fewer homes appearing in the coastal area (Figure 19). According to the United States Census Bureau (2022), in 2020, HPP was home to 14,957 individuals and between 2017-2021, consisted of 4,236 households.

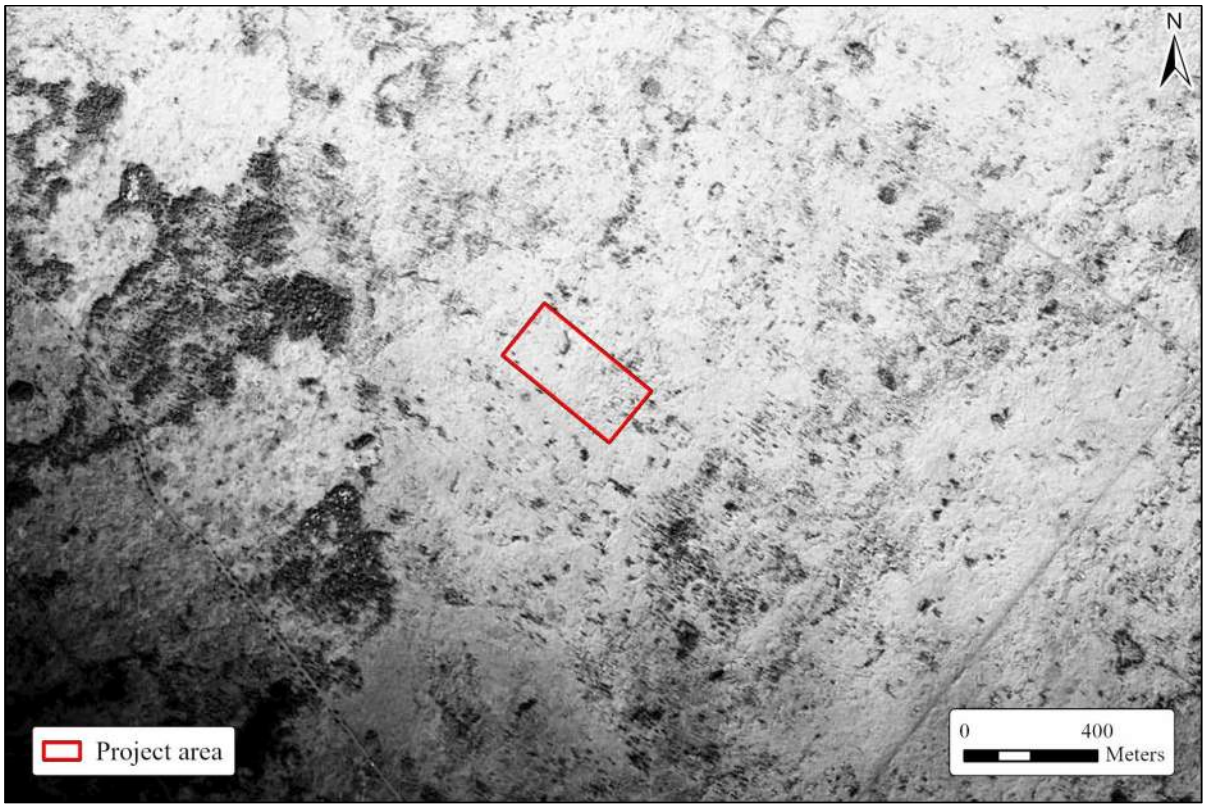

Figure 18. 1961 USGS aerial photograph showing the current project area.

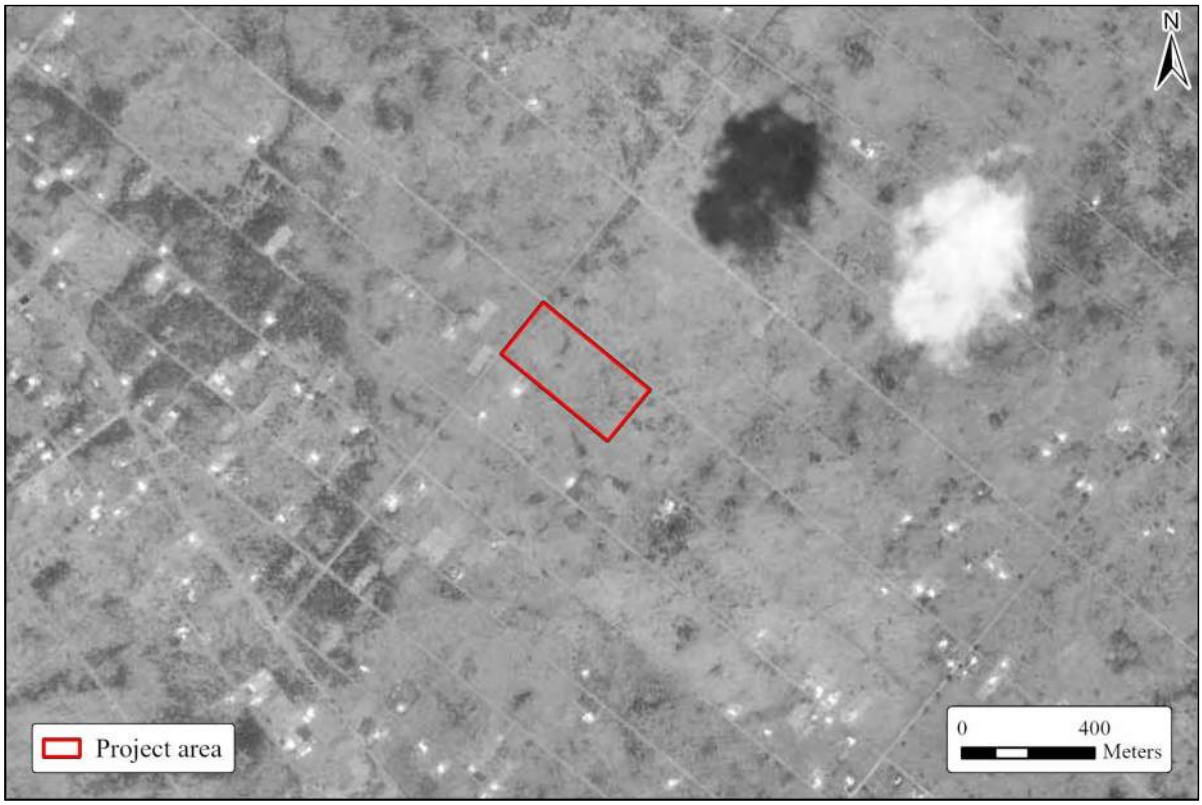

Figure 19. 1976 USGS aerial photograph showing the current project area.

PREVIOUS ARCHAEOLOGICAL STUDIES

Archaeological studies (Figure 20; Table 2) have taken place within numerous TMK parcels throughout HPP following inception of the subdivision. No studies have taken place within the current project area. Most of the studies (Clark 2018; Escott 2020; Haun and Henry 2013a, 2013b, 2013c, 2013d; Higelmire and Lash 2017) produced negative findings.

Table 2. Previous archaeological studies conducted in the vicinity of the current project area.

Year	*Author(s)*	*Type of Study*
1984	Olson	-
1985	Rosendahl	Archaeological Field Inspection
2010	Wilkinson et al.	Archaeological Inventory Survey
2013a	Haun and Henry	Archaeological Assessment
2013b	Haun and Henry	Archaeolgoical Assessment
2013c	Haun and Henry	Archeological Assessment
2013d	Haun and Henry	Archeological Assessment
2017	Higelmire and Lash	Archaeological Inventory Survey
2020	Escott	Archaeological Field Inspection

In 1984, Paul H. Rosendahl, Inc. (Olson 1984) conducted a study documenting the recently discovered Puna Cave System, SIHP # 50-10-45-10001 (Figure 21) located just southwest of the Kea‘au-Pāhoa Highway. The cave system is described as an extensive lava tube system, including the Kazumura—or Puna—Cave. The cave complex is located approximately 4.5miles inland at Kalapana and was first discovered by researchers in 1982 (Olson 1984). The cave consists of over fourteen miles of a multi-chambered, subterranean lava tube that extends from the mountains towards the sea. This cave is recognized as the longest lava tube in the world and the deepest cave in the nation (Allred and Allred 1997; National Park Service 2021). Olson describes “six separate, but seemingly related, major archaeological sites” utilized for the “religious practice of sorcery” and may be the birth palce of the goddess Kapokohelele, Kapo of the flying vagina (Olson 1984:1). The sites include features of “underground temples, altars, platforms, walls, fire hearths, ceremonial areas, ancient burial tombs of *ali‘i* (chiefs), human sacrifices, stone images of ancient gods, and extensive deposits of prehistoric Hawaiian artifacts,” (Olson 1984:1). Five of the six sites are located within the Kea‘au Ahupua‘a: SIHP Site # -10001-1, Kapo; -2, Kahuna Living Quarters; -03, Burial Chamber I; -04 Kuni Ceremonial area; and -5, Burial Chamber II. While none of these sites are located within the project area, there is possibility of skylights from unexplored branches of the lava tube reaching into the current project area.

In 1985, Paul H. Rosendahl conducted an archaeological field inspection (Rosendahl 1985) of approximately 4-5 acres within a small *kipuka* that spanned several parcels, TMKs: (3) 1-5-023:001, 040, 074, 075, 117, 126, 147, and 184. This work was done in anticipation of a then proposed park along 17th street. As a result of that field inspection numerous habitational and agricultural sites were identified and interpreted as “traditional Hawaiian dryland agricultural exploitation and associated temporary residential occupation” (Rosendahl 1985:1). The sites consisted of “stacked stone walls, walled enclosures, low terraces and platforms, modified bed-rock outcrops, stone mounds and piles, and cleared areas” (Rosendahl 1985:1). All of the sites were in good condition, retained good integrity and were determined significant for “scientific research and interpretive values” (Rosendahl 1985). Rosendahl recommended preservation of the sites and detailed documentation through the form of an intensive archaeological inventory survey. No further work was done regarding the 31-acre proposed preservation area until the Hawaiian Paradise Park Owners Association (HPPOA)’s general manager contracted Scientific Consultant Services Inc. to conduct a field inspection in 2020.

Figure 20. Previous archaeological studies conducted within the vicinity of the project area.

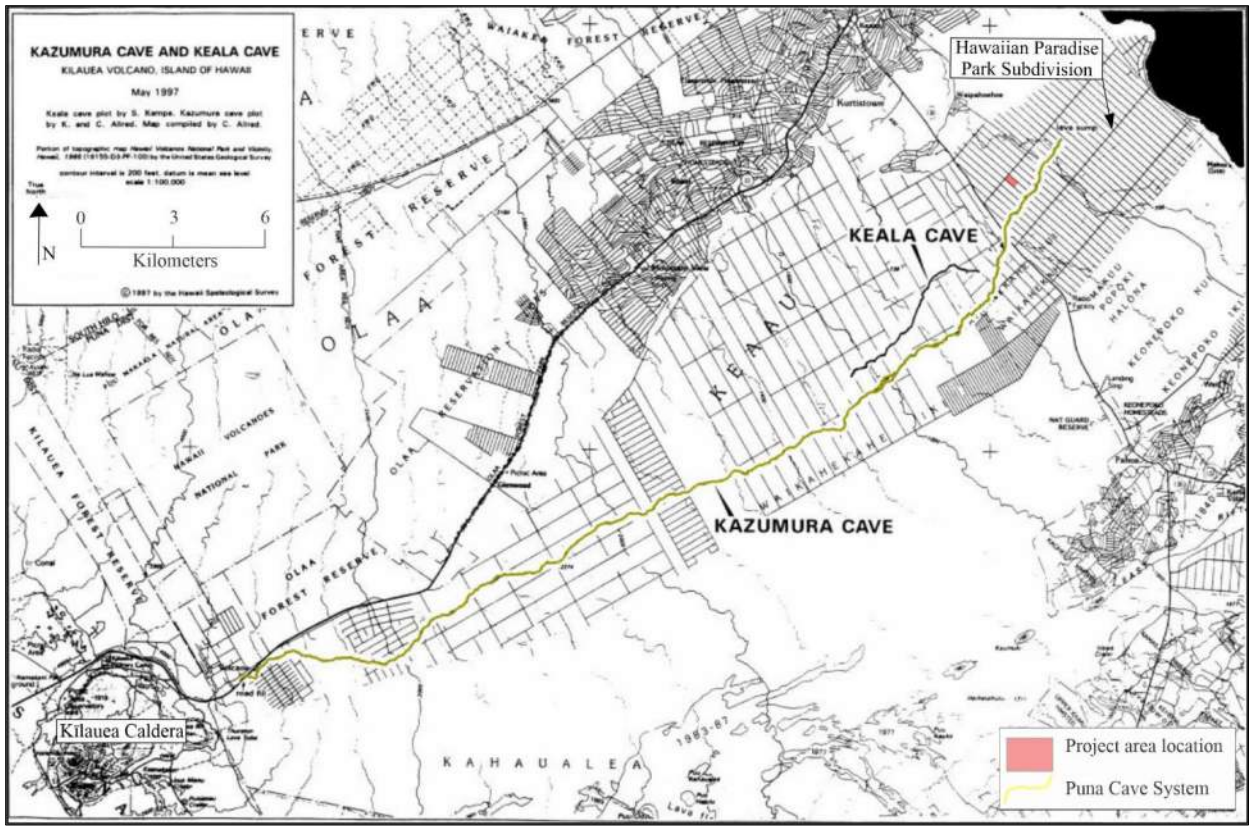

Figure 21. Map showing the extent of the Kazumura Cave system with the current project area indicated.

In 2010, Cultural Surveys Hawai‘i (CSH) (Wilkinson et al. 2010), conducted an archaeological inventory survey for the widening of the Kea‘au-Pāhoa Higway. The study identified a single previously identified historic site consisting of an abandoned concrete bridge and associated asphalt roadway (SIHP # 50-10-474-26874, 1930s Bridge). Due to the location of the site and eligibility as a historic property, it was determined that the project would have adverse effect. Mitigation recommendations included documentation of the site, archaeological monitoring of construction activities, and avoidance of nearby private properties and roadside memorials.

In 2020, Scientific Consultant Services, Inc conducted a field inspection (Escott 2020) of a 22,445 square foot (0.515-acre) portion of the 121.6-acre roadway parcel fronting the before mentioned 31-acre preservation area; TMK: (3) 1-5-023:253. The inspection was done in preparation of improvements to an approximately 80 meters by 22.5-meter-wide area of the roadway. No archaeological properties were identified as a result of their field inspection. Two years later, a GPS survey within a portion of a nearby parcel (TMK: [3] 1-5-023:126) was conducted by (Escott 2022). The purpose of the GPS survey was to establish the outer boundary around the archaeological features identified by Rosendahl in 1985. The GPS survey results were shared with the HPPOA in the form of two kmz files; “HPP Arch Feature GPS Points” and Site Perimeter” (Escott 2022:2). It was recommended by Scientific Consultant Services, Inc. that “[i]f fencing is erected around the archaeological site, you should consider er[e]cting it at least 30 feet outside of the outer site perimeter” (ibid.).

3. STUDY AREA EXPECTATIONS

Within the *ahupua'a* of Kea'au, the current project area falls in a zone likely to be characterized by dispersed, though possibly intense, Precontact agricultural pursuits. These general models are based on early historical accounts that consider environmental variables and human resource needs. Archaeological study has largely supported these patterns and refined them for specific areas.

Previous archaeological studies have documented a Precontact settlement pattern along the coast that includes dispersed habitation sites and agricultural complexes along with ceremonial and burial areas, all associated with a fairly dense (but not necessarily nucleated) population. Areas inland of the coast were exploited for agricultural purposes and the collection of forest resources, but were not generally chosen for habitation. Kea'au does not appear to have been a population center during Precontact times, and by early Historic times, as drastic population reduction occurred throughout Hawai'i and traditional sites along the coast were abandoned, settlement appears to have become even less dense (Maly 1998). The later Historic Period saw a minor expansion of settlement in this area of both transplanted Hawaiians and non-Hawaiians alike. This was primarily due to sugarcane cultivation and ranching. The influx of people during this period waned by the early twentieth century as a result of commercial economic failures, and the population once again dipped. However, by the mid twentieth century, with the development of residental subdivisions, the population began to increase once again. In recent times, Puna has been recognized as one of the fastest growing districts in the nation.

Given the above overview of regional and local archaeological research we are well-positioned to offer some predictions concerning the potential of the current project area for yielding significant archaeological or historical material remains. Overall, the probability of encountering archaeological resources in this area seems very low as no historic properties have been identified on nearby TMK parcels. Due to activities associated with the transistion from forest to sugarcane cultivation and pastures, any archaeological features that might have escaped this disturbance could include agricultural features typical of this part of Puna (e.g., modified depressions, modified outcrops, alignments, and/or mounds associated), and possibly, but not likely, scattered habitation features (platforms, terraces, pavements, walls, and/or enclosures), though they would not be expected to maintain much integrity. Lava tubes, both culturally sterile and those containing cultural material, have been recorded in the vicinity of the study areas. There is a moderate possibility that lava tube openings exist within the study areas.

4. FIELDWORK, CONCLUSIONS, AND RECOMMENDATIONS

Fieldwork for the current study was conducted on October 6, 2023 by David Morris-King, M.Sc., Colsen Balai, B.A., Jonas Leon, B.A, and Olivia Crabtree, B.A, under the supervision of Matthew R. Clark, M.A. (Principal Investigator). A total of 32-person hours were expended to complete the survey fieldwork which consisted of an intensive (100% coverage) pedestrian survey of the entire project area. The entire ground surface of study area was visually inspected by field technicians. Field crew members walked in systematic transects paralleling the project area boundaries with spacing between crew members no more than 15 meters. Ground surface visibility was variable depending on the vegetation, but generally adequate throughout the project area. Areas thick with *uluhe* fern yielded the lowest visibility. No subsurface testing was conducted due to a lack of soil deposition and surface features.

As a result of the current fieldwork, no historic properties of any kind were identified within the current project area. Modern rubbish and debris are present throughout the project area, and concentrated along the roadside boundaries nearest to ʻOkika and ʻŌlena Avenues. Pig disturbance was also noted across the project area, including pig trails and mud wallows. It is the conclusion of this study that the proposed development of the project area will have no effect on any historic properties. With respect to the historic preservation review process of the Department of Land and Natural Resources–State Historic Preservation Division (DLNR–SHPD), given the negative findings of the current study, the recommended determination of effect for the proposed development of a park on TMK: (3) 1-5-039:267, pursuant to HAR §13-284-7, is "no historic properties affected." No further historic preservation work is recommended prior to permit issuance or during any subsequent development activities within the project area. In the unlikely event that significant archaeological resources are discovered during the future ground disturbing activities, work should cease in the area of the discovery and DLNR-SHPD contacted pursuant to HAR 13§13-275-12.

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APPENDIX G

Biological Survey Report

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Biological Survey of Proposed Hawaiian Paradise Park District Park TMK (3) 1-5-039: 267, Puna District, Island of Hawai‘i

By Ron Terry, Ph.D and Patrick J. Hart, Ph.D.
Geometrician Associates, LLC
September 2024

Introduction

This biological survey concerns the proposed Hawaiian Paradise Park District Park site, which is located on a 20-acre property between 25th and 26th Avenues east of Kaloli Drive in the Hawaiian Paradise Park (aka HPP) subdivision of the Puna District on the Island of Hawai‘i (Figure 1). In order to conduct this development activity responsibly, the County of Hawai‘i committed to identify the location of any sensitive species or habitat, ascertain the potential for biological impacts, and develop mitigation measures to avoid or reduce impacts to minimal levels.

The property was surveyed by Patrick Hart on September 30, 2023 after documentary research by Ron Terry and Patrick Hart based on prior surveys of similar areas in Puna. Of particular relevance for background was a survey of a 9.5-mile, 50 to 200-foot wide corridor surrounding State Highway 130 (Kea‘au-Pāhoa Road), between the southeastern end of Kea‘au and Pāhoa (Geometrician 2009, 2018). As part of background research, we also reviewed USFWS critical habitat maps for the area. As shown in Figure 2, the USFWS’s Critical Habitat Mapper shows no designated critical habitat on or near the property. We analyzed listings of threatened and endangered (T&E) plant and animal taxa for the Hawaiian Islands, and then extracted those species that were historically or currently present in the lowland areas of Lower Puna, in order to increase the accuracy of detecting a potential T&E species. The only plant even slightly likely to occur in this context was the recently listed endangered ha‘iwale (*Cyrtandra nanawaleensis*), for which there was a special effort to search. In contrast, a number of wide-ranging T&E vertebrate species were documented to be present throughout the Puna District.

The objectives of the botanical survey component of the survey were to: 1) describe the vegetation; 2) list all species encountered; and 3) identify the locations of any individual plants with rare, threatened or endangered status. The faunal portion of the survey consisted of visual/auditory faunal surveys both during and apart from the botanical survey that covered birds and introduced mammals, reptiles, or amphibians, as well as habitat assessment. Although no Hawaiian hoary bat surveys were undertaken, the general value of the habitat for the bat was evaluated. Not included in the survey was any systematic invertebrate survey.

Vegetation Type and Influences

The property is located on the flank of Kīlauea, an active volcano. The surface consists of lava flows of the Puna Basalt series of 200 to 750 years in age, originating from the volcano’s summit (Wolfe and Morris 1996). The soil on the property is classified by the U.S. Natural Resources Conservation Service (formerly Soil

Conservation Service) (1973) as Keaukaha highly decomposed plant material, 2 to 10 percent slopes (https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx). This young soil consists of organic material over pahoehoe lava, with bedrock from 4-12 inches below the surface where not exposed. Where undisturbed, it supports native forest. Annual rainfall averages about 138 inches (Giambelluca et al. 2014).

The natural vegetation of similarly aged lava flows in this part of the Puna lowland rain forest is dominated by ʻōhiʻa (*Metrosideros polymorpha*) and uluhe (*Dicranopteris linearis*) (Gagne and Cuddihy 1990). In many places, these original communities have been destroyed or heavily degraded by low-density residential development, farming and cattle grazing, infrastructure, quarries and small urban centers.

Early legends describing the location of the future Hawaiian Paradise Park and also a map from 1841 by Charles Wilkes of the United States Exploring Expedition (Wilkes 1844:61) indicate that this part of Puna was known for its hala (*Pandanus tectorius*) forest, which was likely mixed with ʻōhiʻa and a variety of other native trees, shrubs, vines, herbs and ferns. Cattle ranching got its start in the area at least as early as 1872, when rancher Obed B. Spencer leased the entire massive Keaʻau Ahupuaʻa from Charles Kanaina and Charles R. Bishop, guardians of King William C. Lunalilo, for a term of ten years, beginning September 1, 1873. Spencer then transferred the lease and sold his personal property, including about 300 cattle, 4,000 goats, and also numbers of horses and sheep, to another group (Maly 1999:78). The lease was extended and ultimately sold to J. E. Elderts and William H. Shipman, who ended up controlling almost all the land between Keaʻau and Kapoho (Maly 1999:84; Cahill 1996).

Lands with suitable soils near Keaʻau and Pāhoa were put into sugar cultivation over the course of the next few decades. The lack of suitable soil spared Hawaiian Paradise Park and similar subdivisions from the utter transformation wrought by sugar cane cultivation, but these areas were grazed and logged for large trees in some places. Consultation of historic U.S. Geological Survey and U.S. Department of Agriculture airphotos and maps indicate that the property under study was slowly reforesting after the cessation of low-density grazing in the mid-20th century, when the former ranch lands were converted to agricultural/residential subdivisions such as Hawaiian Paradise Park. Scattered tall ʻōhiʻa and mango groves are visible in the oldest airphotos. In many areas there emerged a low-diversity forest that in the tree layer was nearly a monoculture of ʻōhiʻa, with an understory of uluhe and other native ferns, sedges, non-native grasses, and alien shrubs such as *Melastoma* spp. Through time, expanding settlement led to edge disturbances and increasing weed dispersal. This heavily degraded the vegetation of not only cleared areas but adjacent ungraded land, which is now often dominated not by ʻōhiʻa but instead by a variety of weedy trees, most prominently the problematic albizia (*Falcataria moluccana*).

Field Methodology

The project area was surveyed by a 4-person team, all of whom had experience with the identification of lowland plants in Hawaiʻi. The crew walked transects spaced approximately 25 m apart across the entire project site, paying special attention to shaded areas under emergent trees such as Chinese banyan (*Ficus microcarpa*) and gunpowder tree (*Trema orientalis*). Plant species were identified in the field and, as necessary,

collected and keyed out in the laboratory. All bird species were identified in the field using 10X42 power binoculars. A single crew-member (Hart) conducted acoustic surveys for the presence of Hawaiian hawks along transects spaced 100m apart using broadcast playbacks of ʻio calls known to elicit a strong behavioral response.

Findings: Vegetation

Vegetation of the project site is comprised of an open ʻōhiʻa forest with an understory of uluhe ferns, *Melastoma* and a variety of non-native herbs and grasses including *Schizachrium condensatum, Sporobolus indicus, and Eragrostis tenella*. A few non-native, emergent trees were also found scattered across the site such as albizia, Chinese banyan and gunpowder tree. The vegetation in the shrub and herb layers was predominantly non-native, but some native ferns and fern allies were present in low abundance, including moa (*Psilotum nudum*), wawaeʻiole (*Lycopodiella cernua),* and palaʻa (*Sphenomeris chinensis*).

Findings: Flora and Rare, Threatened or Endangered Species

Table 1 is a list of plant species detected. Of the 65 species, 9 are native, with 8 being indigenous (native to Hawaiʻi and elsewhere) and 1 endemic (native only to Hawaiʻi). All natives are very common on the Big Island and elsewhere in Hawaiʻi. The 4-person crew made a concerted effort to locate any individuals of the endangered *Cyrtandra nanawalensis,* but none were detected. The shady cracks and crevices in lava that are generally preferred by this species were rare across the project area. No listed, candidate or proposed endangered plant species (USFWS 2024) were found during the survey in either area. No existing or proposed federally designated critical habitat for plants (or animals) is present on or near the property. In terms of conservation value, no botanical resources requiring special protection are present, although it is recognized that the ʻōhiʻa forest, despite its moderate to heavy degradation, has intrinsic conservation value.

Findings: Fauna

With the exception of a single observation of a Hawaiian hawk or ʻiʻo (*Buteo solitarius*), the observed bird fauna was entirely non-native and including a number of Japanese white-eyes (*Zosterops japonicus*) as well as common mynas (*Acridotheres tristis*), northern cardinals (*Cardinalis cardinalis*), spotted doves (*Spilopelia chinensis*), house finches (*Haemorhous mexicanus*), yellow-billed cardinals (*Paroaria capitata*), yellow-fronted canaries (*Serinus mozambicus*), saffron finches (*Sicalis flaveola*), zebra doves (*Geopilia striata*) and chickens (*Gallus gallus*). Additional observations at different seasons and times of the day would undoubtedly reveal more bird species, with nearly all likely to be non-native. The single Hawaiian hawk was observed perched in a moderately tall ʻōhiʻa tree. This formerly federally-listed endangered bird (still listed by the State of Hawaiʻi) is very commonly seen in forests, agricultural areas, and even towns throughout East Hawaiʻi. Hawaiian hawks generally prefer ʻōhiʻa forest habitat but are known to breed successfully in both native and non-native forests. They occur throughout the island of Hawaiʻi from sea level to 8,530 feet in elevation. Hawks often forage in forests near agricultural tracts and nest in tall trees of a variety of species. Most nesting occurs in tall native ʻōhiʻa trees, although hawks may also nest in non-native trees, including

eucalyptus, ironwood, mango, coconut palm and macadamia. Nest construction is protracted, beginning up to two months before the first egg is laid and continuing into the nestling period. Egg-laying generally occurs from March to June, and fledging from July to September. Both sexes contribute to nest-building. Clutch size is nearly always one, although clutches of two and three eggs have been reported. Both sexes incubate but females perform most of the brooding of nestlings, while males provide most of the food to chicks and female. Both adults feed fledglings, which are dependent on adults for up to nine months. Hawks are vulnerable to disturbance during the nesting season from March 1 to September 30 of each year.

The area is generally poor habitat for native forest birds due to the low elevation, mostly non-native vegetation, and intrusive, ongoing human activities. The native Hawai'i ʻamakihi (*Chlorodrepanis virens virens*) has been detected in nearby areas within Hawaiian Paradise Park and is likely to be occasionally present. Bird survey work in Puna documented in Spiegel et al (2006) indicates that in many lowland forests, Hawai'i ʻamakihi are the most common and widespread native birds. They are significantly associated with ʻōhiʻa. Some populations of this native honeycreeper appear to have adapted to the mosquito-borne diseases of the Hawaiian lowlands. At low elevations there has been widespread recovery of this species and a changing composition of the forest bird community; nevertheless, lowlands dominated by non-native vegetation and bird species continue to have few native forest birds, even this one. The Hawai'i ʻamakihi is not a listed T&E species.

Because of the non-coastal location, only one species of shorebird is likely to be seen. The very common native resident migratory bird Pacific golden-plover (*Pluvea fulvialis*) also utilizes inland habitats, especially patches of short grass, during its winter residency in Hawaiʻi. The kolea is not a listed T&E species but is protected from killing under the Migratory Bird Treaty Act.

Due to the lack of streams or ponds, the only waterbird likely to occasionally be present in the general area is the threatened Hawaiian goose or nēnē (*Branta sandwicensis*). Nēnē have become very common on many Hawaiian islands and can be found at elevations ranging from sea level to sub-alpine areas above 7,000 feet. Historically, flocks moved between high-elevation feeding habitats and lowland nesting areas. Nests consist of a shallow scrape lined with plant material and down. Breeding pairs usually return to the previous year's nest site, typically in dense vegetation. Nēnē have an extended breeding season, and nesting may occur in all months except May, June, and July. There are no grassy patches on the property with the characteristics that would be likely to host nēnē, and no signs of this bird were observed.

Although they would rarely if ever be visible, several listed seabirds may overfly the HPP area between the months of May and November, including the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*). These seabirds hunt over the ocean during the day and fly to higher elevations at night to nest. The Hawaiian petrel was formerly common on the Island of Hawaiʻi. This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea, as well as at the mid-to-high elevations

of Hualālai. It has within recent historic times been reduced to relict breeding colonies located at high elevations on Mauna Loa, Kohala and, possibly, Hualālai. The Hawaiian petrel (as well as the band-rumped storm petrel) generally nest on the Big Island well above 5,000 feet in elevation. Some Hawaiian petrel nests have recently been found at lower elevations on Kohala volcano. Both the Newell's shearwater and Hawaiian petrel are known to burrow under ferns on forested mountain slopes. These burrows are used year after year, usually by the same pair of birds. Although capable of climbing shrubs and trees before taking flight, they need an open downhill flight path through which they can become airborne. Once abundant on all the main Hawaiian islands, most Newell's shearwater colonies are today found in the steep terrain between 500 to 2,300 feet on Kaua'i. Band-rumped storm petrels have recently been discovered to be nesting on the Mauna Loa side of the saddle between this mountain and Mauna Kea. Although each of these seabirds may fly over HPP on their way to and from mountain nesting areas and the open ocean, no suitable nesting habitat for any of them is present on the property.

The primary cause of mortality in these seabird species in Hawai'i is thought to be predation by alien mammals at the nesting colonies. Collision with man-made structures is another significant cause. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals including cats and mongooses.

It is highly likely that Hawaiian hoary bats (*Lasiurus cinereus semotus*), the only native Hawaiian land mammals, are sometimes present on the property. They have been found throughout Puna and in most areas on the island of Hawai'i. Bats may forage for flying insects on the property on a seasonal basis and may also roost in trees and large shrubs. Bats are often visible while they are feeding on flying insects near dusk and dawn at various locations around the island of Hawai'i. The presence of these bats can also be verified by radar and echolocation detectors. If a bat is detected during a night's study, this merely indicates that they were present in the area. Determination of bat populations or usage patterns requires much more sophisticated, long term studies. Conversely, the absence of bat detections does not indicate an absence of bats, which may have been absent for only a night, a week, or a season, or may have simply gone undetected. No bats were observed in the survey, which took place in daylight and did not use any detection equipment. For the purposes of this assessment, it is assumed that Hawaiian hoary bats are present at least some of the time, as they have been frequently seen and detected in 'ōhi'a and groves of other species. Hawaiian hoary bats are vulnerable to disturbance during the summer pupping season and require special mitigation measures.

Aside from bats, the other mammals in the project area are all introduced species, including feral cats (*Felis catus*), feral pigs (*Sus scrofa*), mongooses (*Herpestes* spp.) and various species of rats (*Rattus* spp.) and mice (*Mus* spp.). Surveyors did not observe any mammals during the survey, but pig trails were common throughout the project area. Coqui frogs (*Eleutherodactylus coqui*) were clearly heard on the biological survey despite it being the middle of the day. Several other species of non-native reptiles and amphibians may also be present. None are of conservation concern and all are deleterious to native flora and fauna.

Although no invertebrate survey was conducted, no likely hosts of the endangered Blackburn's sphinx moth (particularly tree tobacco or *Nicotiana glauca*) were observed. Similarly, the vegetation did not appear to contain the species necessary to sustain various T&E damselflies (*Megalagrion* spp.) or picture wing flies (*Drosophila* spp.). It should be noted that the vegetation was patchily infested with little fire ant (*Wasmannia auropunctata*), a pest that has become near-universal in settled parts of Puna.

Impacts and Mitigation Measures

No rare, threatened or endangered plant species are present. Some of the property contain a degraded medium-stature ʻōhiʻa forest that also contains uluhe and various other native ferns. Clearing of the property would destroy many individuals of these and a few other common native plants, but it would not affect rare, threatened or endangered plants, nor would it intrude into a sensitive native ecosystem. In the context of the thousands of acres of State land in this area, much of it covered with diverse native forest protected within the Conservation District, the loss of up to 20 acres of somewhat degraded ʻōhiʻa forest, although not negligible, is not critical to the preservation of habitat.

An issue for construction in property with ʻōhiʻa trees has recently surfaced. Two species of fungus called *Ceratocystis lukuohia and C. huliohia* produce a disease that is new to science and new to Hawaiʻi – Rapid ʻŌhiʻa Death (ROD) (Hawaiʻi Division of Forestry and Wildlife [DOFAW] 2017). This disease has killed hundreds of thousands of ʻōhiʻa trees across more than 34,000 acres of the Big Island. It was first discovered in Lower Puna. Projects that harm or relocate ʻōhiʻa trees can spread the disease, and certain mitigation measures are recommended, although it is important to recognize that treatment protocols are evolving. The following mitigation protocol is proposed, and as construction planning progresses, it should be supplied to DOFAW to ensure it meets current standards as part of the development process:

- Prior to clearing the edges of the property, ʻōhiʻa trees on the boundary should be identified. Any such trees that are not planned for removal on the edges should be protected from disturbance entirely, or cut and chipped or buried, to ensure that they do not present a ready target for ROD infection that could spread to other trees;
- Treat any unavoidable scars on ʻōhiʻa trees that result from clearing to prevent infestation of the fungus;
- Stack all removed ʻōhiʻa trees and dispose of by burying or chipping; do not remove from the property. Decontaminate boots and work tools before and after working in an area with ʻōhiʻa trees;

Another concern for the movement of products is the spread of invasive species, particularly little fire ants and coqui frogs, both of which are rampant in the general area. A biosecurity plan specifying requirements for construction contractors to clean equipment prior to leaving the Pāhoa area should be instituted in order to reduce the spread of these species. DOFAW and the Big Island Invasive Species Council should be consulted in order to solicit comments and potential additional measures that could reasonably be adopted.

In order to avoid impacts to the endangered but regionally widespread terrestrial vertebrates listed above, we recommend that the project commit to several conditions.

- Construction should refrain from activities that disturb or remove shrubs or trees taller than 15 feet between June 1 and September 15, when Hawaiian hoary bats may be sensitive to disturbance.
- If landclearing occurs between the months of March and September, inclusive, a pre-construction hawk nest search by a qualified ornithologist using standard methods should be conducted. If Hawaiian hawk nests are present, no land clearing should be allowed until October, when hawk nestlings will have fledged.
- All exterior lighting should be shielded from shining upward, in conformance with Hawai‘i County Code § 14–50 et seq., to minimize the potential for seabird disorientation. The project should utilize blue-deficient lighting such as filtered LED lights or amber LED lights, with a Correlated Color Temperature (CCT) of 2700 Kelvin or less, which promotes dark skies and minimizes impacts to seabirds.
- Although no T&E waterbirds or Hawaiian geese are likely to be present, if federal funding is involved, the project should be prepared for the requirement to have a biological monitor verify site conditions prior to construction and institute standard avoidance and mitigation measures should these species be detected.

Report Limitations

No biological survey of a large area can claim to have detected every species present. Some plant species are cryptic in juvenile or even mature stages of their life cycle. Dry conditions can render almost undetectable plants that extended rainfall may later invigorate and make obvious. Thick brush can obscure even large, healthy specimens. Birds utilize different patches of habitat during different times of the day and seasons, and only long-term study can determine the exact species composition. The findings of this survey must therefore be interpreted with proper caution; in particular, there is no warranty as to the absence of any particular species.

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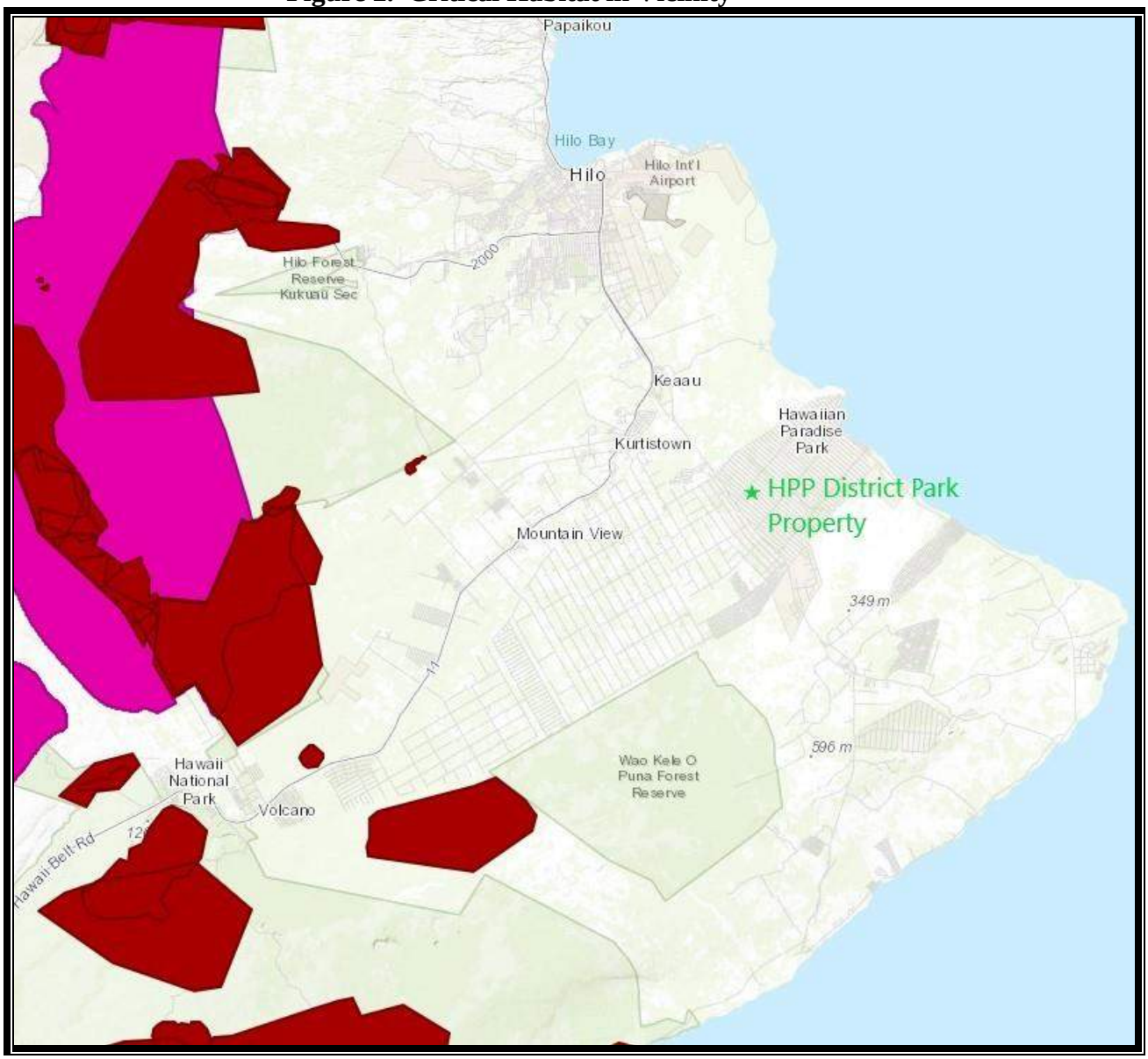
Figure 1. Property for Proposed Park

Aerial Image Base Map © Google Earth

Figure 2. Critical Habitat in Vicinity



Source: https://ecos.fws.gov/ecp/report/table/critical-habitat.html
Polygons indicate critical habitat for single or multiple T&E plants and animals;
Note: no low-elevation or similar forest type areas contain critical habitat

Table 1. Plant Species Observed on Property for Proposed Park

Scientific Name	Family	Common Name	Life Form	Status
Ageratum conyzoides	Asteraceae	Ageratum	Herb	A
Alstonia macrophylla	Apocynaceae	Devil Tree	Tree	A
Arundina graminifolia	Orchidaceae	Bamboo Orchid	Herb	A
Blechnum appendiculatum	Blechnaceae	Blechnum	Fern	A
Brachiaria mutica	Poaceae	California Grass	Herb	A
Buddleia asiatica	Buddleiaceae	Dog Tail	Shrub	A
Castilleja arvensis	Scrophulariaceae	Indian Paintbrush	Herb	A
Cecropia obtusifolia	Cecropiaceae	Cecropia	Tree	A
Chamaecrista nictitans	Fabaceae	Partridge Pea	Herb	A
Chloris sp.	Poaceae	Chloris	Herb	A
Cibotium glaucum	Dicksoniaceae	Hapu‘u Pulu	Fern	A
Clidemia hirta	Melastomataceae	Koster’s Curse	Shrub	A
Cocos nucifera	Arecaceae	Coconut	Tree	A
Crotalaria retusa	Fabaceae	Crotalaria	Herb	A
Cyclosorus dentatus	Thelypteridaceae	Downy Wood Fern	Fern	A
Cyperus halpan	Cyperaceae	Cyperus	Herb	A
Desmodium cajanifolium	Fabaceae	Desmodium	Shrub	A
Desmodium triflorum	Fabaceae	Desmodium	Herb	A
Dicranopteris linearis	Gleicheniaceae	Uluhe	Fern	I
Digitaria sp.	Poaceae	Digitaria	Herb	A
Dissotis rotundifolia	Melastomataceae	Dissotis	Herb	A
Dracaena sp.	Agavaceae	Money Tree	Tree	A
Drymaria cordata	Caryophyllaceae	Pipili	Herb	A
Emilia sonchifolia	Asteraceae	Pualele	Herb	A
Eragrostis tenella.	Poaceae	Lovegrass	Herb	A
Falcataria moluccana	Fabaceae	Albizia	Tree	A
Ficus microcarpa	Moraceae	Banyan	Tree	A
Hedychium sp.	Zingiberaceae	Ginger	Herb	A
Hibiscus rosa-sinensis	Malvaceae	Hibiscus	Shrub	A
Hippobroma longiflora	Campanulaceae	Star of Bethlehem	Herb	A
Huperzia squarrosa	Lycopodiaceae	Tassle Fern	Herb	A
Hyptis pectinata	Lamiaceae	Comb Hyptis	Shrub	A
Lantana camara	Verbenaceae	Lantana	Shrub	A
Lepisorus thunbergianus	Polypodiaceae	Pakahakaha	Fern	I
Lycopodiella cernua	Lycopodiaceae	Wāwae‘iole	Herb	I
Macaranga mappa	Euphorbiaceae	Bingabing	Tree	A
Megathyrsus maximus	Poaceae	Guinea Grass	Herb	A
Melastoma sp.	Melastomataceae	Melastoma	Shrub	A
Melinus minutiflora	Poaceae	Molasses Grass	Herb	A
Melinis repens	Poaceae	Natal Redtop	Herb	A
Melochia umbellata	Sterculiaceae	Melochia	Tree	A
Metrosideros polymorpha	Myrtaceae	‘Ōhi‘a	Tree	E
Mimosa pudica	Fabaceae	Sleeping Grass	Herb	A
Nephrolepis multiflora	Nephrolepidaceae	Sword Fern	Fern	A
Paederia foetida	Rubiaceae	Maile Pilau	Vine	A
Paspalum conjugatum	Poaceae	Hilo Grass	Herb	A
Paspalum urvillei	Poaceae	Vasey Grass	Herb	A

Phymatosorus grossus	Polypodiaceae	Maile Scented Fern	Fern	A
Pityrogramma calomelanos	Pteridaceae	Silver Back Fern	Fern	A
Pluchea caroliniensis	Asteraceae	Sourbush	Shrub	A
Psidium cattleianum	Myrtaceae	Strawberry Guava	Tree	A
Psidium guajava	Myrtaceae	Guava	Tree	A
Psilotum nudum	Psilotaceae	Whisk Fern	Herb	I
Pteris cretica	Pteridaceae	Cretan Brake	Fern	I
Pycreus polystachyos	Cyperaceae	Sedge	Herb	I
Schefflera actinophylla	Araliaceae	Octopus Tree	Tree	A
Schizachyrium condensatum	Poaceae	Tufted Beardgrass	Grass	A
Spathodea campanulata	Bignoniaceae	African Tulip	Tree	A
Spathoglottis plicata	Orchidaceae	Philippine Ground Orchid	Herb	A
Sphenomeris chinensis	Lindsaeaceae	Pala‘a	Fern	I
Sporobolus indicus	Poaceae	Smutgrass	Herb	A
Stachytarpheta jamaicensis	Verbenaceae	Jamaica Vervain	Herb	A
Trema orientalis	Ulmaceae	Gunpowder Tree	Tree	A
Walteria indica	Malvaceae	‘Uhaloa	Herb	I
Wedelia trilobata	Asteraceae	Wedelia	Herb	A

A = alien, E = endemic, I = indigenous

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APPENDIX H

Traffic Impact Analysis Report

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Draft
Hawaiian Paradise Park – New District Park
Traffic Impact Analysis Report

Hawaiian Paradise Park, Hawai‘i

September 2024

Prepared for:
County of Hawaii Department of Parks and Recreation

SSFM International

Prepared by:

Table of Contents

List of Figures

List of Tables

List of Appendices

I. PROJECT DESCRIPTION

The County of Hawai‘i (COH) Department of Park and Recreation (DPR) is proposing to develop a new park (development) within the community of Hawaiian Paradise Park (HPP) located on the island of Hawai‘i. The development falls within the Puna District of the COH. The COH has identified the need for additional parks and recreational opportunities given the population growth throughout the district, specifically identifying a lack of existing parks and recreational facilities within HPP.HPP is a census designated place (CDP). According to the 2020 US Census statistics, HPP increased by about 30% in population between 2010 and 2020, with census data showing a population of 11,404 in 2010 increasing to 14,957 in 2020.

A 20-acre parcel located on Tax Map Key (TMK) (3) 1-5-039:267 was accepted by the COH through dedication by the Hawaiian Paradise Park Owners Association (HPPOA) for the purpose of establishing a park in the HPP subdivision (see Figure 1). HPPOA conducted a community survey as part of a 2015 update to the *Hawaiian Paradise Park Community Master Plan* (COH, 1997), in which residents identified additional recreational facilities as the highest priority for the community. The COH DPR completed the *Hawaiian Paradise Park New Park Master Plan* (HPP Park MP) (COH DPR, March 2018), which outlined the vision and following goals for this future development:

- Provide compatible recreational uses within the park supportive of the community’s needs.
- Provide appropriate facilities within the park to support COH DPR’s current programs and public services.

The COH manages a variety of park types and sizes, including:

- **Neighborhood Park:** typically designed to meet the needs of a neighborhood. Smallest of park types.
- **Community Park:** typically designed for small neighborhood communities.
- **District Park:** typically designed to meet the needs of an entire district population capable for island wide attractions.
- **Regional Park:** typically designed to meet the needs of a specific region, usually a larger scale in comparison to a district part.

Currently, there are no COH-owned parks within HPP. The nearest COH-owned park to the project site is Shipman Park, a “district park” located approximately 5.60-miles away. Per the HPP Park MP, the project is proposed to fulfill the needs of a “community park” for HPP. The proposed park is located on Makuu Street between 16th and 17th Avenue and is open to HPPOA members. Similar facilities in the region include COH-owned community parks in Hawaiian Beaches, Kurtistown, and Pāhoa District Park (renamed to William “Billy” Kenoi District Park in 2002). COH maintained parks within the Puna District are shown in Figure 2.

Figure 1: Project Location

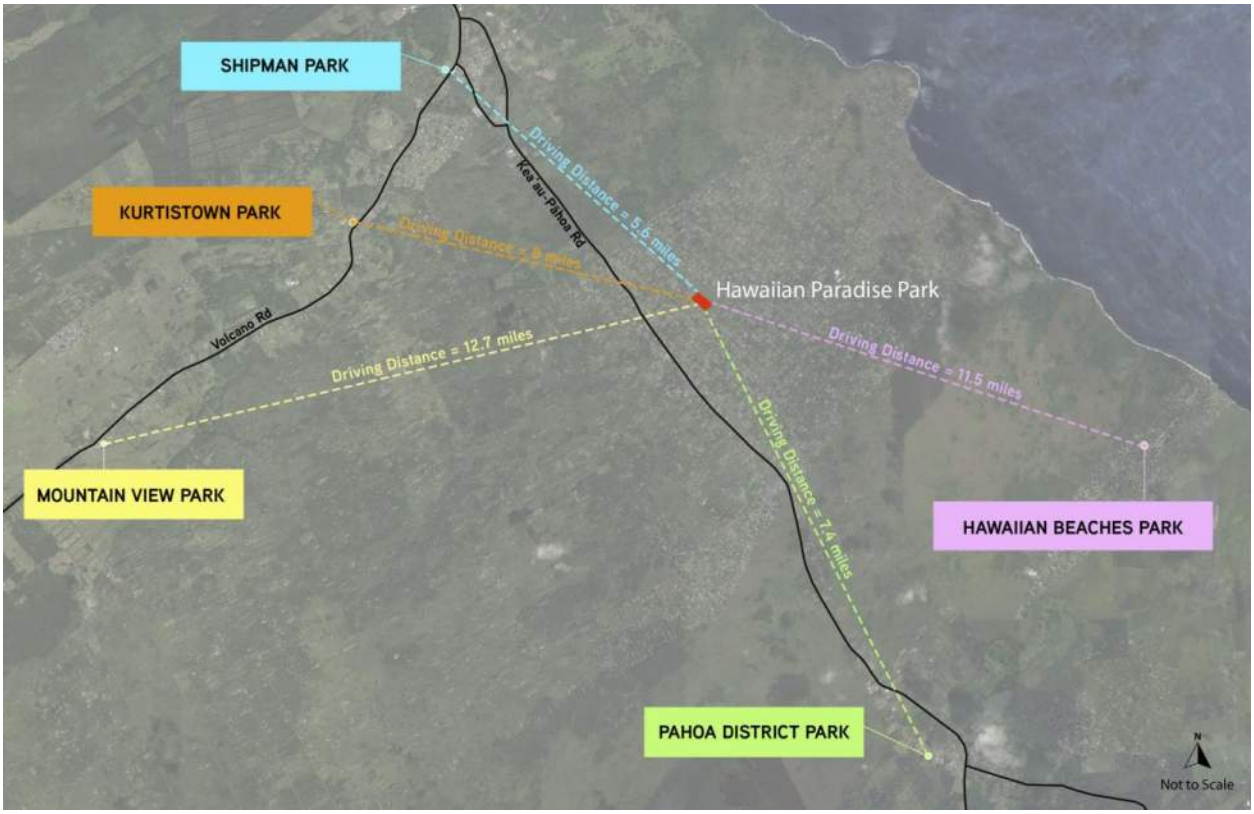

Figure 2: COH Parks and Amenities in Puna District

The HPP Park MP proposed various park areas and features, including:

- Baseball/Softball Field
- Football/Soccer Field
- Tennis Courts (2)
- Pickleball Courts (3)
- Covered Play court (24,120 square feet [SF]) with Basketball & Volleyball Courts
- Pool (9,600 SF) with Pool Building (3,760 SF)
- Skate Park (15,000 SF)
- Playground for Small Kids (2,600 SF) and Bigger Kids (5,600 SF)
- Dog Parks for Small Dogs (13,000 SF) and Big Dogs (20,000 SF)
- Community Center (6,890 SF) with 4,000 SF of event space
- Concession and Comfort Station (1,638 SF)
- Multiple Parking Lots (231 stalls)
- Picnic Areas
- Exercise Stations

A conceptual site plan for the development, as outlined in the HPP Park MP, is shown in Figure 3. The conceptual site plan shows both park driveways on 25th Avenue and 26th Avenue operating with two-way access,. The park will be fenced, with gated entrances for pedestrians at 25th Avenue, 26th Avenue, and a midblock access on Kaloli Drive between 25th Avenue and 26th Avenue.

Figure 3: Conceptual Site Layout (HPP Park MP)

This traffic impact analysis report (TIAR) is being prepared to support an Environmental Assessment (EA) for the proposed development and will analyze traffic operations and impacts for the AM and PM peak hours. Analysis will be completed for Existing (2023) Conditions, as well as for the Future Without Project, and Future With Project Conditions for five (5) years into the future corresponding to 2028.

II. EXISTING CONDITIONS

A. Geometric Configuration

1. Kea'au-Pāhoa Road

Kea'au-Pāhoa Road (also referred to as Hawai'i Route 130, Pāhoa-Kalapana Road and Kaimū Chain of Craters Road) is a State of Hawai'i (State)-owned roadway extending approximately 21.60-miles between Volcano Road (Hawai'i Route 11) in the northwest to the southeast boundary of Hawai'i Volcano National Park in the southeast. In the surrounding project area, Kea'au-Pāhoa Road has an Federal Highway Administration (FHWA) functional classification of a small urban minor arterial. The corridor provides the sole connection for communities such as HPP to/from Hilo. The corridor is a two-way roadway, with four travel lanes from Kea'au-Pāhoa Bypass Road to Shower Drive. Kea'au-Pāhoa Road drops a westbound lane at Shower Drive and drops an eastbound lane east of Puakalo Street.

The Hawai'i Department of Transportation (HDOT) operates a westbound contraflow from 5:30 AM – 8:30 AM Mondays to Fridays, except for holidays extending from Old Government Road in the west to just east of Puakalo Street in the east. The contraflow plans on Kea'au-Pāhoa Road (obtained from an HDOT website) were consolidated and are shown in Figures 4 and 5. During the AM contraflow, one of the eastbound lanes is converted to a westbound lane. The only left turns allowed within the contraflow limits are at Kea'au-Pāhoa Road and Shower Drive/Pōhaku Drive. Striped and paved shoulders are present along the corridor. A varying width striped median is present in portions of the corridor. Dedicated left-turn lanes are provided along the corridor at major intersections.

Sidewalks, bike facilities, or curb and gutter do not exist along most of the corridor. The corridor provides some direct connections to residential lots, agricultural land, and undeveloped land. The posted speed limit varies, but within the project study area is 45 miles per hour (MPH).

2. Kaloli Drive

Kaloli Drive extends 4.20-miles between Kea'au-Pāhoa Road in the south, to Beach Road in the north. All roads in HPP, including Kaloli Drive, are privately owned and maintained by HPP. Posted "PRIVATELY MAINTAINED ROADS DRIVE AT YOUR OWN RISK" signs are posted by HPPOA along Kaloli Drive. Kaloli Drive is a two-way roadway, with two travel lanes. No sidewalks, bike facilities, shoulders, or curb and gutter are present along the corridor. Dedicated left-turn lanes are generally not provided along the corridor. The corridor provides direct connections to large single-family lots, as well as agricultural lands, with other portions fronting the corridor being undeveloped. The posted speed limit within the project study area is 35 MPH. "BLIND HILL AHEAD" signs are scattered along Kaloli Drive due to the rolling terrain of Kaloli Drive. Streetlights are not provided on Kaloli Drive.

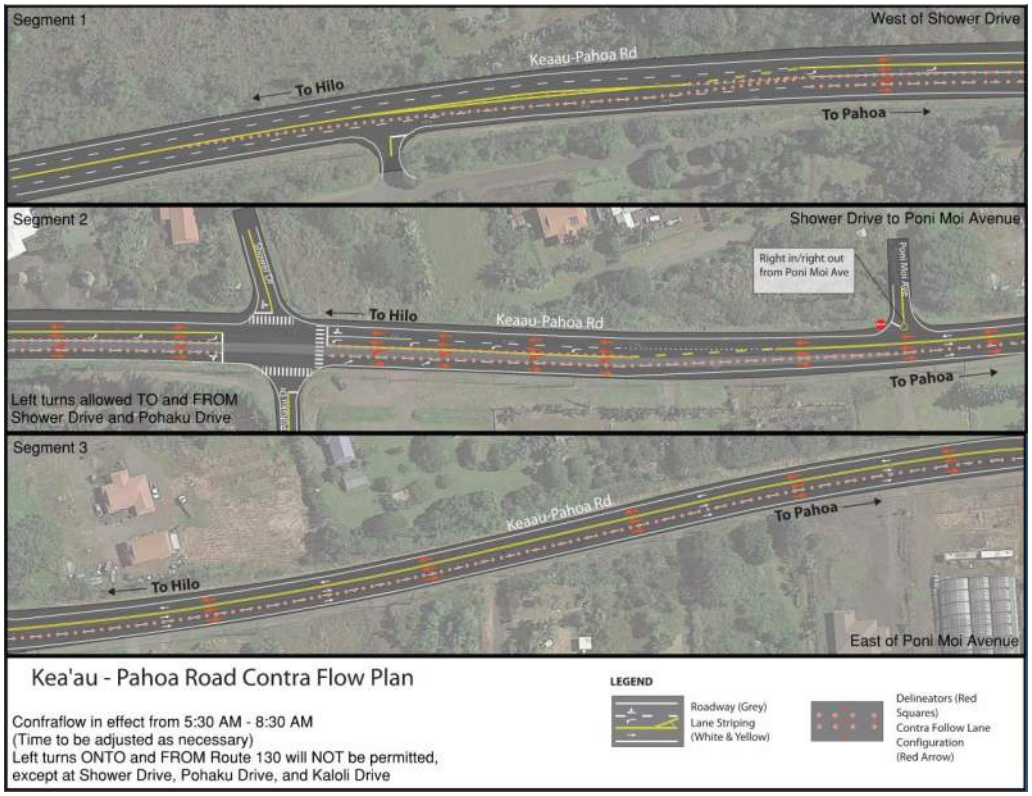

Figure 4: AM Contraflow from West of Shower Drive to West of Pōhaku Place

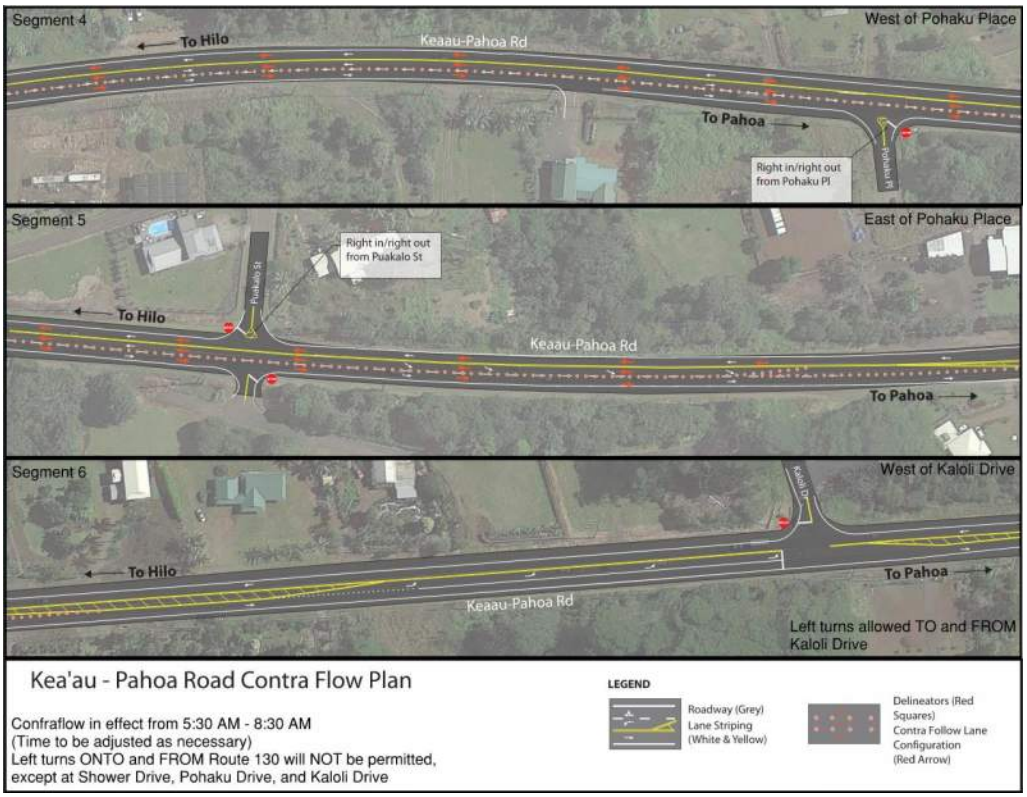

Figure 5: AM Contraflow from West of Pōhaku Place to Kaloli Drive

3. 25th Avenue (ʻOkika Avenue)

25th Avenue extends 3.60-miles between Shower Drive in the west, to east of Makuʻu Drive in the east. All roads in HPP, including 25th Avenue, are privately owned and maintained by HPP. Street name signs include "25" and "ʻOkika" signs. 25th Avenue does not have a FHWA functional classification per the Fed-Aid Update, meaning it is defined as a local roadway. 25th Avenue is a two-way roadway, with two travel lanes. Sidewalks, bike facilities, shoulders, or curb and gutter do not exist along the corridor. The corridor provides direct connections to large single-family lots, as well as agricultural lands, with other portions fronting the corridor being undeveloped. 25 MPH posted speed limit signs are provided along 25th Avenue. There are no existing streetlights on 25th Avenue.

4. 26th Avenue (ʻŌlena Avenue)

26th Avenue extends 3.60-miles between Shower Drive in the west, to east of Makuʻu Drive in the east. All roads in HPP, including 26th Avenue, are privately owned and maintained by HPP. Street name signs at intersections include "26" and "ʻŌlena" signs. 26th Avenue does not have a FHWA functional classification per the Fed-Aid Update, meaning it is defined as a local roadway. 26th Avenue is a two-way roadway, with two travel lanes. Sidewalks, bike facilities, shoulders, or curb and gutter do not exist along the corridor. The corridor provides direct connections to large single-family lots, as well as agricultural lands, with other portions fronting the corridor being undeveloped. 25 and 15 MPH posted speed limit signs are provided along 26th Avenue west and east of Kaloli Drive, respectively. There are no existing streetlights on 26th Avenue.

B. Study Intersections

The existing lane configuration at the study intersections are shown in Figure 6.

1. Kaloli Drive and Keaʻau-Pāhoa Road

Kaloli Drive at Keaʻau-Pāhoa Road is three-way, stop-controlled for the southbound Kaloli Drive approach. Kaloli Drive intersects Keaʻau-Pāhoa Road from the north. There are no marked crosswalks or sidewalks at the intersection. A dedicated eastbound left turn lane is provided from Keaʻau-Pāhoa Road onto Kaloli Drive. A dedicated refuge lane is provided for southbound left turns from Kaloli Drive onto Keaʻau-Pāhoa Road. The Kaloli Drive southbound approach is a single lane, but right turn vehicles at the intersection maneuver around left turning vehicles queued at the stop line. This approach will be analyzed with a separate left turn and right turn lane to reflect the existing field condition.

Vehicles from Kaloli Drive onto Keaʻau-Pāhoa Road may have sight distance issues due to the existing vegetation growing on the northwest corner that obstructs the view of southbound vehicles. Vehicles making left turns and right turns from Kaloli Drive were observed rolling past the stop bar frequently (see Figure 7) to get a better line of sight when looking for a gap to turn into.

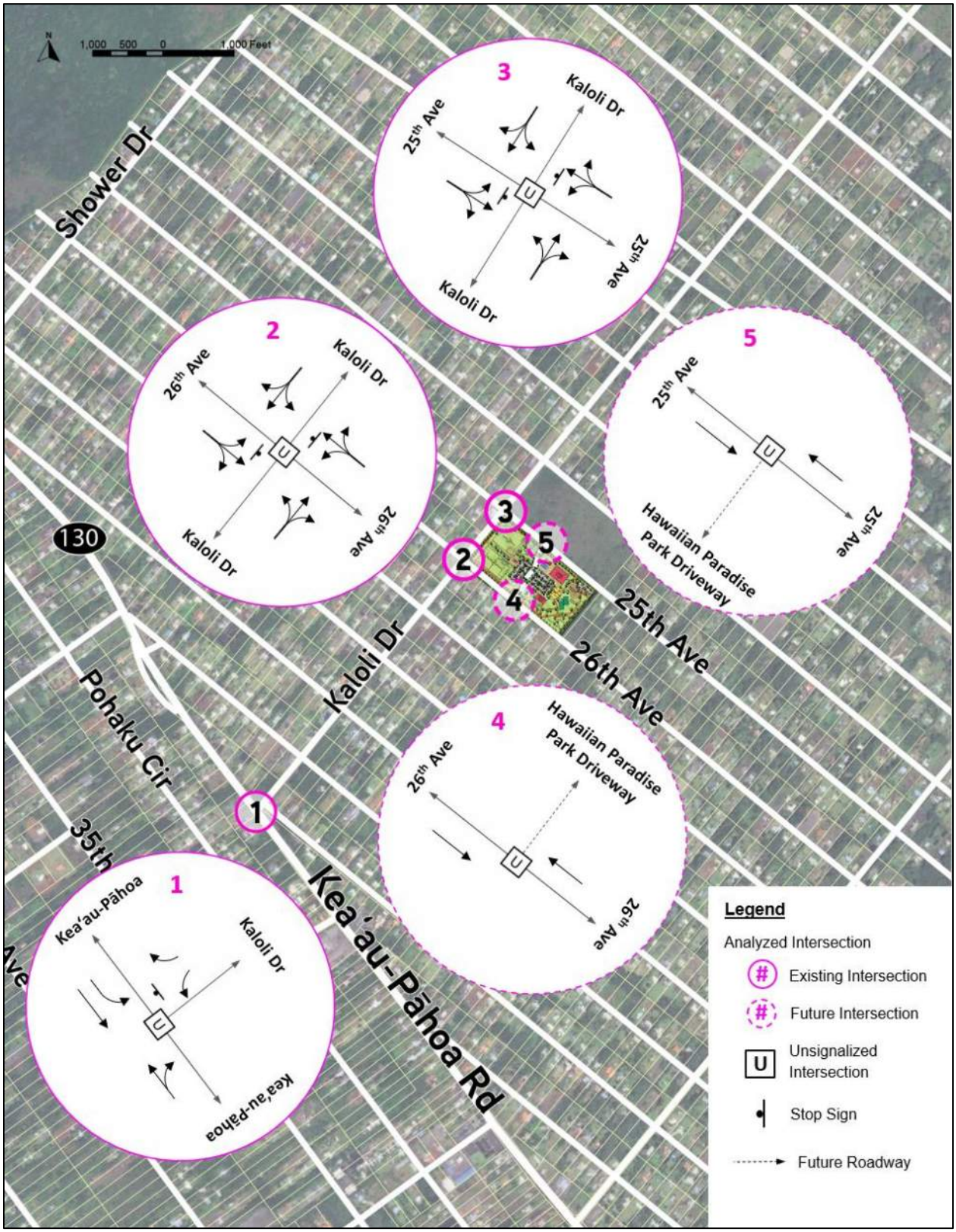

Figure 6: Existing Lane Configuration

Figure 7: Left Turn Vehicle from Kaloli Drive Extending Beyond the Stop Line

31st Avenue (‘Uala Avenue) intersects Kaloli Drive about 70 feet north of Kea‘au-Pāhoa Road. If there are more than three vehicles queued at the Kaloli Drive and Kea‘au-Pāhoa Road intersection, left turn vehicles from 31st Avenue may have trouble turning onto Kaloli Drive. This situation was not observed during the site visit.

2. Kaloli Drive and 26th Avenue

Kaloli Drive and 26th Avenue is a two-way, stop-controlled (TWSC) intersection with stop control on 26th Avenue. There are no marked crosswalks or sidewalks at the intersection. Damage in the grassy shoulder area suggests vehicles parking in the shoulder along Kaloli Drive.

3. Kaloli Drive and 25th Avenue

Kaloli Drive and 25th Avenue is a TWSC intersection with stop control on 25th Avenue. There are no marked crosswalks, sidewalks, bike facilities, or transit facilities at the intersection. Damage in the grassy shoulder area suggests vehicles parking in the shoulder along Kaloli Drive.

4. 26th Avenue and (future) HPP District Park South Driveway

The future HPP District Park South Driveway will be located about 700 feet east of Kaloli Avenue at 26th Avenue. The south driveway will be a two-way driveway.

5. 25th Avenue and (future) HPP District Park North Driveway

The future HPP District Park North Driveway will be located about 600 feet east of Kaloli Avenue at 25th Avenue. The driveway will be an exit only from HPP Park onto 25th Avenue. The north driveway will be a two-way driveway.

C. Multimodal Facilities

Throughout the majority of HPP, sidewalks and bike facilities are not provided, including the blocks surrounding the project area.

The COH operates the *Hele-On Bus (COH Bus)* throughout the island, of which one route operates within HPP – Route 402 (Hawaiian Paradise Pk/Orchidland/Hawaiian Acres/Ainaloa). The route runs towards Kea'au, terminating in Kea'au-town, at which point riders can connect to numerous other COH Bus routes that connect elsewhere throughout the island, including Hilo. Various COH Bus stops are located within HPP, including three along Kaloli Drive; however, these stops are not signed and do not provide any rider facilities. The existing Route 402 and major stop locations are shown in Figure 8. Route 402 operates every other hour, with the first bus arriving at stops along Kaloli Drive just after 6:00 AM, and the last bus arriving just after 8:00 PM, Monday through Saturday. COH Bus notes that riders can flag the bus along its route at safe intersections where the bus can safely pull over. Effective February 27th, 2022, COH Bus fares are free through December 31st, 2025. Detailed bus routes and timetables are included in Appendix A.

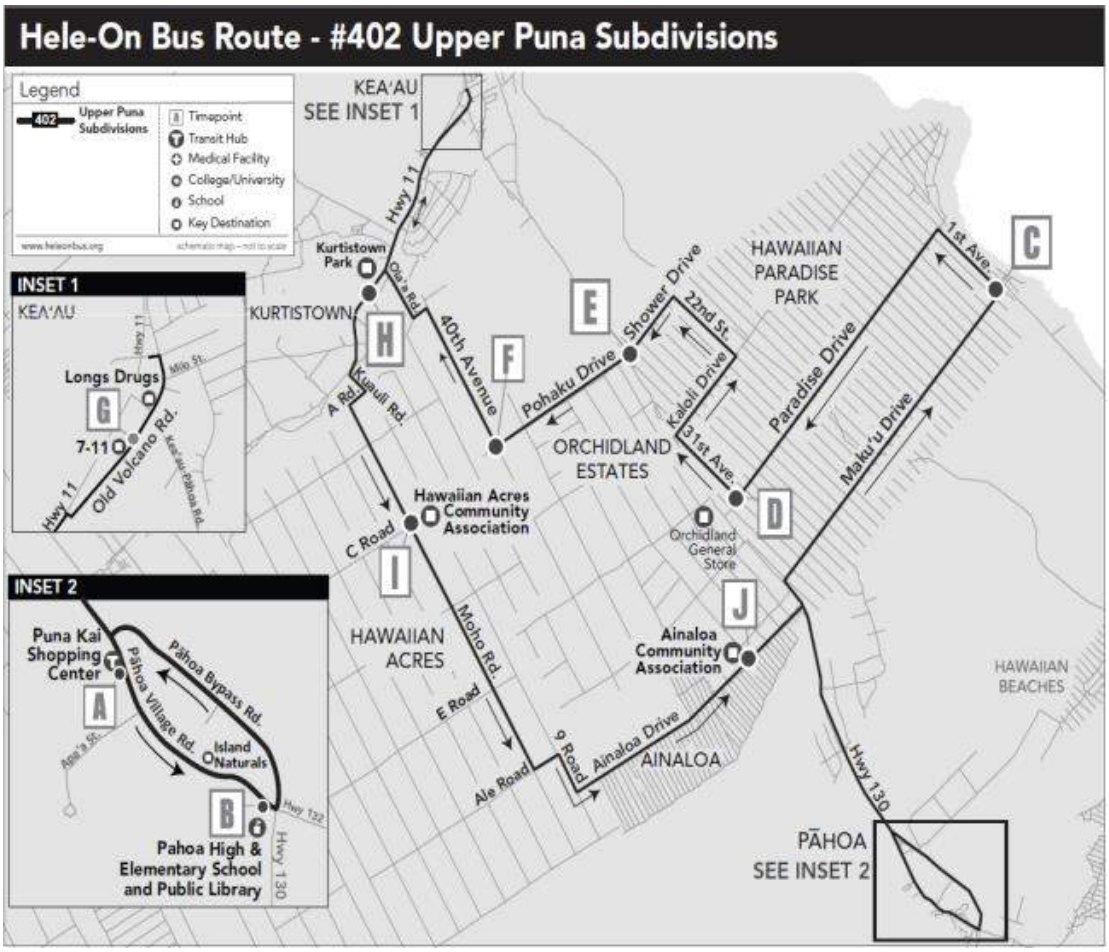

Figure 8: Route 402 Route Map and Major Stop Locations

D. Vehicle Volumes

1. 24-Hour Volume

Historic HDOT Annual Average Daily Traffic (AADT) counts on Kea'au-Pāhoa Road between Shower Drive and Pōhaku Place were available from 2013 to 2021, except for 2017. The 2020 and 2021 AADT were lower than the 2013 AADT, likely due to the impact of the Covid-19 pandemic restrictions and were not used in the analysis. The historic HDOT AADT counts are shown in Table 1.

Table 1: Kea'au-Pāhoa Road 24-Hour Historical Volumes

Year	AADT
2013	23,300
2014	24,400
2015	20,000
2016	23,300
2017	-
2018	22,000
2019	26,700
2020	21,500
2021	23,100

HDOT counts taken on April 26 to April 27, 2021 at Kea'au-Pāhoa Road between Shower Drive and Pōhaku Place found that the AM and PM peak hours occurred between 7:00 to 8:00 AM and 3:30 to 4:30 PM, respectively (see Figure 9). These volumes may have been impacted by the Covid-19 pandemic, but it shows the general peak direction and magnitude of the commuter peak hours. The AM peak direction in the westbound direction to Hilo, while the PM peak direction is eastbound towards Pāhoa.

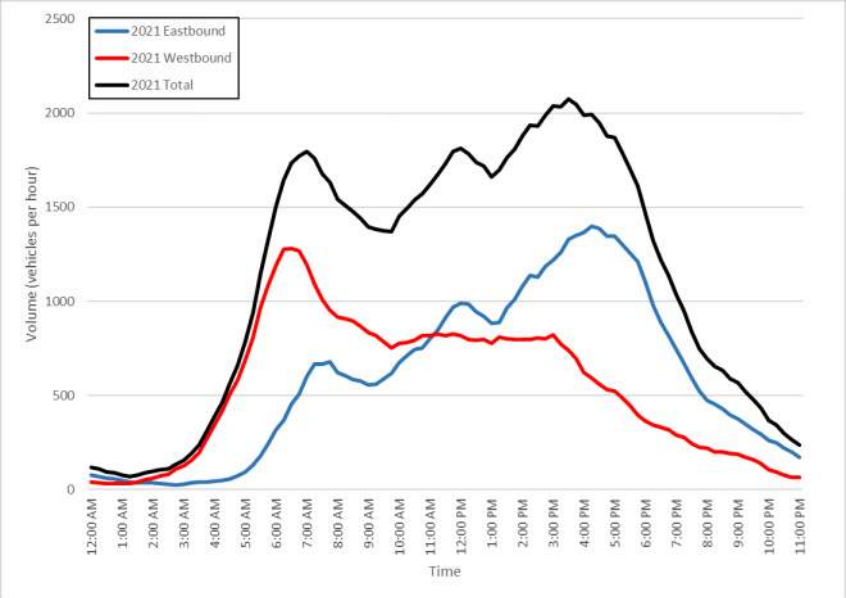

Figure 9: Kea'au-Pāhoa Road 24-Hour Volume Historical Distribution (HDOT, 2021)

2. Intersection Peak Turning Movement Counts

Multimodal turning movement traffic counts taken on October 4, 2023 found that the AM and PM peak hours occurred between 7:00 to 8:00 AM and 3:45 to 4:45 PM, respectively. Peak hour traffic volumes are shown in Figure 10. Intersection turning movement counts can be found in Appendix B.

3. Pedestrian and Bicycle Volumes

Pedestrian and bike counts taken on October 4, 2023 during the AM and PM peak hours are shown in Tables 2 and 3, respectively. There were no significant pedestrian and bike counts in the area. Pedestrian and bike counts can be found in Appendix B.

Table 2: Peak Hour Pedestrian Volumes

Intersection	AM Peak (7:00-8:00 AM)				PM Peak (3:45-4:45 AM)			
	North Leg	East Leg	South Leg	West Leg	North Leg	East Leg	South Leg	West Leg
Kea'au-Pāhoa Road at Kaloli Drive	3	0	0	0	0	0	0	0
Kaloli Drive at 26th Avenue	0	0	0	0	0	0	0	0
Kaloli Drive at 25th Avenue	1	0	1	0	0	0	0	0

Table 3: Peak Hour Bicycle Volumes

Intersection	AM Peak (7:00-8:00 AM)				PM Peak (3:45-4:45 AM)			
	South bound	West bound	North bound	East bound	South bound	West bound	North bound	East bound
Kea'au-Pāhoa Road at Kaloli Drive	3	0	0	0	0	0	0	0
Kaloli Drive at 26th Avenue	0	0	0	0	0	0	0	0
Kaloli Drive at 25th Avenue	1	0	1	0	0	0	0	0

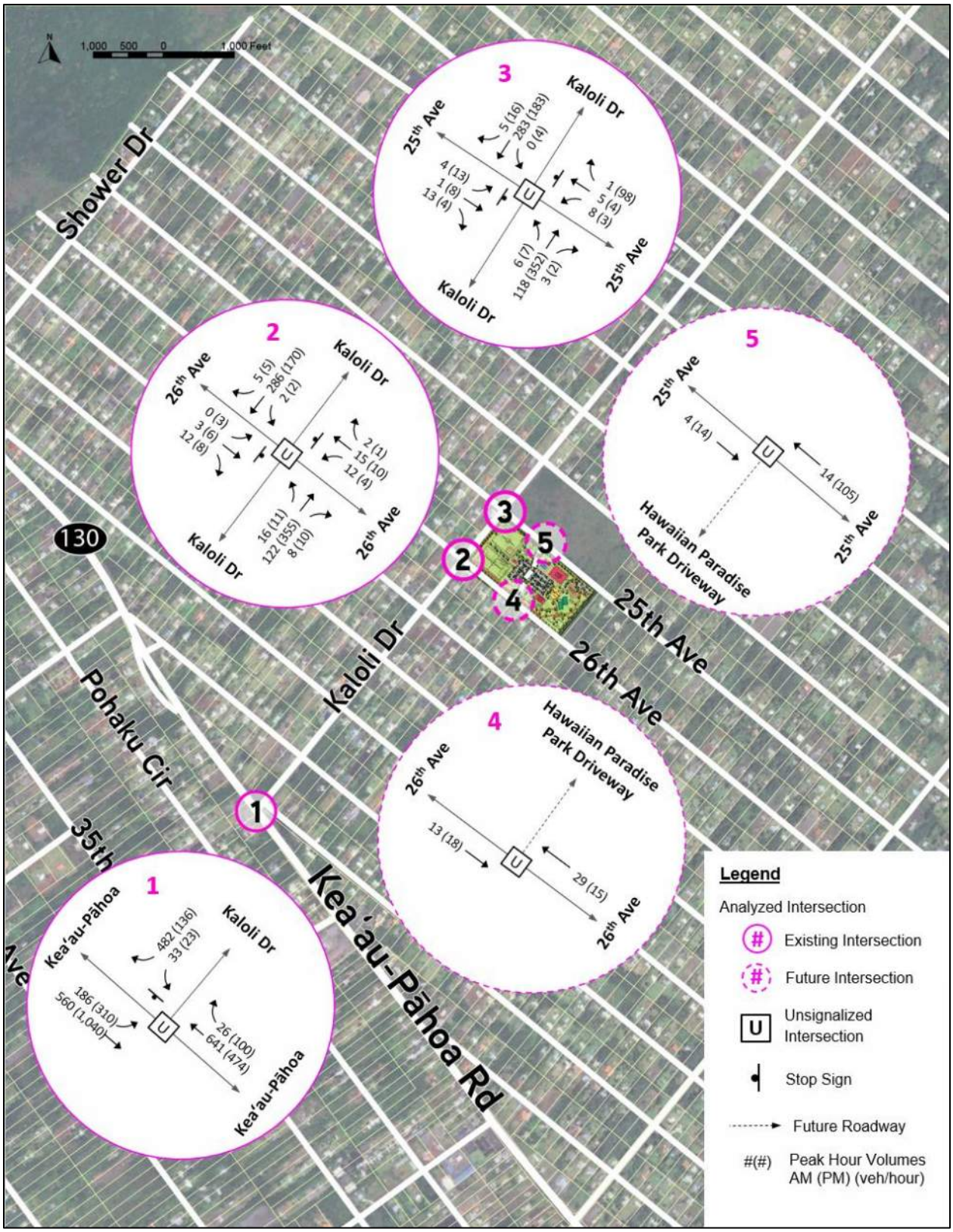

Figure 10: Existing (2023) Intersection Peak Hour Volumes

E. Existing Automobile LOS

1. Methodology

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. Guidelines state that LOS D or better is appropriate for the study intersection and movements. Intersection LOS and delay was determined for the AM and PM peak hours using Synchro Version 11.0 traffic analysis software.

As stated in the *HCM6* (TRB, 2016), LOS for a TWSC intersection is determined by the measured control delay (see Table 4). Delay at a TWSC intersection is defined by each minor movement and 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 4: LOS Criteria for Unsignalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	≤ 1.0	> 1.0
≤ 10.0	A	F
> 10.0 and ≤ 15.0	B	F
> 15.0 and ≤ 25.0	C	F
> 25.0 and ≤ 35.0	D	F
> 35.0 and ≤ 50.0	E	F
> 50.0	F	F

Source: HCM6 (TRB, 2016)

The LOS analysis for signalized intersections is determined by average total vehicle delay based on the methodologies of the *HCM6* (TRB, 2016), shown in Table 5. High numbers of vehicles passing through the intersection, long cycle lengths, inappropriate signal phasing, or poor signal progression can result in long delays, and consequently poor LOS.

Table 5: LOS Criteria for Signalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	≤ 1.0	> 1.0
≤ 10.0	A	F
> 10.0 and ≤ 20.0	B	F
> 20.0 and ≤ 35.0	C	F
> 35.0 and ≤ 55.0	D	F
> 55.0 and ≤ 80.0	E	F
> 80.0	F	F

Source: HCM6 (TRB, 2016)

2. Existing Intersection LOS Results

Existing (2023) intersection and movement LOS and delay (seconds/vehicle) were determined for the AM and PM peak hours using *Synchro 11* traffic analysis software. Results are shown in Table 6 and Appendix C. Movements that operate at LOS E or worse are highlighted in yellow. The Kaloli Drive southbound right turn at Kea'au-Pāhoa Road operates at LOS F (v/c of 1.32). The nearly 3-minute delay indicates that drivers will have difficulty finding an acceptable gap to make this movement. The v/c above 1.00 indicates that the demand to make this movement is higher than the capacity. Mitigation for this movement will be analyzed.

Table 6: Existing (2023) LOS

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr	**-**	**48.8**	**-**	**-**	**2.8**	**-**
Kea'au-Pāhoa Rd EB Left	B	10.6	0.25	B	10.3	0.32
Kea'au-Pāhoa Rd EB Through	free movement			free movement		
Kea'au-Pāhoa Rd WB Through-Right	free movement			free movement		
Kaloli Dr SB Left	C	22.6	0.16	D	34.6	0.16
Kaloli Dr SB Right	F	187.3	1.32	B	13.8	0.26
Kaloli Dr & 26th Ave	**-**	**1.4**	**-**	**-**	**0.9**	**-**
26th Ave EB Left-Through-Right	B	10.6	0.03	B	11.9	0.03
26th Ave WB Left-Through-Right	B	13.0	0.07	B	13.9	0.04
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.6	0.01
Kaloli Dr SB Left-Through-Right	A	7.5	0.00	A	8.1	0.00
Kaloli Dr & 25th Ave	**-**	**0.9**	**-**	**-**	**2.6**	**-**
25th Ave EB Left-Through-Right	B	10.6	0.03	C	17.1	0.09
25th Ave WB Left-Through-Right	B	12.0	0.03	B	12.6	0.00
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.7	0.01
Kaloli Dr SB Left-Through-Right	A	0.0	0.00	A	8.2	0.00

3. Existing (2023) Mitigation

A traffic signal warrant analysis was completed at Kea'au-Pāhoa Road and Kaloli Drive. Traffic signal Warrant 2, 4-Hour Warrant, from the *Manual on Uniform Traffic Control Devices* (*MUTCD)* (FHWA, 2009), was used for the analysis. The major approach volume consists of the Existing (2023) volume travelling along Kea'au-Pāhoa Road in both directions, while the minor approach volume consists of the Existing (2023) southbound Kaloli Drive volumes. The traffic warrant is satisfied when 4 hour of traffic volumes for the major and minor approach are above the "2 or more lanes & 1 lane" curve threshold. Kea'au-Pāhoa Road at Kaloli Drive will pass the 4-Hour Traffic Signal Warrant (see Table 7) during the Existing (2023) condition.

Table 7: 4-Hour Traffic Signal Warrant at Kea'au-Pāhoa Road and Kaloli Drive

Time	Major Approach Volume	Minor Approach Volume	Passes 4-Hour Warrant Treshold?
6:00-7:00 AM	1,058	654	Yes
7:00-8:00 AM	1,411	514	Yes
1:00-2:00 PM	1,718	161	Yes
2:00-3:00 PM	1,856	110	Yes
3:00-4:00 PM	1,874	154	Yes
4:00-5:00 PM	1,834	144	Yes

4. Signalization of Kea'au-Pāhoa Road

Research was completed on October 31, 2023, at the *Statewide Transportation Improvements Program* (STIP) FY 2022-2025 website. The STIP is a four-year forecast that identifies state and county transportation projects to be funded with Federal Highway and Federal Transit funds. The latest Revision #15 Amendment was approved and effective starting on September 12, 2023. The Kea'au-Pāhoa Road (Route 130) Improvements project from Kea'au Bypass to Pāhoa-Kapoho Road Project (Modernization Project Number HS 17) Phase 2 proposes to widen Kea'au-Pāhoa Road from Shower Drive to Kaloli Drive and signalize Kea'au-Pāhoa Road at Kaloli Drive. This project is scheduled for construction in 2026. A temporary traffic signal design from May 2019 at Kea'au-Pāhoa Road at Kaloli Drive is shown in Figure 11.

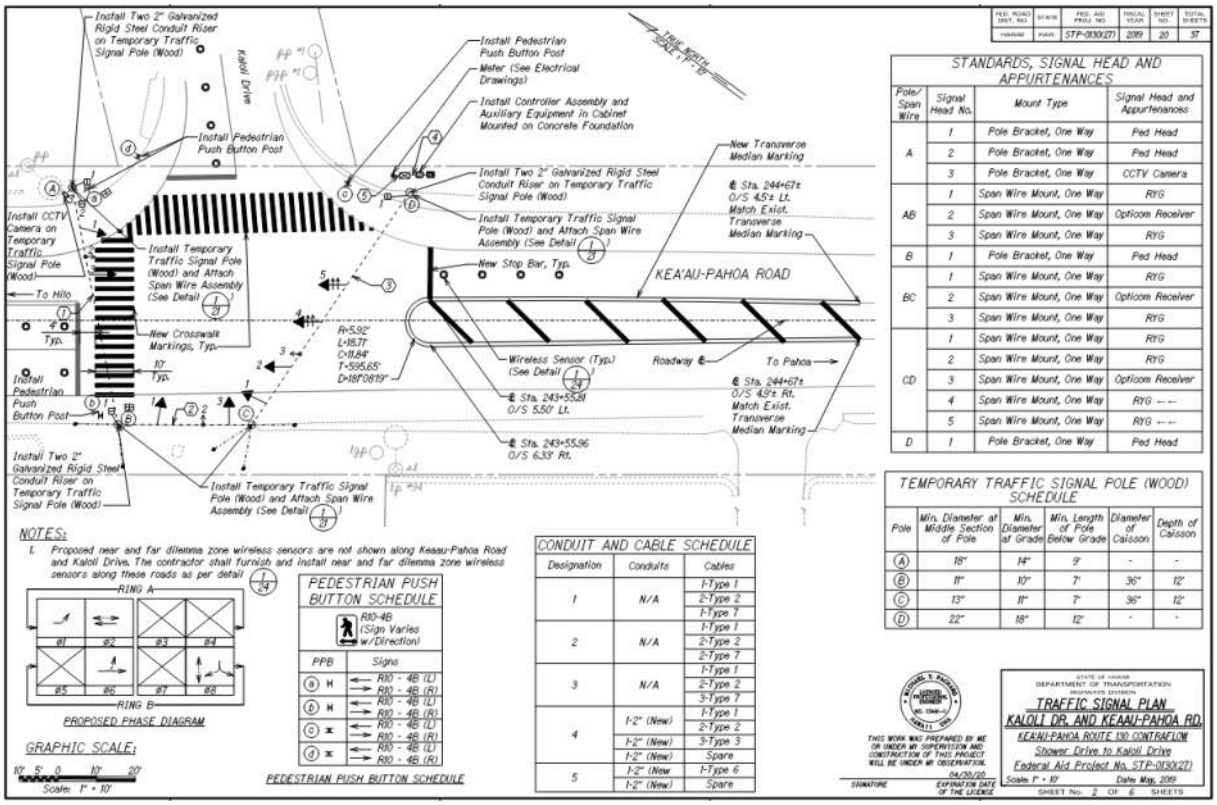

Figure 11: Traffic Signal Design at Kea'au-Pāhoa Road and Kaloli Drive

The widening of Kea'au-Pāhoa Road was not considered at this time. Two traffic signal phasing alternatives were considered at Kea'au-Pāhoa Road and Kaloli Drive. Results are shown in Table 8 and Appendix C.

Table 8: Existing (2023) Alternatives at Kea'au-Pāhoa Road and Kaloli Drive

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Existing TWSC)	**-**	**48.8**	**-**	**-**	**2.8**	**-**
Kea'au-Pāhoa Rd EB Left	B	10.6	0.25	B	10.3	0.32
Kea'au-Pāhoa Rd EB Through	free movement			free movement		
Kea'au-Pāhoa Rd WB Through-Right	free movement			free movement		
Kaloli Dr SB Left	C	22.6	0.16	D	34.6	0.16
Kaloli Dr SB Right	F	187.3	1.32	B	13.8	0.26
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**D**	**48.6**	**-**	**A**	**8.9**	**-**
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	C	21.5	0.71	A	7.3	0.55
Kea'au-Pāhoa Rd EB Through	A	9.4	0.59	A	6.5	0.83
Kea'au-Pāhoa Rd WB Through-Right	D	38.1	0.95	B	10.4	0.72
Kaloli Dr SB Left	B	16.4	0.07	B	16.2	0.11
Kaloli Dr SB Right (Permitted)	F	121.1	1.17	C	22.6	0.73
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**C**	**24.8**	**-**	**A**	**7.7**	**-**
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	B	16.8	0.67	A	7.0	0.54
Kea'au-Pāhoa Rd EB Through	A	8.7	0.57	A	5.8	0.82
Kea'au-Pāhoa Rd WB Through-Right	C	29.0	0.91	A	10.0	0.71
Kaloli Dr SB Left	B	17.7	0.08	B	16.5	0.12
Kaloli Dr SB Right (Permitted+Overlap)	D	41.3	0.93	B	13.1	0.35

The first alternative analyzed the intersection with protected+permitted eastbound left turn phasing (as shown in Figure 11) and an optimized cycle length. This resulted in an overall intersection LOS of D, with the southbound projected to operate at LOS F (v/c 1.17) during the AM peak hour. All other movements are projected to operate at LOS D or better.

The second alternative analyzed the intersection with protected+permitted eastbound left turn phasing, a permitted+overlap southbound right turn and an optimized cycle length.

There are special conditions that must be met for an overlap phase to be considered:

- There is significant left turn volume from the major street and right turn from the overlapping street.
    - The left turn and right turn volume are significant. This condition is satisfied.
- The overlap phase must be provided from a dedicated right turn lane and run concurrently with a protected left turn phase/lane on the cross street.

    - The existing dedicated eastbound left turn lane is part of the future design. This condition is satisfied.
- U-turns from the left turn lane on the cross street are not allowed as this would conflict with the overlapping right turn movement.
    - There is no median provided that will allow for eastbound u-turning vehicles on Kea‘au-Pāhoa Road. This condition is satisfied.
- The overlap phase cannot not conflict with any potential pedestrian movement. This would occur when there is a channelized right turn lane. Pedestrian signal control would need to be installed to prohibit crossing from the curb to the channelized right turn during the overlap phase.
    - There is no pedestrian crossing that will conflict with the eastbound left turn or southbound right turn movement. This condition is satisfied.

The overlap will provide southbound right turn vehicles with a dedicated turn signal, resulting in more southbound right turn vehicles being processed through the intersection. This resulted in an intersection LOS of C during the AM peak hour, with all movements projected to operate at LOS D or better. Therefore, it is recommended that Kea‘au-Pāhoa Road be signalized with phasing to include protected-permitted eastbound left turns and permitted+overlap southbound right turns.

III. Future Without Project Conditions

Regional traffic growth, trip generation from any upcoming planned projects, and future surrounding area development's traffic were added to the roadway network and analyzed for periods of five (5) years into the future, corresponding to 2028.

A. Nearby Masterplans

1. Federal-Aid Highways 2035 Transportation Plan for the District of Hawai'i (July 2014)

Exhibit 4-4, Potential Long Range Capacity Solutions, lists state and COH roadway projects that have been identified to improve capacity. One of these projects includes the construction of a 2-lane roadway west of Kea'au-Pāhoa Road between Hilo and Pāhoa ($288,536,000 in FY2011 dollars). Attachment 1, District of Hawai'i Tier 2 Potential Solutions, lists providing 2 travel lanes on Kea'au-Pāhoa Road between Kea'au-Pāhoa Bypass Road and Kapoho Road. Neither of these projects were on the FY2022-2025 STIP or being planned for, and therefore not included in the analysis.

2. Bike Plan Hawai'i (September 2003)

The Bike Plan Hawai'i (September 2003) proposes a 2.4-mile, signed, shared roadway from Kea'au-Pāhoa Road from Kea'au-Pāhoa Road to Shower Drive. This project is outside of the study area and will not affect the study intersections.

B. Upcoming Planned Project

Research was completed on October 31, 2023, at the State of Hawai'i Office Environmental Review Program (ERP) website. The ERP website provides Environmental Impact Statement (EIS) and Environmental Assessments (EA) available to the public. The *Kea'au-Mountain View Public Library TIAR* (ATA, July 2023) and the *Kea'au Village Master Plan Phase 1 & 2 Traffic Impact Report* (TIR) (WOC, August 2016) were identified as projects that could impact the study area.

1. Kea'au-Mountain View Public Library TIAR

This project proposes a 12,000 SF public library replacing the existing libraries at the Kea'au Middle School and Mountain View Elementary School at the northeast corner of Kea'au-Pāhoa Road and Old Volcano Road. The project is located almost five miles from the Kea'au-Pāhoa Road and Kaloli Drive intersection. Construction for this project is expected to be completed by 2027. The project generated traffic for the new library will add less than 12 vehicles per hours to Kea'au-Pāhoa Road east of Old Volcano Road. This volume is not significant and will be accounted for in the background growth rate.

2. Kea'au Village Master Plan Phase 1 & 2

Phase 1 and 2 of the Kea'au Village Master Plan is expected to be completed in 2026 and 2029, respectively. Phase 1 includes 228 single family homes, 233 multi-family homes, 27,800 SF of office space, and 207,500 SF of commercial space (see Table 9). Project related trips for Phase 1 will be completed by 2028 and pass through Kea'au-Pāhoa Road at Kaloli Drive. Vehicles are assumed to pass through Shower Drive without any distribution and distributed at Kaloli Drive using existing traffic patterns. Project related trips for Phase 2 will be completed by 2029, a year after our future analysis and therefore will not be included in the background volume.

Table 9: Kea'au Village Master Plan Phase 1 Land Use

Phase (Completion Date)	Phase	Proposed Land use			
		Single Family (Units)	Multi Family (Units)	Office (SF)	Commercial (SF)
Phase 1 (2026)	Phase 1A	98	153	27,800	103,800
	Phase 1B	130	80	-	25,300
	Phase 1C	-	-	-	78,400
	Phase 1D	Wastewater Treatment Plant Only			
Phase 1 Total	**Phase 1 Total**	**228**	**233**	**27,800**	**207,500**

C. Volumes

1. Background Growth

Historic HDOT AADT on Kea'au-Pāhoa Road between Shower Drive and Pōhaku Place from 2013-2019 resulted in an annual growth rate of 1.82%. The 2020 and 2021 AADT were lower than the 2013 AADT, likely due to the impact of the Covid-19 pandemic restrictions and were not used in the growth rate calculations. The *Federal-Aid Highways 2035 Transportation Plan for the District of Hawai'i* (CH2M Hill, 2014) forecasts a compounded annual increase of 2.12% in Puna from 2020 to 2035 (see Table 10). The historical growth rate of 1.82% from 2013-2019 is based on actual data, while the 2.12% growth rate from 2020 to 2035 is based on a future projection. The 1.82% annual growth rate is assumed to be a more accurate representation of the regional growth rate and will be used for analysis.

Table 10: Traffic Forecast – Daily Vehicle Trips in Puna

Year	Daily Vehicle Trips	Growth Rate
2020	92,180	2.12%
2035	126,290	

Source: *Federal-Aid Highways 2035 Transportation Plan for the District of Hawai'i (CH2M Hill, 2014)*

Projects not identified in the 2022-2025 STIP or the ERP are assumed to be included in the 1.82% annual growth rate. The Future (2028) Without Project volumes are shown in Figure 12.

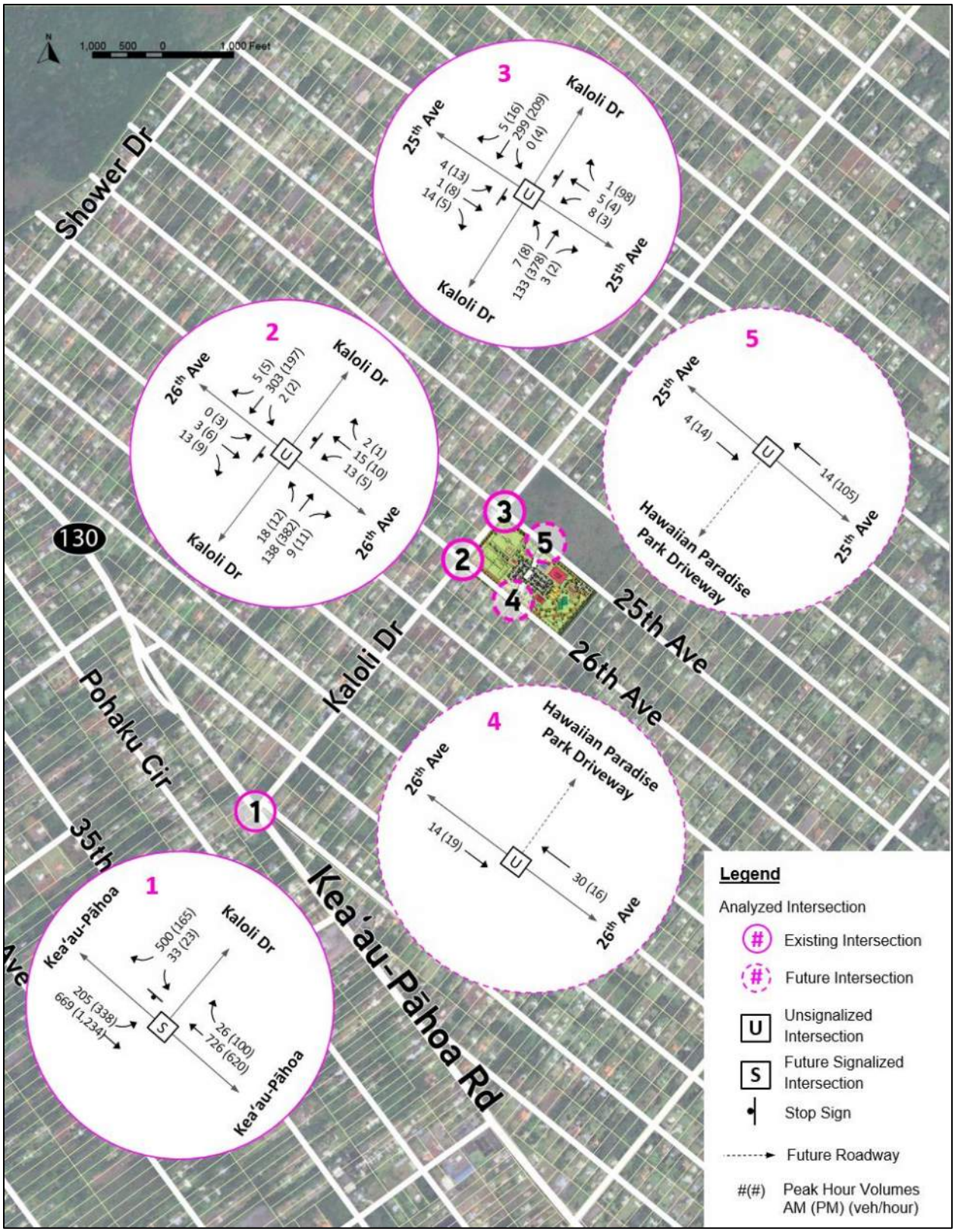

Figure 12: Future (2028) Without Project Intersection Peak Hour Volumes

D. Future (2028) Without Project LOS

1. Future (2028) Without Project Conditions

Future (2028) Without Project intersection and movement LOS and delay (seconds/vehicle) were determined for the AM and PM peak hours using *Synchro 11* traffic analysis software. Kea'au-Pāhoa Road and Kaloli Drive was analyzed as an actuated signalized intersection, with protected+permitted eastbound left turns, a permitted+overlap southbound right turn and an optimized cycle length. Results are shown in Table 11 and Appendix D. Movements that operate at LOS E or worse are highlighted in yellow. The southbound right turn is projected to operate at LOS F (v/c of 1.06). This movement is projected to have less delay than the LOS F threshold of 80.0 seconds/vehicle but a v/c over 1.00. Mitigation for this movement will be analyzed.

Table 11: Future (2028) Without Project LOS

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**C**	**33.5**	-	**B**	**11.9**	-
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	C	20.4	0.77	B	10.7	0.66
Kea'au-Pāhoa Rd EB Through	A	8.3	0.60	B	11.1	0.90
Kea'au-Pāhoa Rd WB Through-Right	C	28.3	0.91	B	10.9	0.69
Kaloli Dr SB Left	C	21.9	0.09	C	25.2	0.10
Kaloli Dr SB Right (Permitted+Overlap)	F	79.8	1.06	C	22.0	0.45
Kaloli Dr & 26th Ave	-	**1.4**	-	-	**0.9**	-
26th Ave EB Left-Through-Right	B	10.8	0.03	B	12.2	0.04
26th Ave WB Left-Through-Right	B	13.5	0.07	B	14.7	0.04
Kaloli Dr NB Left-Through-Right	A	8.0	0.02	A	7.7	0.01
Kaloli Dr SB Left-Through-Right	A	7.5	0.01	A	8.2	0.01
Kaloli Dr & 25th Ave	-	**0.9**	-	-	**2.6**	-
25th Ave EB Left-Through-Right	B	10.8	0.03	C	18.2	0.10
25th Ave WB Left-Through-Right	B	12.4	0.03	B	13.1	0.22
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.8	0.01
Kaloli Dr SB Left-Through-Right	A	0.0	0.00	A	8.3	0.00

2. Future (2028) Without Project Mitigation

The Future (2028) Without Project eastbound and westbound approaches are projected to operate at LOS A and LOS C, respectively. There is an opportunity to adjust the signal timing to provide more green time for the southbound approach by taking green time from the eastbound and westbound approaches. The expected result improves the southbound movement, while adding some delay to the eastbound and westbound approaches, but still maintaining an acceptable LOS for all movements. For this analysis, the cycle length was kept the same with green time taken from the eastbound and westbound approaches and added to the southbound approach. A four second change resulted in the overall intersection projected to maintain a LOS C, with all movements projected to operate at LOS D or better (see Table 12

and Appendix D). Therefore, it is recommended that signal timing adjustments be made as needed.

Table 12: Future (2028) Without Project LOS with Signal Timing Adjustment

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**C**	**33.5**	**-**	**B**	**11.9**	**-**
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	C	20.4	0.77	B	10.7	0.66
Kea'au-Pāhoa Rd EB Through	A	8.3	0.60	B	11.1	0.90
Kea'au-Pāhoa Rd WB Through-Right	C	28.3	0.91	B	10.9	0.69
Kaloli Dr SB Left	C	21.9	0.09	C	25.2	0.10
Kaloli Dr SB Right (Permitted+Overlap)	F	79.8	1.06	C	22.0	0.45
Kea'au-Pāhoa Rd & Kaloli Dr (+4 sec for SB approach in AM Peak)	**C**	**32.7**	**-**	**B**	**11.9**	**-**
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	C	27.2	0.84	B	10.7	0.66
Kea'au-Pāhoa Rd EB Through	B	10.3	0.63	B	11.1	0.90
Kea'au-Pāhoa Rd WB Through-Right	D	41.1	0.96	B	10.9	0.69
Kaloli Dr SB Left	C	21.7	0.08	C	25.2	0.10
Kaloli Dr SB Right (Permitted+Overlap)	D	51.7	0.96	C	22.0	0.45

IV. Future With Project Conditions

The HPP Park MP includes the following uses for the proposed park:

- Baseball/Softball Field
- Football/Soccer Field
- Tennis Courts (2)
- Pickleball Courts (3)
- Covered Play Court (24,120 SF) with Basketball & Volleyball Courts
- Pool (9,600 SF) with Pool Building (3,760 SF)
- Skate Park (15,000 SF)
- Playground for Small Kids (2,600 SF) and Bigger Kids (5,600 SF)
- Dog Parks for Small Dogs (13,000 SF) and Big Dogs (20,000 SF)
- Community Center (6,890 SF) with 4,000 SF of event space
- Concession and Comfort Station (1,638 SF)
- Three Parking Lots (Total of 231 stalls)
- Picnic Areas

A. Future With Project Generated Volumes

1. Project Related Volumes

(a) Trip Generation

The trip generation methodology is typically based upon rates developed by the Institute of Transportation Engineers (ITE) and published in the *Trip Generation Manual, 11th Edition* (ITE, 2021). The ITE trip rates are developed by correlating the total vehicle trip generation data with various activity/land use characteristics. For this project, the park could be looked at one parcel, or as a parcel made up of several land uses. As an alternative, it is also a viable option to consider using an existing nearby development with a similar land use.

For this project, no surrounding area parks had similar use and size to what was being proposed at HPP. Pāhoa District Park was identified as a nearby "district park" with greater use and size to the "community park" proposed for HPP and therefore was considered as a conservative estimate of the potential impacts.

Pāhoa District Park contained a swimming pool, community center, and skate park before the construction of Phase 1 (see Figure 13), which included:

- Two Youth Multi-Use Fields (one of which is available for nighttime use),
- Two Multi-Use Fields (one of which is available for nighttime use),
- A Multi-Purpose Facility including a bathroom and concession,
- A Youth Baseball Field (available for nighttime use), and

- A High School Baseball Field (available for nighttime use).

This TIAR analyzes the weekday AM and PM peak hours of the adjacent roadways per standard traffic engineering practice. Therefore, traffic impacts resulting from midday, nighttime, and weekend operations would not affect results.

Figure 13: Pāhoa District Park Phasing

Data collected at the Pāhoa District Park on October 4, 2023, and October 13, 2023, showed 42 inbound and 12 outbound vehicles during the AM peak hour, with 83 inbound and 97 outbound vehicles during the PM peak hour. These volumes were used as the anticipated project generated traffic for the proposed HPP Park, thereby ensuring that the surrounding roadway network can withstand greater park usage.

(b) Trip Distribution/Assignment

Project related trips were distributed using the Existing (2023) traffic patterns.

(c) Modal Choice

All project-related external trips were assumed to be by private vehicle only due to the surrounding land use, rural context, and lack of alternative transportation options. This reflects the worst-case traffic condition with all trips occurring by private vehicle. Trip reduction was not considered for this analysis. The project generated volumes and distribution are shown in Figure 14.

B. Future (2028) With Project Volumes

The Future (2028) With Project volumes (Figure 15) are a sum of the Future (2028) Without Project volumes (Figure 12) and the HPP Park Project generated volumes (Figure 14).

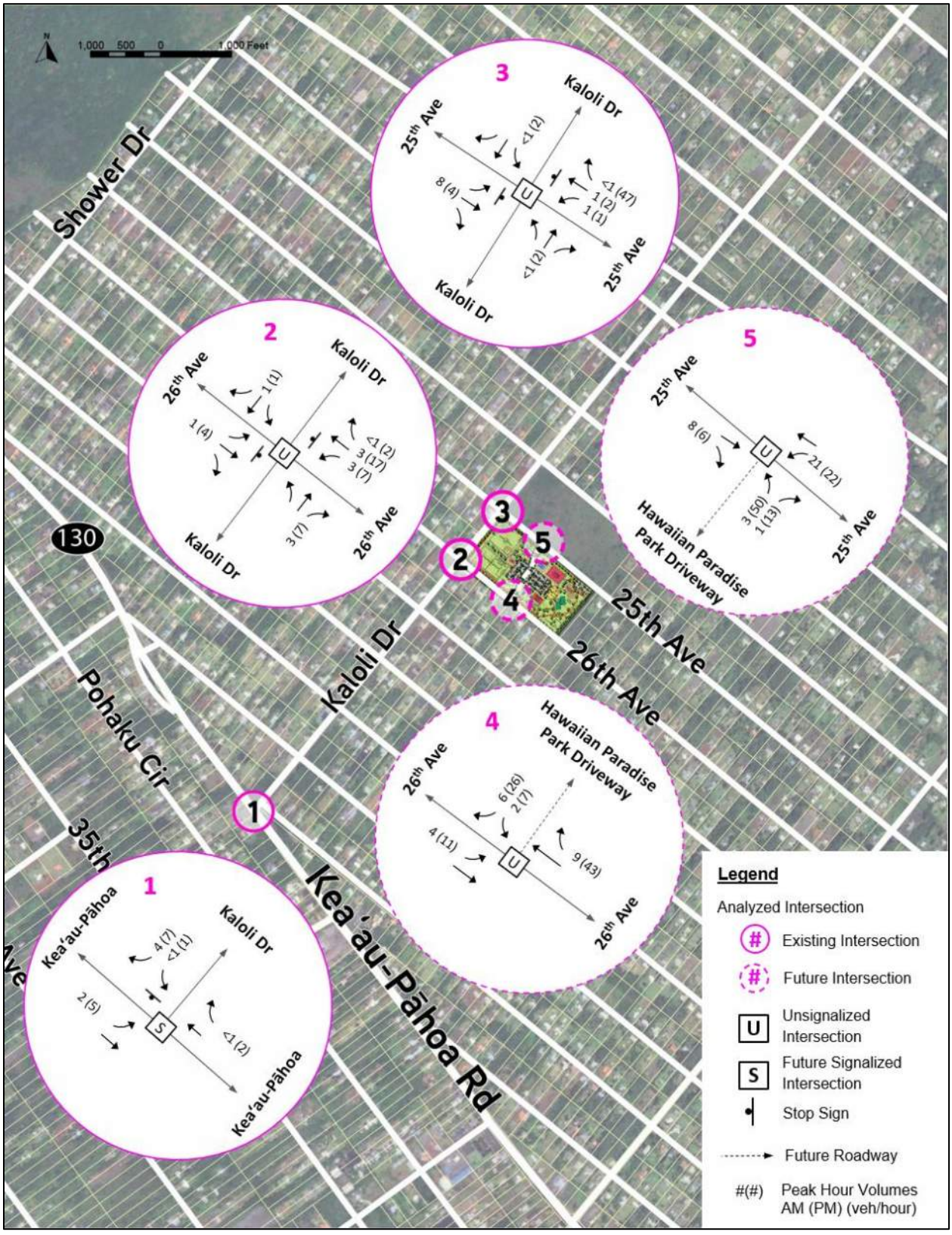

Figure 14: Project Trip Distribution

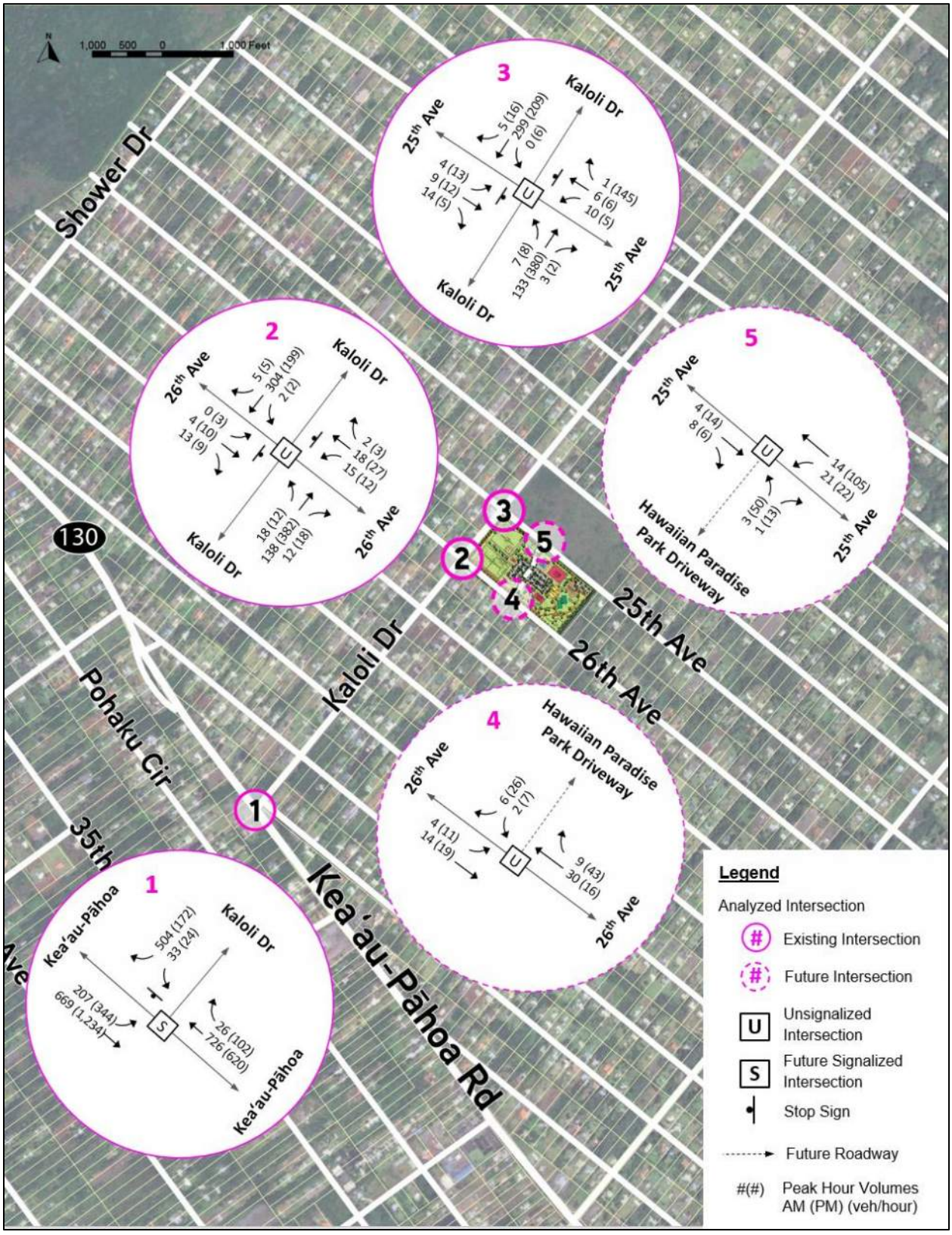

Figure 15: Future (2028) With Project Intersection Peak Hour Volumes

C. Future (2028) With Project LOS

Future (2028) With Project intersection and movement LOS and delay (seconds/vehicle) were determined for the AM and PM peak hours using *Synchro 11* traffic analysis software. Kea'au-Pāhoa Road and Kaloli Drive was analyzed as an actuated signalized intersection, with phasing to include protected+permitted eastbound left turns and a permitted+overlap southbound right turn, and an optimized cycle length. Results are shown in Table 13 and Appendix E. Movements that operate at LOS E or worse are highlighted in yellow. The Kaloli Drive southbound right turn at Kea'au-Pāhoa Road operates at LOS F (v/c of 1.14) with the delay increasing from 79.8 sec/veh in the Future (2028) Without Project condition to 113.5 sec/veh in the Future (2028) With Project condition. The LOS F is a result of the delay being over the 80.0 second threshold for LOS F and a v/c over 1.00. Mitigation for this movement will be analyzed.

1. Future (2028) With Project Conditions

Table 13: Future (2028) With Project LOS

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**D**	**43.1**	-	**B**	**12.4**	-
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	C	23.5	0.81	B	11.2	0.68
Kea'au-Pāhoa Rd EB Through	A	8.9	0.63	B	11.7	0.90
Kea'au-Pāhoa Rd WB Through-Right	C	32.4	0.93	B	11.4	0.70
Kaloli Dr SB Left	C	24.3	0.09	C	25.4	0.10
Kaloli Dr SB Right (Permitted+Overlap)	F	113.5	1.14	C	22.2	0.46
Kaloli Dr & 26th Ave	-	**1.5**	-	-	**1.5**	-
26th Ave EB Left-Through-Right	B	11.0	0.03	B	12.9	0.05
26th Ave WB Left-Through-Right	B	13.7	0.09	B	15.6	0.12
Kaloli Dr NB Left-Through-Right	A	8.0	0.02	A	7.7	0.01
Kaloli Dr SB Left-Through-Right	A	7.5	0.01	A	8.2	0.01
Kaloli Dr & 25th Ave	-	**1.2**	-	-	**3.7**	-
25th Ave EB Left-Through-Right	B	11.4	0.03	C	20.2	0.13
25th Ave WB Left-Through-Right	B	12.6	0.04	B	14.5	0.33
Kaloli Dr NB Left-Through-Right	A	7.9	0.01	A	7.8	0.01
Kaloli Dr SB Left-Through-Right	A	0.1	0.01	A	8.3	0.01
26th Ave & HPP District Park South Driveway	-	**1.5**	-	-	**3.0**	-
26th Ave EB Left-Through	A	7.3	0.01	A	7.4	0.01
HPP South Driveway SB Exit	A	8.6	0.01	A	8.7	0.04
HPP District Park North Driveway & 25th Ave	-	**3.7**	-	-	**3.7**	-
25th Ave WB Left-Through	A	7.3	0.01	A	7.3	0.02
HPP District Park North Driveway NB Left-Right	A	8.8	0.01	A	9.7	0.08

2. Future (2028) With Project Mitigation

The Future (2028) With Project eastbound and westbound approaches are projected to operate at LOS A and LOS C, respectively. There is an opportunity to adjust the signal timing to provide more green time for the southbound approach by taking green time from the eastbound and

westbound approaches. The expected result is to improve the southbound movement, while adding some delay to the eastbound and westbound approaches, but still maintaining an acceptable LOS for all movements. For this analysis, the cycle length was adjusted with green time taken from the eastbound and westbound approaches and added to the southbound approach. This change resulted in the overall intersection projected to maintain a LOS D, with all movements projected to operate at LOS D or better (see Table 14 and Appendix E). Therefore, it is recommended that the signal timing adjustments be made as needed.

Table 14: Future (2028) With Project LOS with Signal Timing Adjustment

Intersection	AM			PM		
	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
Kea'au-Pāhoa Rd & Kaloli Dr (Signalized)	**D**	**42.8**	**-**	**B**	**12.4**	**-**
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	C	24.9	0.83	B	11.2	0.68
Kea'au-Pāhoa Rd EB Through	A	8.9	0.63	B	11.7	0.90
Kea'au-Pāhoa Rd WB Through-Right	C	32.8	0.93	B	11.4	0.70
Kaloli Dr SB Left	C	24.5	0.09	C	25.4	0.10
Kaloli Dr SB Right (Permitted+Overlap)	F	111.6	1.14	C	22.2	0.46
Kea'au-Pāhoa Rd & Kaloli Dr (signal timing adjustment)	**D**	**38.4**	**-**	**B**	**12.4**	**-**
Kea'au-Pāhoa Rd EB Left (Protected+Permitted)	D	37.2	0.86	B	11.2	0.68
Kea'au-Pāhoa Rd EB Through	B	13.0	0.65	B	11.7	0.90
Kea'au-Pāhoa Rd WB Through-Right	D	52.2	0.98	B	11.4	0.70
Kaloli Dr SB Left	C	27.8	0.08	C	25.4	0.10
Kaloli Dr SB Right (Permitted+Overlap)	D	52.9	0.94	C	22.2	0.46

V. Summary and Recommendations

The COH DPR is proposing to develop a new community park within HPP, located in Kea‘au on the island of Hawai‘i. The proposed park is located to the east of Kaloli Drive, between 25th Avenue and 26th Avenue. There are no construction plans for the development, however, the development is assumed to be completed by 2028. Traffic analysis was completed for the Existing (2023) and Future (2028) Without Project and With Project conditions.

The existing southbound right turn at Kea‘au-Pāhoa Road and Kaloli Drive operates at LOS F during the AM peak hour. This intersection passed the MUTCD 4-Hour traffic signal warrant for existing conditions and is noted to be on the STIP for construction in 2026. This intersection was analyzed as an actuated intersection with phasing to include a protected+permitted eastbound left turn phase and a permitted+overlap southbound right turn phase. With these changes, the intersection is projected to operate at LOS C with all movements projected to operate at LOS D or better.

Future (2028) traffic volumes were calculated by adding the Kea‘au Villages Master Plan Phase 1 project related traffic and the regional traffic growth. A 1.82% annual growth rate was applied to Kea‘au-Pāhoa Road based on historic HDOT AADT from 2013-2019 on Kea‘au-Pāhoa Road between Shower Drive and Pōhaku Place.

Future (2028) Without Project and Future (2028) With Project analyzed Kea‘au-Pāhoa Road and Kaloli Drive as an actuated intersection with phasing to include a protected+permitted eastbound left turn phase and a permitted+overlap southbound right turn phase. In both conditions, the southbound right turn from Kaloli Drive is projected to operate at LOS F, with a v/c ratio above 1.00. The eastbound and westbound approaches are projected to operate at LOS A and LOS C, respectively. Analysis was done by analyzing the intersection with a longer cycle length and reallocating green time from the eastbound and westbound approaches to the southbound approach. This signal timing adjustment resulted in the intersection projected to operate at LOS D, with all movements projected to operate at LOS D or better.

It is recommended that the Kea‘au-Pāhoa Road intersection be signalized per the STIP, with traffic signal phasing to include protected+permitted eastbound left turns and permitted+overlap southbound right turns. An overlap phase would require a dedicated right turn lane and a dedicated left turn lane for the protected left turn on the cross street. It is recommended that the Kaloli Drive approach be restriped to have dedicated left turn and right turn lanes. It was observed that the left turn vehicles do not impede right turning vehicles at the Kaloli Drive approach. The proposed restriping is not anticipated to change the existing driving behavior. Signal timing can be adjusted as necessary to improve the southbound approach while still maintaining an acceptable LOS for all movements.

VI. References

ATA, Inc. *Kea'au-Mountain View Public Library TIAR*, July 2023.

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Wilson Okomoto Corporation. Kea'au Villages Master Plan Phase 1 & 2 TIR, July 2017.

Appendix A –
Bus Routes and Maps

Aloha & Welcome Aboard!

The friendly professionals at Hele-On welcome you! The County of Hawai'i Mass Transit Agency is pleased to provide this bus service to you! We hope that you will "Take the Trip!" and enjoy the safety, convenience and service that Hele-On has to offer!

Service Hours

Hele-On bus service is generally available Monday-Sunday between the hours of 3:15 a.m. and 2:00 a.m. depending on the route. Please see route timetables for details. Sunday schedules operate on County observed holidays which are: New Year's Day, Dr. Martin Luther King Jr. Day, Presidents Day, Prince Kuhio Day, Good Friday, Memorial Day, King Kamehameha Day, Independence Day, Statehood Day, Labor Day, Election Day, Veterans Day, Thanksgiving Day and Christmas Day. Pay close attention to which routes operate on Sundays and County observed holidays.

Title VI of the Civil Rights Act of 1964

County of Hawai'i Mass Transit Agency operates it programs and services without regard to race, color and national origin in accordance with Title VI of the Civil Rights Act of 1964. Any person who believes that she or he has been aggrieved by any unlawful discriminatory practice under Title VI must file a complaint within 180 days of the alleged occurrence to FTA or County of Hawai'i. Additional details available on bus or website.

This information is available in alternative languages and formats by calling (808) 961-8744 or emailing heleonbus@hawaiicounty.gov

Route operated by : Roberts Hawaii

Fares—Effective February 27, 2022

Hele-On is free until December 31, 2025! Just Hop on and Hele-On!

Call Us…..We'll Be Around!

For comments, concerns, questions or suggestions regarding Hele-On transit services please contact the County of Hawai'i Mass Transit Agency by calling: (808) 961-8744, fax to: (808) 961-8745, writing to: County of Hawai'i Mass Transit Agency, 25 Aupuni Street, Hilo, HI 96720 or by emailing: heleonbus@hawaiicounty.gov.

John C. Andoh, Mass Transit Administrator & General Manager

How To Use This Timetable

Each of our routes has a unique name and number and the route destination is on the front and right side of the bus. The schedule shows the departure times of the bus as it travels along the route. **Read the timetable from left to right.**

Time points are shown on the map and on the timetable. See the timetable to estimate the arrival time at your bus stop. Since safe driving is always a priority, traffic, weather and other conditions can change arrival times. ***Please plan accordingly.***

How To Ride A Hele-On Bus

Prior to boarding a Hele-On bus, wait at a blue and white Hele-On Bus Stop, red and white bus stop or Kona Trolley sign and wait on the proper side of the roadway. In some cases, you may need to flag the bus (at a safe pullover location) due to no sign being available. Arrive at least five (5) minutes before the bus is due to arrive.

- If you are unfamiliar with your stop, sit or stand behind the white line in the front of the bus and ask the bus operator to notify you when your stop is approaching.
- Ask the bus operator if you are not sure if the bus goes to your desired bus stop.
- Be mindful of changes in the schedule, overall conditions and weather.
- No eating, drinking or smoking of any kind.
- No boarding with surfboards or body boards.
- Electronic devices may be played with earphones set a at low level and talking on cellular phones are to not be used on the bus.
- Shoes and shirt are required to ride.
- No rowdy behavior on the bus.
- No spitting or expectorating on the bus.
- No flammable, explosive, sharp or toxic materials.
- No obstructing, fighting or interfering with the bus operator or bus operations.
- Only five bags are allowed on the bus.

Violators of these rules can result in a fine, suspension from riding the bus and/or imprisonment as defined in the Hawaii County Code 2-27-3 and/or Hawaii Revised Statutes.

Hele-On
County of Hawai'i Bus

Route 402: Hawaiian Paradise Park/ Orchidland/Hawaiian Acres/ Ainaloa Route Timetable

Take The Trip!

Monday-Saturday service between Pahoa @ Puna Kai Shopping Center, Hawaiian Paradise Park, Orchidland, Hawaiian Acres, Kea'au & Ainaloa

Telephone: (808) 961-8744
TDD/TTY: 711
www.heleonbus.org

Effective Monday, April 4, 2022 - Revised

Route 402: Hawaiian Paradise Park/ Orchidland/Hawaiian Acres/Ainaloa

Effective April 4, 2022

Northbound to Kea'au

	Pahoa		Hawaiian Paradise Park			Orchidland Estates	Kea'au
	A	B	C	D	E	F	G
	Kea'au Pahoa Road @ Kahakai Blvd (Puna Kai Shopping Center)	Pahoa Village Road @ Pahoa Elementary School	Makuu Dr @ 1st Avenue	Paradise Dr @ 31st Ave	Showers Dr @ Hwy 130	Pohaku Drive @ 40th Ave	Old Volcano Road @ Keaau-Pahoa Road (HMSA building, farside)
Bus Stop ID#	968	970	TBA	931	927	TBA	TBA
	---	---	---	---	---	---	---
	5:30 AM	5:35 AM	5:50 AM	6:00 AM	6:10 AM	6:15 AM	6:30 AM
	7:30 AM	7:35 AM	7:50 AM	8:00 AM	8:10 AM	8:15 AM	8:30 AM
	9:30 AM	9:35 AM	9:50 AM	10:00 AM	10:10 AM	10:15 AM	10:30 AM
	11:30 AM	11:35 AM	11:50 AM	**12:00 PM**	**12:10 PM**	**12:15 PM**	**12:30 PM**
	1:30 PM	**1:35 PM**	**1:50 PM**	**2:00 PM**	**2:10 PM**	**2:15 PM**	**2:30 PM**
	3:30 PM	**3:35 PM**	**3:50 PM**	**4:00 PM**	**4:10 PM**	**4:15 PM**	**4:30 PM**
	5:30 PM	**5:35 PM**	**5:50 PM**	**6:00 PM**	**6:10 PM**	**6:15 PM**	**6:30 PM**
	7:30 PM	**7:35 PM**	**7:50 PM**	**8:00 PM**	**8:10 PM**	**8:15 PM**	**8:30 PM**

This route operates Monday-Saturday only. There is no Sunday or holiday service.

--- = bus does not serve timepoint.

Monday-Friday only

Route 402: Hawaiian Paradise Park/ Orchidland/Hawaiian Acres/Ainaloa

Effective April 4, 2022

Southbound to Pahoa

Kea'au	Kurtistown	Hawaiian Acres	Ainaloa	Pahoa
G	H	I	J	A
Old Volcano Road @ Keaau-Pahoa Road (HMSA building, farside)	Highway 11 @ Across from Kurtistown Park	Moho Rd @ C Rd - Hawaiian Acres Community Center	Ainaloa Blvd @ Ainaloa Community Center	Kea'au Pahoa Road @ Kahakai Blvd (Puna Kai Shopping Center)
TBA	921	TBA	941	968
4:35 AM	4:40 AM	4:50 AM	5:05 AM	5:20 AM
6:35 AM	6:40 AM	6:50 AM	7:05 AM	7:20 AM
8:35 AM	8:40 AM	8:50 AM	9:05 AM	9:20 AM
12:35 PM	**12:40 PM**	**12:50 PM**	**1:05 PM**	**1:20 PM**
2:35 PM	**2:40 PM**	**2:50 PM**	**3:05 PM**	**3:20 PM**
4:35 PM	**4:40 PM**	**4:50 PM**	**5:05 PM**	**5:20 PM**
6:35 PM	**6:40 PM**	**6:50 PM**	**7:05 PM**	**7:20 PM**
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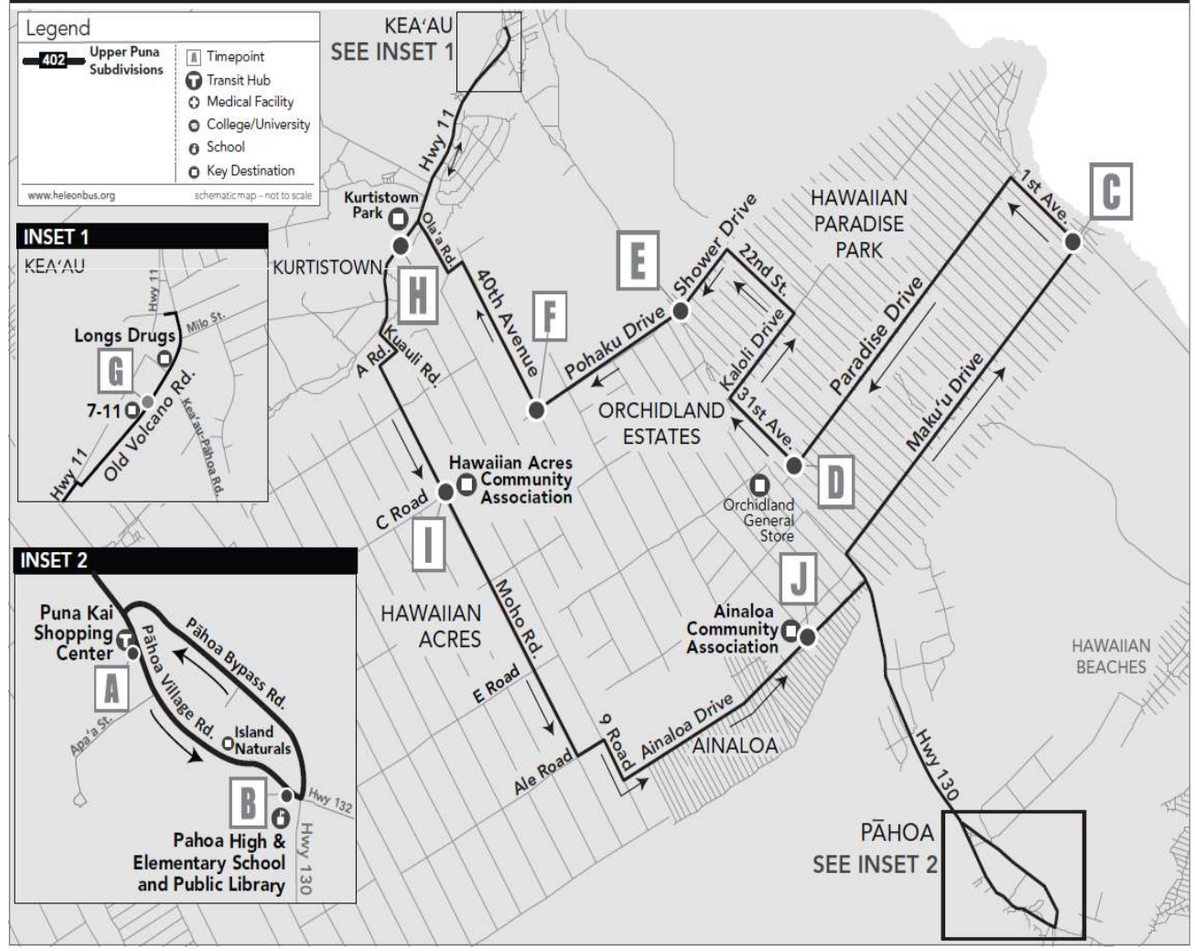
Hele-On Bus Route - #402 Upper Puna Subdivisions



To read the timetable, read from left to right to follow the course of the route and then read down for the times that the bus operates. Schedules are subject to change without notice. Times are approximate and may vary depending on traffic conditions, weather and other conditions.

AM times are shown in lightface type. **PM times are in boldface type.**

No Sunday or holiday service.

Not all Hele-On bus stops are shown. Please flag the bus along its route at safe intersections where the bus can safely pull over or board at a bus shelter, a Kona Trolley Stop sign, a Hele-On Bus Stop or a red/white or blue Bus Stop sign.

- - - means timepoint is not served.

Appendix B –
2023 Traffic Count Data

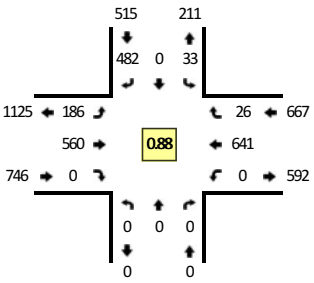
Type of peak hour being reported: Intersection Peak

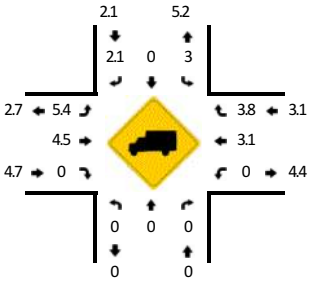
Method for determining peak hour: Total Entering Volume

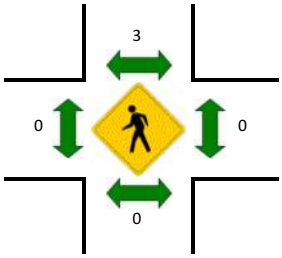
LOCATION: Kaloli Dr -- Keaau-Pahoa Rd
CITY/STATE: Hawaiian Paradise Park, HI

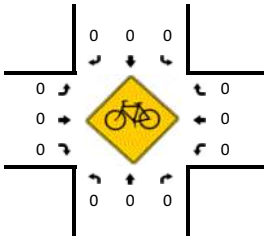
QC JOB #: 16351901
DATE: Wed, Oct 4 2023

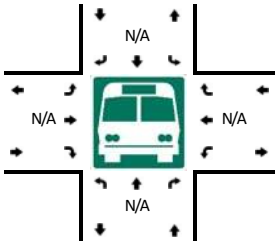
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

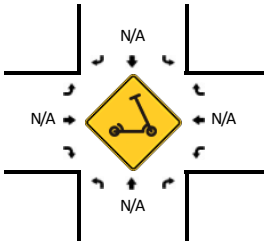












15-Min Count Period Beginning At	Kaloli Dr (Northbound)				Kaloli Dr (Southbound)				Keaau-Pahoa Rd (Eastbound)				Keaau-Pahoa Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	3	0	127	0	10	39	0	0	0	196	0	0	375	
6:15 AM	0	0	0	0	4	0	169	0	17	63	0	0	0	185	2	0	440	
6:30 AM	0	0	0	0	3	0	177	0	19	65	0	0	0	181	2	0	447	
6:45 AM	0	0	0	0	0	0	171	0	13	93	0	1	0	170	3	0	451	1713
7:00 AM	0	0	0	0	2	0	164	1	26	89	0	0	0	154	1	0	437	1775
7:15 AM	0	0	0	0	10	0	142	0	44	129	0	1	0	161	4	0	491	1826
7:30 AM	0	0	0	0	13	0	112	0	56	188	0	1	0	166	11	0	547	1926
7:45 AM	0	0	0	0	7	0	64	0	58	154	0	0	0	160	10	0	453	1928

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	0	0	0	52	0	448	0	224	752	0	4	0	664	44	0	2188
Heavy Trucks	0	0	0		4	0	12		8	40	0		0	12	0		76
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 10/13/2023 5:33 AM

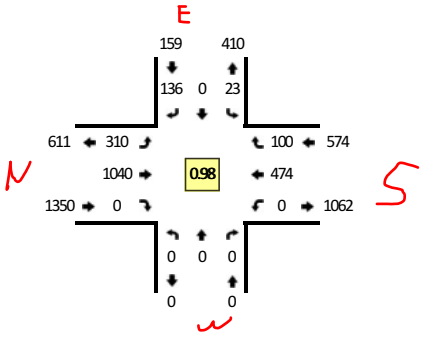
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

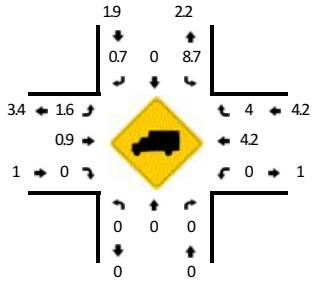
LOCATION: Kaloli Dr -- Keaau-Pahoa Rd
CITY/STATE: Hawaiian Paradise Park, HI

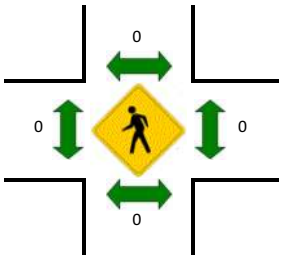
QC JOB #: 16351902
DATE: Wed, Oct 4 2023

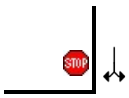


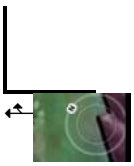
Peak-Hour: 3:45 PM -- 4:45 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

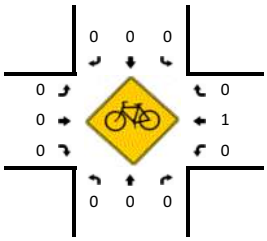
TRUE DATA TO IMPROVE MOBILITY

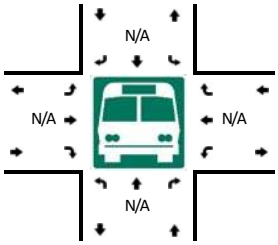


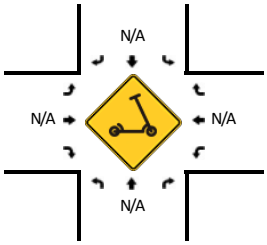












15-Min Count Period Beginning At	Kaloli Dr (Northbound)				Kaloli Dr (Southbound)				Keaau-Pahoa Rd (Eastbound)				Keaau-Pahoa Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	0	0	0	0	3	0	34	0	52	206	0	2	0	138	9	0	444	
1:45 PM	0	0	0	0	10	0	29	0	61	224	0	1	0	142	22	0	489	
2:00 PM	0	0	0	0	8	0	30	0	59	225	0	1	0	134	14	0	471	
2:15 PM	0	0	0	0	6	0	41	0	70	202	0	0	0	136	24	0	479	1883
2:30 PM	0	0	0	0	6	0	20	0	49	217	0	0	0	155	21	0	468	1907
2:45 PM	0	0	0	0	6	0	25	0	62	216	0	0	0	145	21	0	475	1893
3:00 PM	0	0	0	0	6	0	22	0	84	270	0	0	0	108	22	0	512	1934
3:15 PM	0	0	0	0	8	0	17	0	62	277	0	0	0	130	17	0	511	1966
3:30 PM	0	0	0	0	9	0	29	0	79	217	0	0	0	128	14	0	476	1974
3:45 PM	0	0	0	0	1	0	28	0	78	272	0	0	0	116	27	0	522	2021
4:00 PM	0	0	0	0	7	0	34	1	86	262	0	0	0	107	22	0	519	2028
4:15 PM	0	0	0	0	8	0	38	0	73	241	0	0	0	128	24	0	512	2029
4:30 PM	0	0	0	0	6	0	36	0	72	265	0	1	0	123	27	0	530	2083
4:45 PM	0	0	0	0	14	0	25	0	85	237	0	0	0	88	27	0	476	2037
5:00 PM	0	0	0	0	12	0	23	0	81	248	0	0	0	99	21	0	484	2002
5:15 PM	0	0	0	0	5	0	23	0	90	252	0	0	0	97	22	1	490	1980

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	0	0	0	24	0	144	0	288	1060	0	4	0	492	108	0	2120
Heavy Trucks	0	0	0		4	0	0		8	8	0		0	8	4		32
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 10/13/2023 5:33 AM

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

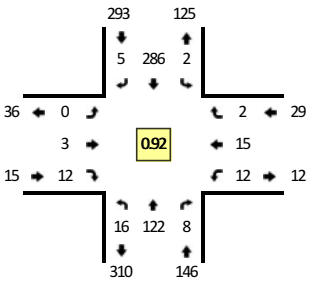
Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

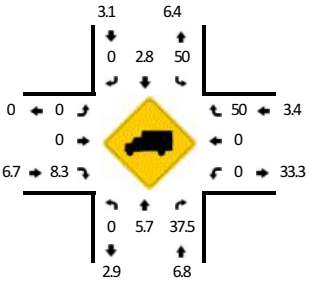
LOCATION: Kaloli Dr -- 26th Ave/Olena Ave
CITY/STATE: Hawaiian Paradise Park, HI

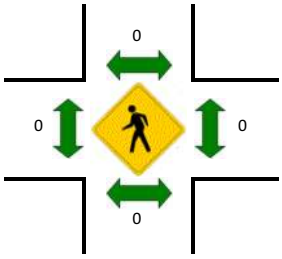
QC JOB #: 16351903
DATE: Wed, Oct 4 2023

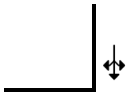
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

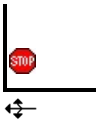


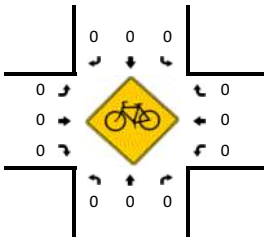
TRUE DATA TO IMPROVE MOBILITY

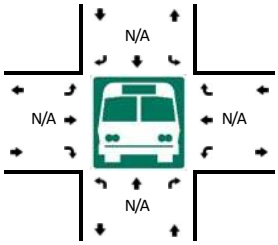


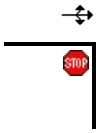


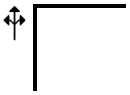


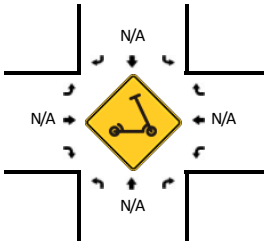












15-Min Count Period Beginning At	Kaloli Dr (Northbound)				Kaloli Dr (Southbound)				26th Ave/Olena Ave (Eastbound)				26th Ave/Olena Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	1	11	0	0	0	98	3	0	0	0	1	0	2	2	0	0	118	
6:15 AM	1	17	1	0	0	159	1	0	0	3	1	0	4	4	0	0	191	
6:30 AM	1	12	0	0	2	150	2	0	0	1	3	0	6	1	0	0	178	
6:45 AM	0	17	0	0	0	103	0	0	1	3	2	0	3	2	0	0	131	618
7:00 AM	1	19	2	0	1	74	1	1	0	0	6	0	5	5	0	0	115	615
7:15 AM	1	19	2	0	0	85	0	0	0	1	3	0	1	2	0	0	114	538
7:30 AM	3	36	2	0	0	73	1	0	0	1	0	0	3	2	2	0	123	483
7:45 AM	11	48	2	0	0	54	3	0	0	1	3	0	3	6	0	0	131	483

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	44	192	8	0	0	216	12	0	0	4	12	0	12	24	0	0	524
Heavy Trucks	0	8	0		0	4	0		0	0	0		0	0	0		12
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/6/2023 10:19 AM

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

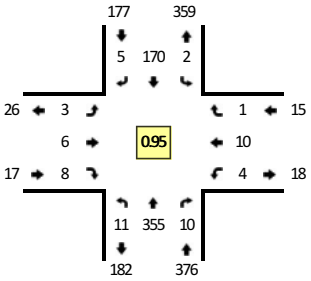
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

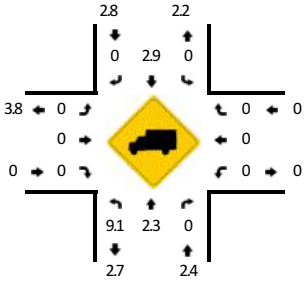
LOCATION: Kaloli Dr -- 26th Ave/Olena Ave
CITY/STATE: Hawaiian Paradise Park, HI

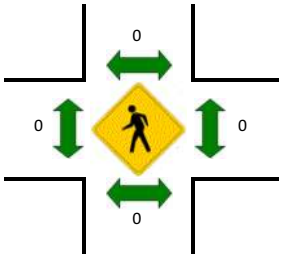
QC JOB #: 16351904
DATE: Wed, Oct 4 2023

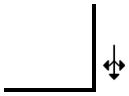
Peak-Hour: 3:45 PM -- 4:45 PM
Peak 15-Min: 4:15 PM -- 4:30 PM

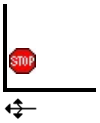


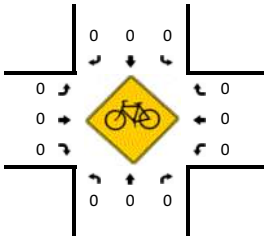
TRUE DATA TO IMPROVE MOBILITY

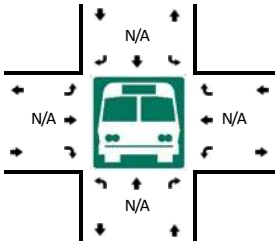


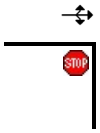


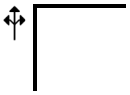


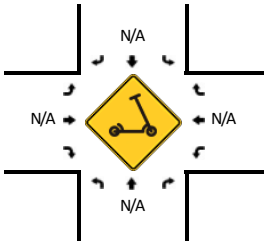












15-Min Count Period Beginning At	Kaloli Dr (Northbound)				Kaloli Dr (Southbound)				26th Ave/Olena Ave (Eastbound)				26th Ave/Olena Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	2	43	0	0	1	39	0	0	2	2	2	0	1	1	1	0	94	
1:45 PM	3	63	3	0	0	58	3	0	2	1	1	0	1	3	1	0	139	
2:00 PM	3	61	1	0	0	39	4	0	1	1	2	0	0	5	0	0	117	
2:15 PM	8	70	3	0	3	53	1	0	0	5	3	0	0	1	2	0	149	499
2:30 PM	2	48	1	0	2	40	3	0	3	6	0	0	0	2	2	0	109	514
2:45 PM	3	67	1	0	1	37	0	0	1	2	1	0	1	5	1	0	120	495
3:00 PM	1	96	8	0	1	42	3	0	2	2	2	0	2	0	0	0	159	537
3:15 PM	0	77	0	0	0	33	0	0	0	0	3	0	3	0	1	0	117	505
3:30 PM	0	69	2	0	0	39	0	0	1	2	2	0	1	1	0	0	117	513
3:45 PM	3	93	4	0	1	37	1	0	1	0	2	0	0	2	0	0	144	537
4:00 PM	1	94	2	0	1	40	1	0	0	3	3	0	1	4	0	0	150	528
4:15 PM	5	84	4	0	0	50	3	0	1	2	1	0	2	2	0	0	154	565
4:30 PM	2	84	0	0	0	43	0	0	1	1	2	0	1	2	1	0	137	585
4:45 PM	1	86	4	0	1	44	2	0	1	2	1	0	0	0	0	0	142	583
5:00 PM	1	81	3	0	0	38	0	0	1	3	1	0	1	1	0	0	130	563
5:15 PM	0	108	2	0	1	34	1	0	0	3	0	0	0	3	1	0	153	562

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	336	16	0	0	200	12	0	4	8	4	0	8	8	0	0	616
Heavy Trucks	4	12	0		0	8	0		0	0	0		0	0	0		24
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 10/13/2023 5:33 AM

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

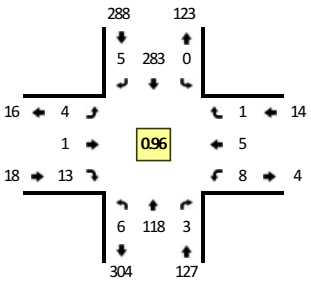
Type of peak hour being reported: User-Defined

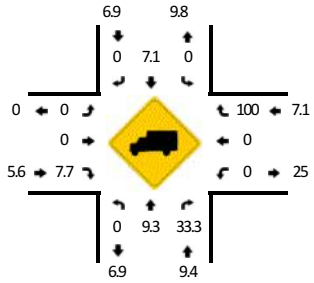
Method for determining peak hour: Total Entering Volume

LOCATION: Kaloli Dr -- 25th Ave/Okika Ave
CITY/STATE: Hawaiian Paradise Park, HI

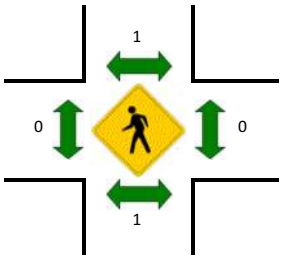
QC JOB #: 16351905
DATE: Wed, Oct 4 2023

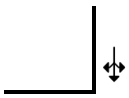
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

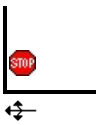


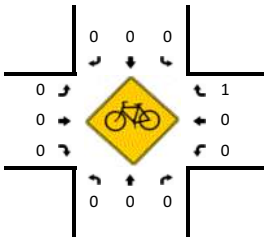


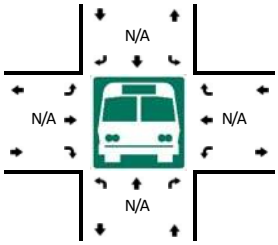
TRUE DATA TO IMPROVE MOBILITY

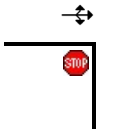


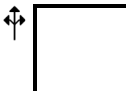


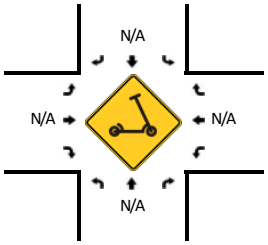












15-Min Count Period Beginning At	Kaloli Dr (Northbound)				Kaloli Dr (Southbound)				25th Ave/Okika Ave (Eastbound)				25th Ave/Okika Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	11	0	0	1	98	2	0	0	1	1	0	4	5	0	0	123	
6:15 AM	1	15	0	0	0	152	0	0	0	0	0	0	6	2	0	0	176	
6:30 AM	0	12	0	0	1	146	0	0	1	1	2	0	7	4	0	0	174	
6:45 AM	1	17	0	0	0	97	1	0	0	2	3	0	3	3	0	0	127	600
7:00 AM	0	18	0	0	0	76	3	0	1	0	2	0	1	3	0	0	104	581
7:15 AM	3	18	0	0	0	77	1	0	1	0	7	0	2	1	0	0	110	515
7:30 AM	2	34	1	0	0	71	1	0	2	0	3	0	1	1	1	0	117	458
7:45 AM	1	48	2	0	0	59	0	0	0	1	1	0	4	0	0	0	116	447

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	8	136	4	0	0	284	4	0	8	0	12	0	4	4	4	0	468
Heavy Trucks	0	12	4		0	20	0		0	0	0		0	0	4		40
Buses																	
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/6/2023 10:19 AM

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

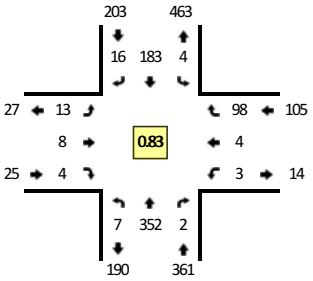
Type of peak hour being reported: User-Defined

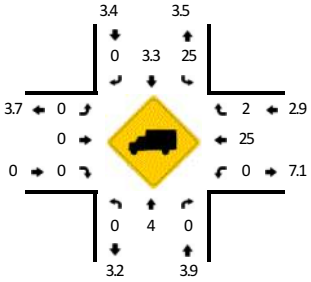
Method for determining peak hour: Total Entering Volume

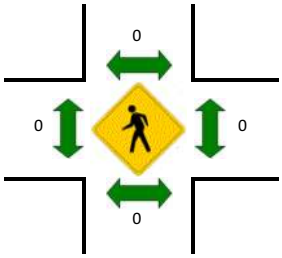
LOCATION: Kaloli Dr -- 25th Ave/Okika Ave
CITY/STATE: Hawaiian Paradise Park, HI

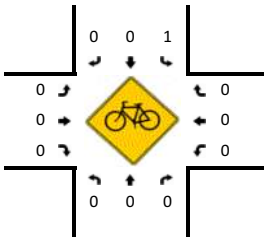
QC JOB #: 16351906
DATE: Wed, Oct 4 2023

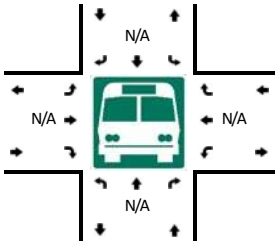
Peak-Hour: 3:45 PM -- 4:45 PM
Peak 15-Min: 3:45 PM -- 4:00 PM

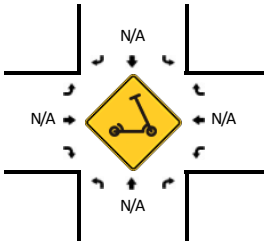












15-Min Count Period Beginning At	Kaloli Dr (Northbound)				Kaloli Dr (Southbound)				25th Ave/Okika Ave (Eastbound)				25th Ave/Okika Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	1	42	0	0	0	37	3	0	5	0	1	0	0	4	3	0	96	
1:45 PM	0	62	1	0	0	60	1	0	5	1	0	0	2	0	3	0	135	
2:00 PM	0	62	0	0	1	42	2	0	2	2	1	0	0	2	3	0	117	
2:15 PM	2	67	1	0	0	56	6	0	4	2	3	0	1	1	15	0	158	506
2:30 PM	1	48	0	0	1	43	0	0	4	3	3	0	0	1	21	0	125	535
2:45 PM	1	67	0	0	0	37	1	0	4	2	1	0	0	1	36	0	150	550
3:00 PM	2	96	0	0	0	47	2	0	2	2	0	0	1	5	50	0	207	640
3:15 PM	1	77	0	0	0	33	1	0	4	1	1	0	1	3	38	0	160	642
3:30 PM	3	65	1	0	0	37	3	0	1	1	1	0	1	0	33	0	146	663
3:45 PM	1	92	0	0	2	39	5	0	6	1	0	0	0	1	63	0	210	723
4:00 PM	2	93	2	0	1	42	4	0	2	3	1	0	1	0	21	0	172	688
4:15 PM	1	84	0	0	1	57	3	0	1	3	3	0	1	1	8	0	163	691
4:30 PM	3	83	0	0	0	45	4	0	4	1	0	0	1	2	6	0	149	694
4:45 PM	0	86	0	0	0	47	2	0	3	1	1	0	2	0	4	0	146	630
5:00 PM	1	79	0	0	0	37	3	0	2	2	0	0	0	1	13	0	138	596
5:15 PM	0	107	2	0	0	36	4	0	4	0	2	0	0	1	11	0	167	600

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	368	0	0	8	156	20	0	24	4	0	0	0	4	252	0	840
Heavy Trucks	0	0	0		4	4	0		0	0	0		0	4	4		16
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/6/2023 10:19 AM

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

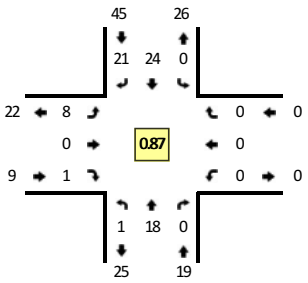
Type of peak hour being reported: Intersection Peak

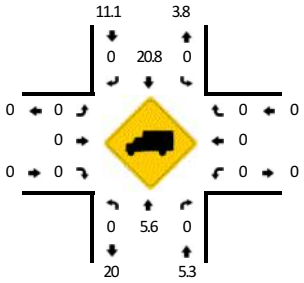
Method for determining peak hour: Total Entering Volume

LOCATION: Kauhale St -- Pahoa District Park North Dwys
CITY/STATE: Pahoa, HI

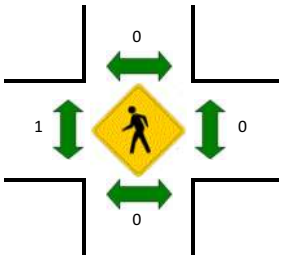
QC JOB #: 16351907
DATE: Wed, Oct 4 2023

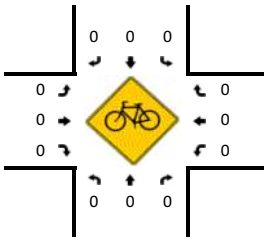
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

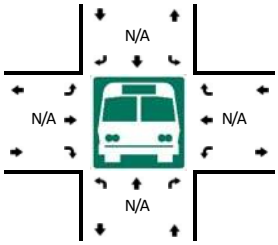


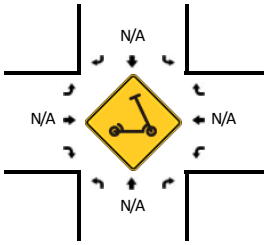


TRUE DATA TO IMPROVE MOBILITY









15-Min Count Period Beginning At	Kauhale St (Northbound)				Kauhale St (Southbound)				Pahoa District Park North Dwys (Eastbound)				Pahoa District Park North Dwys (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	4	
6:15 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
6:30 AM	0	3	0	0	0	6	0	0	0	0	0	0	0	0	0	0	9	
6:45 AM	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	18
7:00 AM	0	4	0	0	0	3	4	0	0	0	1	0	0	0	0	0	12	26
7:15 AM	0	2	0	0	0	8	6	0	3	0	0	0	0	0	0	0	19	43
7:30 AM	0	7	0	0	0	7	5	0	2	0	0	0	0	0	0	0	21	55
7:45 AM	1	5	0	0	0	6	6	0	3	0	0	0	0	0	0	0	21	73

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	28	0	0	0	28	20	0	8	0	0	0	0	0	0	0	84
Heavy Trucks	0	0	0		0	8	0		0	0	0		0	0	0		8
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

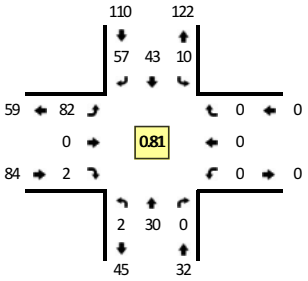
Report generated on 10/13/2023 5:34 AM

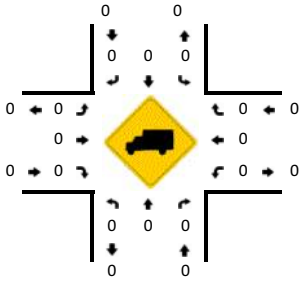
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

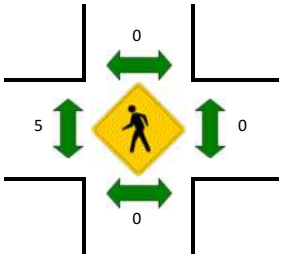
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

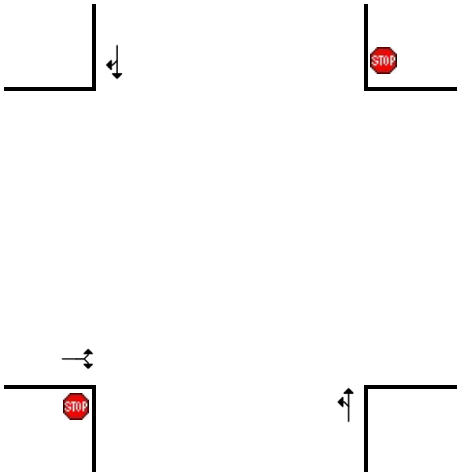
LOCATION: Kauhale St -- Pahoa District Park North Dwys | **QC JOB #:** 16351908
CITY/STATE: Pahoa, HI | **DATE:** Wed, Oct 4 2023

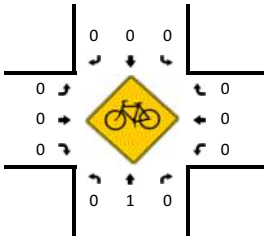
Peak-Hour: 3:30 PM -- 4:30 PM
Peak 15-Min: 4:15 PM -- 4:30 PM

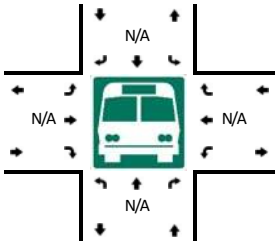


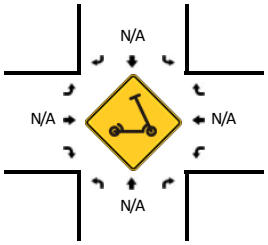












15-Min Count Period Beginning At	Kauhale St (Northbound)				Kauhale St (Southbound)				Pahoa District Park North Dwys (Eastbound)				Pahoa District Park North Dwys (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	0	2	0	0	0	2	15	1	11	0	1	0	0	0	0	0	32	
1:45 PM	1	9	0	0	0	10	7	0	12	0	1	0	0	0	0	0	40	
2:00 PM	0	8	0	0	0	7	17	2	15	0	0	0	0	0	0	0	49	
2:15 PM	1	5	0	0	0	14	23	4	19	0	1	0	0	0	0	0	67	188
2:30 PM	1	10	0	0	0	7	8	1	7	0	1	0	0	0	0	0	35	191
2:45 PM	0	5	0	0	0	5	21	4	22	0	0	0	0	0	0	0	57	208
3:00 PM	0	3	0	0	0	4	12	6	15	0	0	0	0	0	0	0	40	199
3:15 PM	1	3	0	0	0	7	11	1	3	0	0	0	0	0	0	0	26	158
3:30 PM	1	3	0	0	0	12	14	4	13	0	0	0	0	0	0	0	47	170
3:45 PM	0	9	0	0	0	11	14	2	16	0	1	0	0	0	0	0	53	166
4:00 PM	1	8	0	0	0	7	9	1	29	0	1	0	0	0	0	0	56	182
4:15 PM	0	10	0	0	0	13	20	3	24	0	0	0	0	0	0	0	70	226
4:30 PM	0	12	0	0	0	7	8	3	14	0	1	0	0	0	0	0	45	224
4:45 PM	0	13	0	0	0	7	2	1	5	0	2	0	0	0	0	0	30	201
5:00 PM	0	4	0	0	0	8	0	4	2	0	0	0	0	0	0	0	18	163
5:15 PM	0	14	0	0	0	6	2	4	0	0	1	0	0	0	0	0	27	120

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	40	0	0	0	52	80	12	96	0	0	0	0	0	0	0	280
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	4	0		0	0	0		0	0	0		0	0	0		4
Scooters																	

Comments:

Report generated on 10/13/2023 5:34 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

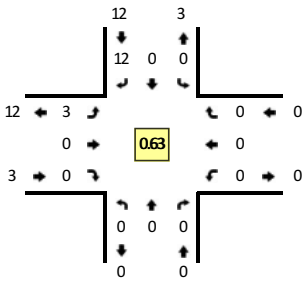
Type of peak hour being reported: Intersection Peak

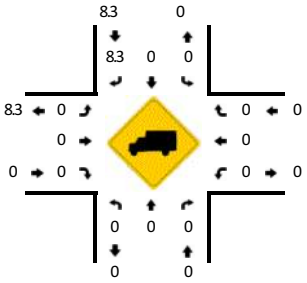
Method for determining peak hour: Total Entering Volume

LOCATION: Kauhale St -- Pahoa District Park South Dwy
CITY/STATE: Pahoa, HI

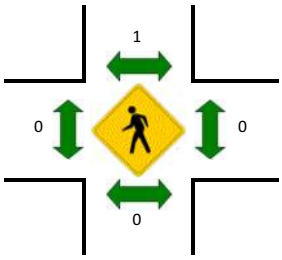
QC JOB #: 16351909
DATE: Wed, Oct 18 2023

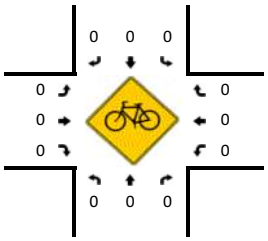
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:15 AM -- 7:30 AM

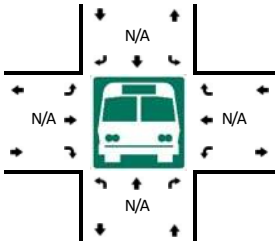


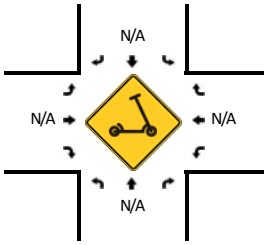


TRUE DATA TO IMPROVE MOBILITY









15-Min Count Period Beginning At	Kauhale St (Northbound)				Kauhale St (Southbound)				Pahoa District Park South Dwy (Eastbound)				Pahoa District Park South Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	
6:45 AM	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	3	4
7:00 AM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	6
7:15 AM	0	0	0	0	0	0	4	0	2	0	0	0	0	0	0	0	6	12
7:30 AM	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	3	14
7:45 AM	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	15

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	0	0	0	0	0	16	0	8	0	0	0	0	0	0	0	24
Heavy Trucks	0	0	0		0	0	4		0	0	0		0	0	0		4
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 10/24/2023 1:42 PM

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

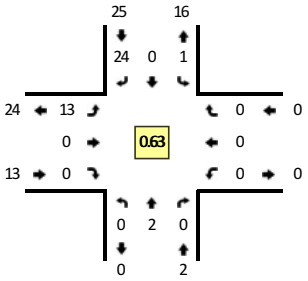
Type of peak hour being reported: User-Defined

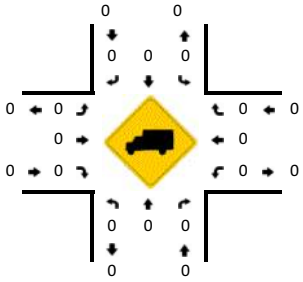
Method for determining peak hour: Total Entering Volume

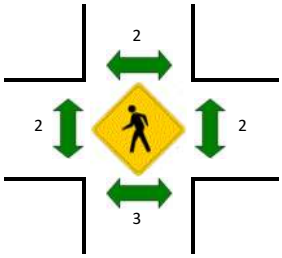
LOCATION: Kauhale St -- Pahoa District Park South Dwy
CITY/STATE: Pahoa, HI

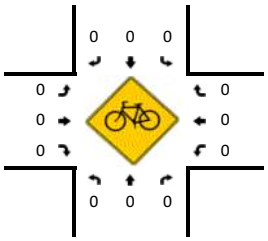
QC JOB #: 16351910
DATE: Wed, Oct 18 2023

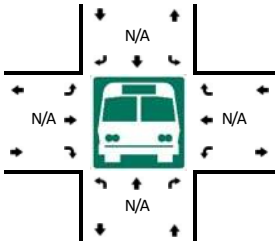
Peak-Hour: 3:30 PM -- 4:30 PM
Peak 15-Min: 4:15 PM -- 4:30 PM

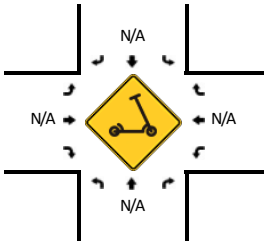












15-Min Count Period Beginning At	Kauhale St (Northbound)				Kauhale St (Southbound)				Pahoa District Park South Dwy (Eastbound)				Pahoa District Park South Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:30 PM	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	6	
1:45 PM	0	0	0	0	0	0	3	1	2	0	0	0	0	0	0	0	6	
2:00 PM	0	1	0	0	0	1	2	0	4	0	0	0	0	0	0	0	8	
2:15 PM	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4	24
2:30 PM	0	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0	5	23
2:45 PM	0	1	0	0	0	0	11	0	5	0	1	0	0	0	0	0	18	35
3:00 PM	0	1	0	0	0	0	5	0	5	0	0	0	0	0	0	0	11	38
3:15 PM	0	0	0	0	0	2	2	0	2	0	0	0	0	0	0	0	6	40
3:30 PM	0	1	0	0	0	0	4	1	3	0	0	0	0	0	0	0	9	44
3:45 PM	0	1	0	0	0	0	6	0	2	0	0	0	0	0	0	0	9	35
4:00 PM	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	6	30
4:15 PM	0	0	0	0	0	0	11	0	5	0	0	0	0	0	0	0	16	40
4:30 PM	0	0	0	0	0	0	4	2	5	0	0	0	0	0	0	0	11	42
4:45 PM	0	0	0	0	0	0	11	1	9	0	0	0	0	0	0	0	21	54
5:00 PM	0	0	0	0	0	0	9	0	6	0	0	0	0	0	0	0	15	63
5:15 PM	0	0	0	0	0	0	5	0	7	0	0	0	0	0	0	0	12	59

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	0	0	0	0	0	44	0	20	0	0	0	0	0	0	0	64
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/6/2023 10:13 AM

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

Traffic Data Service

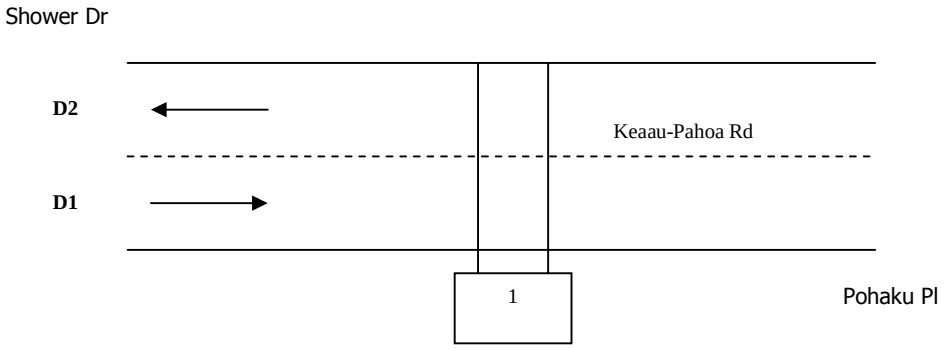
Traffic Station Sketch

N

Island: Hawaii

Area: Paradise Park

Section ID/Station #: B71013000420



	Meter #	File Name	GPS
1.	bg66	D0729009_B71013000420	19.58083, -155.0074
2.		D0729010_B71013000420	

Station Description: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Survey Beginning Date/Time:		Survey Ending Date/Time:
7/29/13 @ 0000		7/30/13 @ 2400

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

Remarks:	1298

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Keaau-Pahoa Rd		16		0130	

D1= Direction to End — D1: Pohaku Pl / KAIMU-CHAIN OF CRATER ROAD

D2= Direction to Begin — D2: Shower Dr / VOLCANO ROAD

Run Date: 2014/05/23

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2013 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 23300
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 07/29/2013															
12:00-12:15	25	12	37	06:00-06:15	64	210	274	12:00-12:15	186	178	364	06:00-06:15	146	70	216
12:15-12:30	15	23	38	06:15-06:30	99	243	342	12:15-12:30	238	144	382	06:15-06:30	140	78	218
12:30-12:45	27	11	38	06:30-06:45	121	270	391	12:30-12:45	198	164	362	06:30-06:45	140	74	214
12:45-01:00	17	9	26	06:45-07:00	97	263	360	12:45-01:00	208	126	334	06:45-07:00	111	62	173
01:00-01:15	13	7	20	07:00-07:15	119	277	396	01:00-01:15	199	124	323	07:00-07:15	124	60	184
01:15-01:30	17	10	27	07:15-07:30	113	302	415	01:15-01:30	236	132	368	07:15-07:30	107	55	162
01:30-01:45	10	10	20	07:30-07:45	115	267	382	01:30-01:45	189	137	326	07:30-07:45	101	59	160
01:45-02:00	18	9	27	07:45-08:00	106	276	382	01:45-02:00	180	118	298	07:45-08:00	95	43	138
02:00-02:15	7	7	14	08:00-08:15	123	240	363	02:00-02:15	215	111	326	08:00-08:15	98	46	144
02:15-02:30	5	7	12	08:15-08:30	103	244	347	02:15-02:30	186	116	302	08:15-08:30	109	46	155
02:30-02:45	9	16	25	08:30-08:45	113	258	371	02:30-02:45	186	108	294	08:30-08:45	100	39	139
02:45-03:00	6	15	21	08:45-09:00	109	222	331	02:45-03:00	175	116	291	08:45-09:00	66	36	102
03:00-03:15	6	24	30	09:00-09:15	135	256	391	03:00-03:15	155	111	266	09:00-09:15	58	47	105
03:15-03:30	6	15	21	09:15-09:30	119	242	361	03:15-03:30	168	101	269	09:15-09:30	71	43	114
03:30-03:45	6	20	26	09:30-09:45	143	213	356	03:30-03:45	203	124	327	09:30-09:45	70	30	100
03:45-04:00	11	26	37	09:45-10:00	124	207	331	03:45-04:00	243	95	338	09:45-10:00	68	21	89
04:00-04:15	6	30	36	10:00-10:15	145	214	359	04:00-04:15	204	94	298	10:00-10:15	66	25	91
04:15-04:30	9	57	66	10:15-10:30	165	181	346	04:15-04:30	260	98	358	10:15-10:30	73	23	96
04:30-04:45	3	50	53	10:30-10:45	133	226	359	04:30-04:45	223	113	336	10:30-10:45	42	21	63
04:45-05:00	9	49	58	10:45-11:00	169	146	315	04:45-05:00	251	83	334	10:45-11:00	41	26	67
05:00-05:15	11	73	84	11:00-11:15	189	158	347	05:00-05:15	191	111	302	11:00-11:15	39	16	55
05:15-05:30	13	99	112	11:15-11:30	181	182	363	05:15-05:30	226	73	299	11:15-11:30	26	26	52
05:30-05:45	24	137	161	11:30-11:45	183	163	346	05:30-05:45	209	81	290	11:30-11:45	28	17	45
05:45-06:00	27	143	170	11:45-12:00	235	130	365	05:45-06:00	174	84	258	11:45-12:00	25	8	33

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	453	1122	1575
AM - K FACTOR (%)			7.75
AM - D (%)	28.76	71.24	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM	07:00 AM to 08:00 AM	
AM - PEAK HR VOLUME	457	1122	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	930	400	1330
PM - K FACTOR (%)			6.55
PM - D (%)	69.92	30.08	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	938	431	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	453	1122	1575
AM - K FACTOR (%)			7.75
AM - D (%)	28.76	71.24	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	12:00 PM to 01:00 PM		
PM - PEAK HR VOLUME	830	612	1442
PM - K FACTOR (%)			7.10
PM - D (%)	57.56	42.44	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	11:45 AM to 12:45 PM		
PEAK HR VOLUME	857	616	1473
DIRECTIONAL PEAK			
PEAK HR TIME	11:45 AM to 12:45 PM	09:00 AM to 10:00 AM	
PEAK HR VOLUME	857	918	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	3,203	5,390	8,593
AM 12-HR PERIOD (00:00-12:00)	3,503	6,249	9,752
PM 6-HR PERIOD (12:00-18:00)	4,903	2,742	7,645
PM 12-HR PERIOD (12:00-24:00)	6,847	3,713	10,560
24 HOUR PERIOD	10,350	9,962	20,312
D (%)	50.96	49.04	100.00

Run Date: 2014/05/23

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2013 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 23300
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 07/30/2013															
12:00-12:15	12	5	17	06:00-06:15	81	275	356	12:00-12:15	213	212	425	06:00-06:15	329	109	438
12:15-12:30	20	4	24	06:15-06:30	133	347	480	12:15-12:30	218	227	445	06:15-06:30	325	104	429
12:30-12:45	14	3	17	06:30-06:45	144	398	542	12:30-12:45	200	220	420	06:30-06:45	274	93	367
12:45-01:00	21	8	29	06:45-07:00	180	414	594	12:45-01:00	241	184	425	06:45-07:00	231	80	311
01:00-01:15	11	5	16	07:00-07:15	174	386	560	01:00-01:15	203	199	402	07:00-07:15	218	76	294
01:15-01:30	9	7	16	07:15-07:30	192	406	598	01:15-01:30	230	229	459	07:15-07:30	216	65	281
01:30-01:45	11	16	27	07:30-07:45	159	380	539	01:30-01:45	232	216	448	07:30-07:45	184	70	254
01:45-02:00	10	6	16	07:45-08:00	135	279	414	01:45-02:00	263	205	468	07:45-08:00	207	58	265
02:00-02:15	9	7	16	08:00-08:15	94	289	383	02:00-02:15	228	205	433	08:00-08:15	133	89	222
02:15-02:30	9	15	24	08:15-08:30	126	297	423	02:15-02:30	255	216	471	08:15-08:30	162	46	208
02:30-02:45	7	23	30	08:30-08:45	127	331	458	02:30-02:45	292	190	482	08:30-08:45	125	46	171
02:45-03:00	6	20	26	08:45-09:00	137	282	419	02:45-03:00	264	158	422	08:45-09:00	118	43	161
03:00-03:15	7	15	22	09:00-09:15	121	249	370	03:00-03:15	291	172	463	09:00-09:15	115	45	160
03:15-03:30	9	11	20	09:15-09:30	118	291	409	03:15-03:30	314	194	508	09:15-09:30	99	57	156
03:30-03:45	8	27	35	09:30-09:45	147	276	423	03:30-03:45	346	220	566	09:30-09:45	101	55	156
03:45-04:00	9	39	48	09:45-10:00	140	254	394	03:45-04:00	386	150	536	09:45-10:00	80	38	118
04:00-04:15	7	28	35	10:00-10:15	162	275	437	04:00-04:15	371	155	526	10:00-10:15	59	33	92
04:15-04:30	13	59	72	10:15-10:30	156	260	416	04:15-04:30	380	169	549	10:15-10:30	101	40	141
04:30-04:45	9	64	73	10:30-10:45	144	257	401	04:30-04:45	360	135	495	10:30-10:45	70	27	97
04:45-05:00	11	71	82	10:45-11:00	147	213	360	04:45-05:00	387	160	547	10:45-11:00	66	24	90
05:00-05:15	13	79	92	11:00-11:15	196	236	432	05:00-05:15	396	139	535	11:00-11:15	46	15	61
05:15-05:30	14	139	153	11:15-11:30	182	230	412	05:15-05:30	424	143	567	11:15-11:30	47	27	74
05:30-05:45	29	183	212	11:30-11:45	216	235	451	05:30-05:45	340	131	471	11:30-11:45	28	12	40
05:45-06:00	51	204	255	11:45-12:00	178	211	389	05:45-06:00	349	118	467	11:45-12:00	29	12	41

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	690	1604	2294
AM - K FACTOR (%)			8.14
AM - D (%)	30.08	69.92	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM	06:30 AM to 07:30 AM	
AM - PEAK HR VOLUME	705	1604	

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	1483	694	2177
PM - K FACTOR (%)			7.73
PM - D (%)	68.12	31.88	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:30 PM to 05:30 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	1567	736	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM		
AM - PEAK HR VOLUME	690	1604	2294
AM - K FACTOR (%)			8.14
AM - D (%)	30.08	69.92	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	1483	694	2177
PM - K FACTOR (%)			7.73
PM - D (%)	68.12	31.88	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	1038	816	1854
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	09:15 AM to 10:15 AM	
PEAK HR VOLUME	1039	1096	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	3,589	7,071	10,660
AM 12-HR PERIOD (00:00-12:00)	3,908	8,109	12,017
PM 6-HR PERIOD (12:00-18:00)	7,183	4,347	11,530
PM 12-HR PERIOD (12:00-24:00)	10,546	5,611	16,157
24 HOUR PERIOD	14,454	13,720	28,174
D (%)	51.30	48.70	100.00

Run Date: 2014/05/23

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2013

Site ID: B71013000420 **Route No:** 130 **Date From:** 2013/07/29 0:00
Town: Hawaii **Direction:** +MP **Date To:** 2013/07/30 23:45
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	78	0.16%	155
PC	36773	75.84%	73546
2A-4T	10614	21.89%	21228
LIGHT VEHICLE TOTALS	47465	97.89%	94929
	HEAVY VEHICLES		
Bus	72	0.15%	180
SINGLE UNIT TRUCK			
2A-6T	177	0.37%	354
3A-SU	540	1.11%	1620
4A-SU	38	0.08%	152
SINGLE-TRAILER TRUCKS			
4A-ST	60	0.12%	240
5A-ST	45	0.09%	225
6A-ST	34	0.07%	204
MULTI-TRAILER TRUCKS			
5A-MT	27	0.06%	135
6A-MT	1	0.00%	6
7A-MT	28	0.06%	196
HEAVY VEHICLE TOTALS	1022	2.11%	3312
CLASSIFIED VEHICLES TOTALS	48487 (A)	100.00%	98241 (B)
UNCLASSIFIED VEHICLES TOTALS	-1	-0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.987

ROADTUBE EQUIVALENT(B/2) = 49121 (C)

PEAK HOUR VOLUME : 2117 **2013/07/30 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)	**18**	**(65A-1) 0.85%**	**413**	**23300**	**(65A-2) 1.77%**	**9.09%**
COMBINATION (TYPE 8-13)	**4**	**(65B-1) 0.19%**	**97**		**(65B-2) 0.42%**	**9.09%**

Traffic Data Service

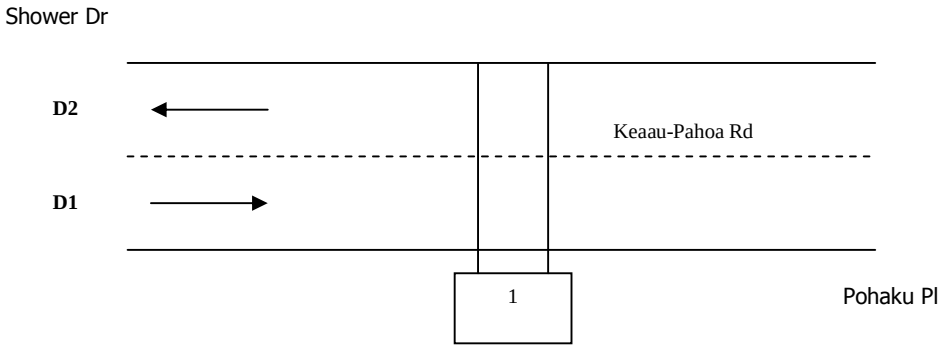
Traffic Station Sketch

N

Island: Hawaii

Area: Paradise Park

Section ID/Station #: B71013000420



	Meter #	File Name	GPS
1.	bg89	D0306001_B71013000420	19.58083, -155.0074
2.		D0306002_B71013000420	

Station Description: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Survey Beginning Date/Time:		Survey Ending Date/Time:
3/6/14@ 0000		3/7/14@ 2400

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

Remarks:	1298

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Keaau-Pahoa Rd		16		0130	

D1= Direction to End — D1: Pohaku Pl / KAIMU-CHAIN OF CRATER ROAD

D2= Direction to Begin — D2: Shower Dr / VOLCANO ROAD

Run Date: 2015/03/17

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2014 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 24400
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 03/06/2014															
12:00-12:15	25	11	36	06:00-06:15	37	244	281	12:00-12:15	158	191	349	06:00-06:15	324	86	410
12:15-12:30	25	11	36	06:15-06:30	61	328	389	12:15-12:30	195	193	388	06:15-06:30	316	88	404
12:30-12:45	17	6	23	06:30-06:45	88	344	432	12:30-12:45	180	193	373	06:30-06:45	254	102	356
12:45-01:00	13	5	18	06:45-07:00	84	206	290	12:45-01:00	202	182	384	06:45-07:00	271	89	360
01:00-01:15	15	4	19	07:00-07:15	92	254	346	01:00-01:15	202	199	401	07:00-07:15	248	66	314
01:15-01:30	8	11	19	07:15-07:30	110	252	362	01:15-01:30	211	181	392	07:15-07:30	252	88	340
01:30-01:45	14	9	23	07:30-07:45	126	254	380	01:30-01:45	210	199	409	07:30-07:45	212	71	283
01:45-02:00	12	8	20	07:45-08:00	146	288	434	01:45-02:00	216	194	410	07:45-08:00	193	66	259
02:00-02:15	15	14	29	08:00-08:15	162	299	461	02:00-02:15	232	212	444	08:00-08:15	186	50	236
02:15-02:30	11	6	17	08:15-08:30	114	220	334	02:15-02:30	250	198	448	08:15-08:30	164	49	213
02:30-02:45	8	11	19	08:30-08:45	82	130	212	02:30-02:45	239	225	464	08:30-08:45	157	50	207
02:45-03:00	4	16	20	08:45-09:00	111	234	345	02:45-03:00	264	195	459	08:45-09:00	141	42	183
03:00-03:15	3	9	12	09:00-09:15	89	168	257	03:00-03:15	248	179	427	09:00-09:15	112	43	155
03:15-03:30	7	17	24	09:15-09:30	135	196	331	03:15-03:30	302	169	471	09:15-09:30	126	47	173
03:30-03:45	7	33	40	09:30-09:45	101	216	317	03:30-03:45	322	157	479	09:30-09:45	105	42	147
03:45-04:00	3	28	31	09:45-10:00	116	202	318	03:45-04:00	314	180	494	09:45-10:00	95	33	128
04:00-04:15	1	35	36	10:00-10:15	133	217	350	04:00-04:15	328	140	468	10:00-10:15	84	34	118
04:15-04:30	10	50	60	10:15-10:30	134	191	325	04:15-04:30	336	161	497	10:15-10:30	92	21	113
04:30-04:45	10	72	82	10:30-10:45	129	200	329	04:30-04:45	329	168	497	10:30-10:45	77	23	100
04:45-05:00	7	75	82	10:45-11:00	152	226	378	04:45-05:00	335	121	456	10:45-11:00	49	15	64
05:00-05:15	15	89	104	11:00-11:15	153	180	333	05:00-05:15	336	130	466	11:00-11:15	46	16	62
05:15-05:30	27	130	157	11:15-11:30	162	190	352	05:15-05:30	335	129	464	11:15-11:30	52	13	65
05:30-05:45	24	154	178	11:30-11:45	184	179	363	05:30-05:45	351	126	477	11:30-11:45	46	19	65
05:45-06:00	25	172	197	11:45-12:00	172	166	338	05:45-06:00	322	122	444	11:45-12:00	32	10	42

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	544	1093	1637
AM - K FACTOR (%)			6.58
AM - D (%)	33.23	66.77	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM	06:15 AM to 07:15 AM	
AM - PEAK HR VOLUME	548	1132	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	1307	649	1956
PM - K FACTOR (%)			7.86
PM - D (%)	66.82	33.18	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:45 PM to 05:45 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	1357	685	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM		
AM - PEAK HR VOLUME	544	1093	1637
AM - K FACTOR (%)			6.58
AM - D (%)	33.23	66.77	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	1307	649	1956
PM - K FACTOR (%)			7.86
PM - D (%)	66.82	33.18	100.00

NON-COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	985	830	1815
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	10:00 AM to 11:00 AM	
PEAK HR VOLUME	985	834	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,873	5,384	8,257
AM 12-HR PERIOD (00:00-12:00)	3,179	6,360	9,539
PM 6-HR PERIOD (12:00-18:00)	6,417	4,144	10,561
PM 12-HR PERIOD (12:00-24:00)	10,051	5,307	15,358
24 HOUR PERIOD	13,230	11,667	24,897
D (%)	53.14	46.86	100.00

Run Date: 2015/03/17

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2014 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 24400
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 03/07/2014															
12:00-12:15	28	16	44	06:00-06:15	42	214	256	12:00-12:15	210	189	399	06:00-06:15	261	117	378
12:15-12:30	20	13	33	06:15-06:30	62	308	370	12:15-12:30	237	195	432	06:15-06:30	266	116	382
12:30-12:45	15	8	23	06:30-06:45	73	358	431	12:30-12:45	181	196	377	06:30-06:45	223	105	328
12:45-01:00	15	13	28	06:45-07:00	81	301	382	12:45-01:00	245	237	482	06:45-07:00	230	83	313
01:00-01:15	13	3	16	07:00-07:15	83	244	327	01:00-01:15	202	204	406	07:00-07:15	263	84	347
01:15-01:30	17	8	25	07:15-07:30	99	251	350	01:15-01:30	210	199	409	07:15-07:30	242	78	320
01:30-01:45	17	8	25	07:30-07:45	149	292	441	01:30-01:45	210	213	423	07:30-07:45	179	82	261
01:45-02:00	15	16	31	07:45-08:00	165	249	414	01:45-02:00	219	212	431	07:45-08:00	199	64	263
02:00-02:15	2	6	8	08:00-08:15	135	267	402	02:00-02:15	230	240	470	08:00-08:15	154	60	214
02:15-02:30	9	13	22	08:15-08:30	114	254	368	02:15-02:30	274	228	502	08:15-08:30	169	65	234
02:30-02:45	3	14	17	08:30-08:45	116	204	320	02:30-02:45	273	225	498	08:30-08:45	150	53	203
02:45-03:00	6	8	14	08:45-09:00	104	209	313	02:45-03:00	305	214	519	08:45-09:00	132	48	180
03:00-03:15	7	18	25	09:00-09:15	117	189	306	03:00-03:15	299	184	483	09:00-09:15	146	43	189
03:15-03:30	7	20	27	09:15-09:30	105	184	289	03:15-03:30	306	185	491	09:15-09:30	173	49	222
03:30-03:45	3	32	35	09:30-09:45	122	226	348	03:30-03:45	320	172	492	09:30-09:45	167	57	224
03:45-04:00	7	23	30	09:45-10:00	113	215	328	03:45-04:00	301	170	471	09:45-10:00	128	49	177
04:00-04:15	5	31	36	10:00-10:15	138	206	344	04:00-04:15	300	169	469	10:00-10:15	99	38	137
04:15-04:30	6	46	52	10:15-10:30	128	200	328	04:15-04:30	324	168	492	10:15-10:30	125	28	153
04:30-04:45	7	68	75	10:30-10:45	142	224	366	04:30-04:45	333	196	529	10:30-10:45	106	31	137
04:45-05:00	7	55	62	10:45-11:00	170	214	384	04:45-05:00	296	148	444	10:45-11:00	79	36	115
05:00-05:15	13	82	95	11:00-11:15	152	192	344	05:00-05:15	290	143	433	11:00-11:15	71	22	93
05:15-05:30	15	115	130	11:15-11:30	171	214	385	05:15-05:30	306	139	445	11:15-11:30	65	28	93
05:30-05:45	16	186	202	11:30-11:45	202	203	405	05:30-05:45	323	146	469	11:30-11:45	56	26	82
05:45-06:00	25	177	202	11:45-12:00	188	198	386	05:45-06:00	290	121	411	11:45-12:00	44	15	59

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM		
AM - PEAK HR VOLUME	563	1062	1625
AM - K FACTOR (%)			6.27
AM - D (%)	34.65	65.35	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM	06:15 AM to 07:15 AM	
AM - PEAK HR VOLUME	563	1211	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	1258	703	1961
PM - K FACTOR (%)			7.56
PM - D (%)	64.15	35.85	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	1258	711	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM		
AM - PEAK HR VOLUME	563	1062	1625
AM - K FACTOR (%)			6.27
AM - D (%)	34.65	65.35	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	02:15 PM to 03:15 PM		
PM - PEAK HR VOLUME	1151	851	2002
PM - K FACTOR (%)			7.72
PM - D (%)	57.49	42.51	100.00

NON-COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	1082	907	1989
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	1082	907	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,971	5,616	8,587
AM 12-HR PERIOD (00:00-12:00)	3,249	6,595	9,844
PM 6-HR PERIOD (12:00-18:00)	6,484	4,493	10,977
PM 12-HR PERIOD (12:00-24:00)	10,211	5,870	16,081
24 HOUR PERIOD	13,460	12,465	25,925
D (%)	51.92	48.08	100.00

Run Date: 2015/03/20

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2014

Site ID: B71013000420 **Route No:** 130 **Date From:** 2014/03/06 0:00
Town: Hawaii **Direction:** +MP **Date To:** 2014/03/07 23:45
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

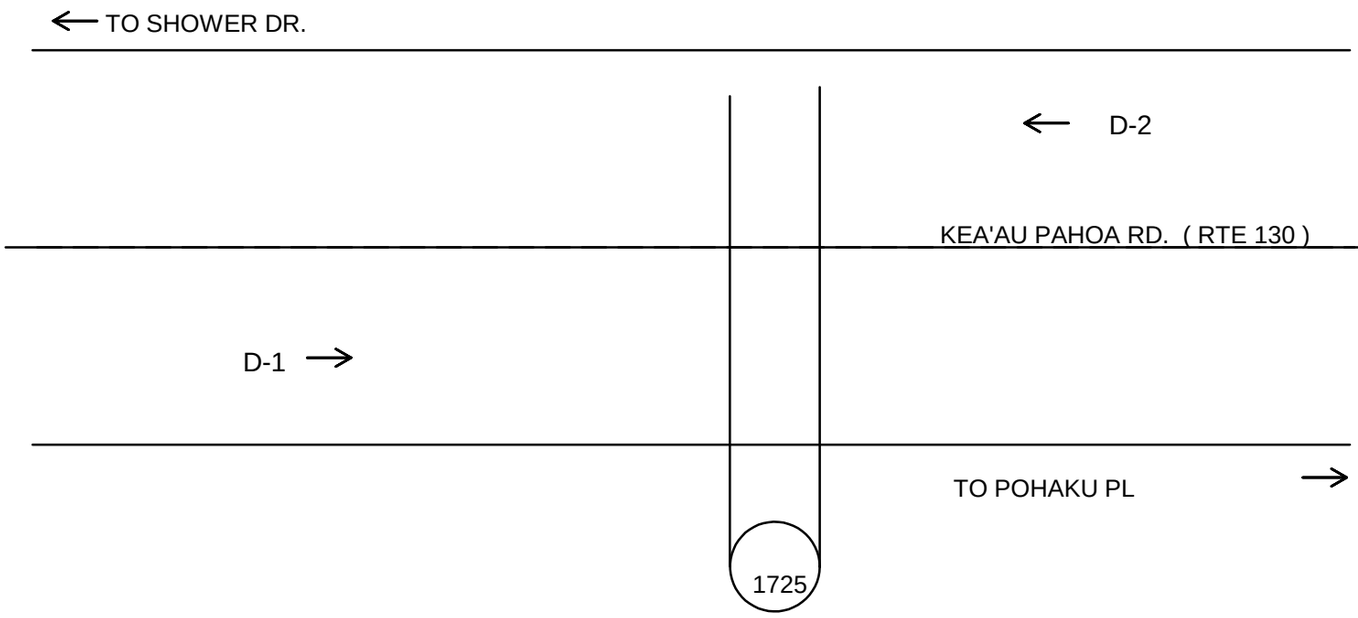
	VOLUME	%	NUMBER OF AXLES
Cycles	208	0.41%	417
PC	39159	77.05%	78318
2A-4T	10663	20.98%	21326
LIGHT VEHICLE TOTALS	50030	98.44%	100061
	HEAVY VEHICLES		
Bus	207	0.41%	517
SINGLE UNIT TRUCK			
2A-6T	118	0.23%	236
3A-SU	230	0.45%	690
4A-SU	35	0.07%	140
SINGLE-TRAILER TRUCKS			
4A-ST	95	0.19%	380
5A-ST	48	0.09%	240
6A-ST	18	0.04%	108
MULTI-TRAILER TRUCKS			
5A-MT	17	0.03%	85
6A-MT	2	0.00%	12
7A-MT	20	0.04%	140
HEAVY VEHICLE TOTALS	790	1.55%	2548
CLASSIFIED VEHICLES TOTALS	50820 (A)	100.00%	102609 (B)
UNCLASSIFIED VEHICLES TOTALS	2	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.991

ROADTUBE EQUIVALENT(B/2) = 51305 (C)

PEAK HOUR VOLUME : 1989 **2014/03/07 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)	**22**	**(65A-1) 1.11%**	**295**	**24400**	**(65A-2) 1.21%**	**8.15%**
COMBINATION (TYPE 8-13)	**6**	**(65B-1) 0.30%**	**100**		**(65B-2) 0.41%**	**8.15%**

ISLAND: HAWAII
AREA: PARADISE PARK



Station No:	B71 0130 00420

Station Location:			
Kea'au Pahoa Road between Shower Drive & Pohaku PL			
Station Mileage:	4.60	GPS Coord (Latitude):	19.58014 N
		GPS Coord (Longitude):	155.00678 W
Begin Survey (Date/Time):	4-8-14 0000	End Survey (Date/Time):	4-10-14 0000
Survey Method: LOOP **HOSE** OTHER		Survey Type: VOL **CLASS** SPEED OTHER	
Survey Crew:	Field crew	Module No.:	

HPMS DATA

Segment Description:

KEA'AU PAHOA ROAD - OLD KEAAU-PAHOA ROAD (RTE. 139) ROAD TO AINALOA BOULEVARD

Segment Begin LRS	4.20	Segment End LRS	4.78	Length	0.58

Facility Name	Juris	Func Class	Area Type	Route No.	Route Mile	D-1 = Direction to End of Route / D-2 = Direction to Beginning of Route	
KEA'AU PAHOA ROAD	S	6	1	130	4.60	D-1	TO KAIMU-CHAIN OF CRATER ROAD
						D-2	TO VOLCANO ROAD

Sketch By: RG Date: 4/14/2014 SLD: 2009

Run Date: 2015/06/25

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2014 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 24400
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/08/2014															
12:00-12:15	30	13	43	06:00-06:15	29	266	295	12:00-12:15	205	144	349	06:00-06:15	436	71	507
12:15-12:30	40	10	50	06:15-06:30	51	360	411	12:15-12:30	218	151	369	06:15-06:30	447	39	486
12:30-12:45	19	6	25	06:30-06:45	65	433	498	12:30-12:45	204	139	343	06:30-06:45	449	40	489
12:45-01:00	30	8	38	06:45-07:00	57	476	533	12:45-01:00	256	119	375	06:45-07:00	432	61	493
01:00-01:15	17	5	22	07:00-07:15	62	488	550	01:00-01:15	218	167	385	07:00-07:15	369	56	425
01:15-01:30	13	2	15	07:15-07:30	87	463	550	01:15-01:30	234	163	397	07:15-07:30	337	83	420
01:30-01:45	14	7	21	07:30-07:45	92	461	553	01:30-01:45	265	124	389	07:30-07:45	293	47	340
01:45-02:00	20	13	33	07:45-08:00	153	435	588	01:45-02:00	254	171	425	07:45-08:00	250	40	290
02:00-02:15	21	4	25	08:00-08:15	173	290	463	02:00-02:15	249	175	424	08:00-08:15	236	35	271
02:15-02:30	18	7	25	08:15-08:30	158	199	357	02:15-02:30	278	141	419	08:15-08:30	230	42	272
02:30-02:45	12	10	22	08:30-08:45	120	166	286	02:30-02:45	225	182	407	08:30-08:45	230	50	280
02:45-03:00	4	16	20	08:45-09:00	44	204	248	02:45-03:00	312	153	465	08:45-09:00	175	40	215
03:00-03:15	3	15	18	09:00-09:15	118	176	294	03:00-03:15	308	116	424	09:00-09:15	223	26	249
03:15-03:30	3	11	14	09:15-09:30	130	150	280	03:15-03:30	274	136	410	09:15-09:30	173	35	208
03:30-03:45	8	18	26	09:30-09:45	110	187	297	03:30-03:45	414	97	511	09:30-09:45	190	36	226
03:45-04:00	19	30	49	09:45-10:00	179	138	317	03:45-04:00	334	149	483	09:45-10:00	107	27	134
04:00-04:15	8	30	38	10:00-10:15	157	165	322	04:00-04:15	389	86	475	10:00-10:15	129	19	148
04:15-04:30	10	54	64	10:15-10:30	118	194	312	04:15-04:30	409	110	519	10:15-10:30	141	22	163
04:30-04:45	16	68	84	10:30-10:45	105	177	282	04:30-04:45	371	129	500	10:30-10:45	93	12	105
04:45-05:00	10	83	93	10:45-11:00	155	165	320	04:45-05:00	386	104	490	10:45-11:00	94	15	109
05:00-05:15	9	77	86	11:00-11:15	156	193	349	05:00-05:15	453	63	516	11:00-11:15	70	15	85
05:15-05:30	8	118	126	11:15-11:30	179	172	351	05:15-05:30	384	125	509	11:15-11:30	63	11	74
05:30-05:45	16	163	179	11:30-11:45	159	169	328	05:30-05:45	407	91	498	11:30-11:45	50	14	64
05:45-06:00	34	206	240	11:45-12:00	215	174	389	05:45-06:00	437	80	517	11:45-12:00	62	11	73

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	394	1847	2241
AM - K FACTOR (%)			8.22
AM - D (%)	17.58	82.42	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM	06:45 AM to 07:45 AM	
AM - PEAK HR VOLUME	604	1888	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:00 PM to 06:00 PM		
PM - PEAK HR VOLUME	1681	359	2040
PM - K FACTOR (%)			7.49
PM - D (%)	82.40	17.60	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:45 PM to 06:45 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	1769	498	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	394	1847	2241
AM - K FACTOR (%)			8.22
AM - D (%)	17.58	82.42	100.00

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:00 PM to 06:00 PM		
PM - PEAK HR VOLUME	1681	359	2040
PM - K FACTOR (%)			7.49
PM - D (%)	82.40	17.60	100.00

NON-COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	1064	651	1715
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	10:15 AM to 11:15 AM	
PEAK HR VOLUME	1064	729	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,872	6,301	9,173
AM 12-HR PERIOD (00:00-12:00)	3,254	7,275	10,529
PM 6-HR PERIOD (12:00-18:00)	7,484	3,115	10,599
PM 12-HR PERIOD (12:00-24:00)	12,763	3,962	16,725
24 HOUR PERIOD	16,017	11,237	27,254
D (%)	58.77	41.23	100.00

Run Date: 2015/06/25

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2014 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 24400
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/09/2014															
12:00-12:15	45	8	53	06:00-06:15	26	252	278	12:00-12:15	185	164	349	06:00-06:15	398	68	466
12:15-12:30	43	12	55	06:15-06:30	54	379	433	12:15-12:30	211	124	335	06:15-06:30	434	75	509
12:30-12:45	32	11	43	06:30-06:45	56	489	545	12:30-12:45	188	166	354	06:30-06:45	414	65	479
12:45-01:00	17	5	22	06:45-07:00	64	498	562	12:45-01:00	164	161	325	06:45-07:00	484	30	514
01:00-01:15	24	8	32	07:00-07:15	60	489	549	01:00-01:15	237	139	376	07:00-07:15	398	54	452
01:15-01:30	12	10	22	07:15-07:30	111	453	564	01:15-01:30	237	154	391	07:15-07:30	376	61	437
01:30-01:45	19	5	24	07:30-07:45	115	439	554	01:30-01:45	260	151	411	07:30-07:45	298	44	342
01:45-02:00	28	12	40	07:45-08:00	164	386	550	01:45-02:00	275	158	433	07:45-08:00	278	62	340
02:00-02:15	17	5	22	08:00-08:15	166	275	441	02:00-02:15	257	88	345	08:00-08:15	209	49	258
02:15-02:30	17	4	21	08:15-08:30	127	255	382	02:15-02:30	247	139	386	08:15-08:30	188	43	231
02:30-02:45	12	12	24	08:30-08:45	110	201	311	02:30-02:45	224	169	393	08:30-08:45	227	57	284
02:45-03:00	6	11	17	08:45-09:00	114	281	395	02:45-03:00	240	166	406	08:45-09:00	232	39	271
03:00-03:15	8	17	25	09:00-09:15	139	228	367	03:00-03:15	251	123	374	09:00-09:15	174	48	222
03:15-03:30	5	22	27	09:15-09:30	115	215	330	03:15-03:30	265	117	382	09:15-09:30	147	48	195
03:30-03:45	11	20	31	09:30-09:45	85	239	324	03:30-03:45	324	98	422	09:30-09:45	149	40	189
03:45-04:00	6	36	42	09:45-10:00	146	202	348	03:45-04:00	388	68	456	09:45-10:00	124	56	180
04:00-04:15	8	31	39	10:00-10:15	137	182	319	04:00-04:15	407	65	472	10:00-10:15	112	43	155
04:15-04:30	11	58	69	10:15-10:30	145	198	343	04:15-04:30	379	72	451	10:15-10:30	119	33	152
04:30-04:45	12	56	68	10:30-10:45	136	200	336	04:30-04:45	442	59	501	10:30-10:45	116	19	135
04:45-05:00	13	79	92	10:45-11:00	155	167	322	04:45-05:00	384	97	481	10:45-11:00	61	23	84
05:00-05:15	12	104	116	11:00-11:15	187	172	359	05:00-05:15	397	65	462	11:00-11:15	52	19	71
05:15-05:30	13	120	133	11:15-11:30	190	142	332	05:15-05:30	418	54	472	11:15-11:30	85	22	107
05:30-05:45	23	162	185	11:30-11:45	131	162	293	05:30-05:45	430	75	505	11:30-11:45	74	13	87
05:45-06:00	43	202	245	11:45-12:00	152	160	312	05:45-06:00	473	67	540	11:45-12:00	52	18	70

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	350	1879	2229
AM - K FACTOR (%)			8.18
AM - D (%)	15.70	84.30	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM	06:30 AM to 07:30 AM	
AM - PEAK HR VOLUME	572	1929	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:30 PM to 06:30 PM		
PM - PEAK HR VOLUME	1735	285	2020
PM - K FACTOR (%)			7.41
PM - D (%)	85.89	14.11	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:30 PM to 06:30 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	1735	406	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	350	1879	2229
AM - K FACTOR (%)			8.18
AM - D (%)	15.70	84.30	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:30 PM to 06:30 PM		
PM - PEAK HR VOLUME	1735	285	2020
PM - K FACTOR (%)			7.41
PM - D (%)	85.89	14.11	100.00

NON-COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:00 PM to 02:00 PM		
PEAK HR VOLUME	1009	602	1611
DIRECTIONAL PEAK			
PEAK HR TIME	01:30 PM to 02:30 PM	09:00 AM to 10:00 AM	
PEAK HR VOLUME	1039	884	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,885	6,664	9,549
AM 12-HR PERIOD (00:00-12:00)	3,322	7,674	10,996
PM 6-HR PERIOD (12:00-18:00)	7,283	2,739	10,022
PM 12-HR PERIOD (12:00-24:00)	12,484	3,768	16,252
24 HOUR PERIOD	15,806	11,442	27,248
D (%)	58.01	41.99	100.00

Run Date: 2015/06/25

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2014

Site ID: B71013000420 **Route No:** 130 **Date From:** 2014/04/08 0:00
Town: Hawaii **Direction:** +MP **Date To:** 2014/04/09 23:45
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	5396	9.90%	10791
PC	33413	61.31%	66826
2A-4T	6931	12.72%	13862
LIGHT VEHICLE TOTALS	45740	83.92%	91479
	HEAVY VEHICLES		
Bus	4685	8.60%	11712
SINGLE UNIT TRUCK			
2A-6T	2377	4.36%	4754
3A-SU	151	0.28%	453
4A-SU	14	0.03%	56
SINGLE-TRAILER TRUCKS			
4A-ST	1099	2.02%	4396
5A-ST	47	0.09%	235
6A-ST	2	0.00%	12
MULTI-TRAILER TRUCKS			
5A-MT	315	0.58%	1575
6A-MT	11	0.02%	66
7A-MT	61	0.11%	427
HEAVY VEHICLE TOTALS	8762	16.08%	23686
CLASSIFIED VEHICLES TOTALS	54502 (A)	100.00%	115166 (B)
UNCLASSIFIED VEHICLES TOTALS	0	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.946

ROADTUBE EQUIVALENT(B/2) = 57583 (C)

PEAK HOUR VOLUME : 2241 **2014/04/08 07:00**	**PEAK HOUR TRUCK VOLUME**	**% TOTAL PEAK HOUR VOLUME**	**24 HOUR TRUCK VOLUME**	**AADT**	**% OF AADT**	**HPMS K-FACTOR (PEAK/AADT) (ITEM 66)**
SINGLE UNIT TRUCKS (TYPE 4-7)	**296**	**(65A-1) 13.21%**	**3613**	**24400**	**(65A-2) 14.81%**	**9.18%**
COMBINATION (TYPE 8-13)	**85**	**(65B-1) 3.79%**	**767**		**(65B-2) 3.14%**	**9.18%**

Traffic Data Service

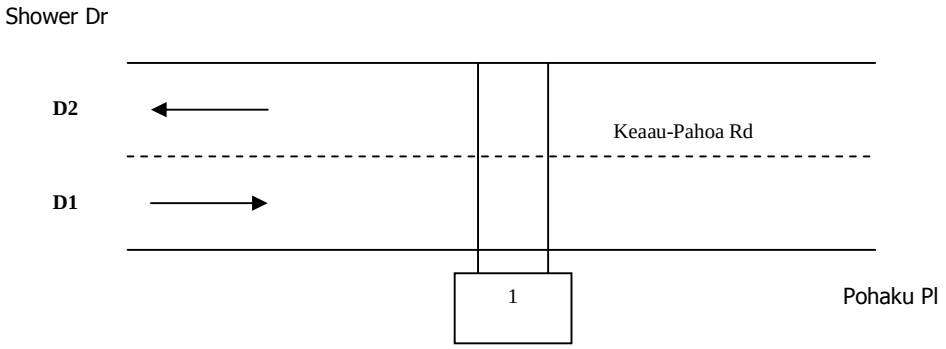
Traffic Station Sketch

N

Island: Hawaii

Area: Paradise Park

Section ID/Station #: B71013000420



	Meter #	File Name	GPS
1.	bg66	D0812019_B71013000420	19.58083, -155.0074
2.		D0812020_B71013000420	

Station Description: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Survey Beginning Date/Time:		Survey Ending Date/Time:
8/12/15@ 0000		8/13/15@ 2400

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

Remarks:	1298

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Keaau-Pahoa Rd		16		0130	

D1= Direction to End — D1: Pohaku Pl / KAIMU-CHAIN OF CRATER ROAD

D2= Direction to Begin — D2: Shower Dr / VOLCANO ROAD

Run Date: 2016/05/18

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2015 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 20000
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 08/12/2015															
12:00-12:15	11	25	36	06:00-06:15	258	28	286	12:00-12:15	127	143	270	06:00-06:15	69	226	295
12:15-12:30	8	29	37	06:15-06:30	290	44	334	12:15-12:30	152	133	285	06:15-06:30	58	259	317
12:30-12:45	5	14	19	06:30-06:45	307	13	320	12:30-12:45	144	121	265	06:30-06:45	58	200	258
12:45-01:00	10	18	28	06:45-07:00	274	0	274	12:45-01:00	154	139	293	06:45-07:00	69	170	239
01:00-01:15	5	10	15	07:00-07:15	245	0	245	01:00-01:15	172	123	295	07:00-07:15	39	225	264
01:15-01:30	5	17	22	07:15-07:30	104	0	104	01:15-01:30	192	116	308	07:15-07:30	44	215	259
01:30-01:45	11	14	25	07:30-07:45	192	0	192	01:30-01:45	116	204	320	07:30-07:45	44	168	212
01:45-02:00	4	5	9	07:45-08:00	191	15	206	01:45-02:00	110	189	299	07:45-08:00	39	154	193
02:00-02:15	14	7	21	08:00-08:15	172	123	295	02:00-02:15	128	176	304	08:00-08:15	41	146	187
02:15-02:30	16	8	24	08:15-08:30	185	47	232	02:15-02:30	122	231	353	08:15-08:30	42	125	167
02:30-02:45	14	3	17	08:30-08:45	210	66	276	02:30-02:45	128	167	295	08:30-08:45	46	141	187
02:45-03:00	18	2	20	08:45-09:00	189	83	272	02:45-03:00	134	179	313	08:45-09:00	38	102	140
03:00-03:15	16	14	30	09:00-09:15	205	88	293	03:00-03:15	113	228	341	09:00-09:15	40	97	137
03:15-03:30	17	10	27	09:15-09:30	196	68	264	03:15-03:30	115	199	314	09:15-09:30	48	91	139
03:30-03:45	34	2	36	09:30-09:45	173	78	251	03:30-03:45	97	222	319	09:30-09:45	54	76	130
03:45-04:00	34	8	42	09:45-10:00	154	96	250	03:45-04:00	99	239	338	09:45-10:00	34	73	107
04:00-04:15	41	6	47	10:00-10:15	210	80	290	04:00-04:15	78	228	306	10:00-10:15	28	87	115
04:15-04:30	54	6	60	10:15-10:30	168	124	292	04:15-04:30	113	240	353	10:15-10:30	36	79	115
04:30-04:45	85	8	93	10:30-10:45	150	110	260	04:30-04:45	76	264	340	10:30-10:45	16	70	86
04:45-05:00	117	9	126	10:45-11:00	135	110	245	04:45-05:00	34	271	305	10:45-11:00	29	42	71
05:00-05:15	104	9	113	11:00-11:15	171	104	275	05:00-05:15	60	217	277	11:00-11:15	21	35	56
05:15-05:30	117	17	134	11:15-11:30	148	112	260	05:15-05:30	69	273	342	11:15-11:30	11	59	70
05:30-05:45	206	20	226	11:30-11:45	152	107	259	05:30-05:45	62	304	366	11:30-11:45	20	29	49
05:45-06:00	163	26	189	11:45-12:00	139	124	263	05:45-06:00	22	221	243	11:45-12:00	14	38	52

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM		
AM - PEAK HR VOLUME	1129	85	1214
AM - K FACTOR (%)			6.42
AM - D (%)	93.00	7.00	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM	08:00 AM to 09:00 AM	
AM - PEAK HR VOLUME	1129	319	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	366	971	1337
PM - K FACTOR (%)			7.07
PM - D (%)	27.37	72.63	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	04:45 PM to 05:45 PM	
PM - PEAK HR VOLUME	424	1065	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM		
AM - PEAK HR VOLUME	1129	85	1214
AM - K FACTOR (%)			6.42
AM - D (%)	93.00	7.00	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	366	971	1337
PM - K FACTOR (%)			7.07
PM - D (%)	27.37	72.63	100.00

NON-COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:30 PM to 02:30 PM		
PEAK HR VOLUME	476	800	1276
DIRECTIONAL PEAK			
PEAK HR TIME	09:15 AM to 10:15 AM	01:30 PM to 02:30 PM	
PEAK HR VOLUME	733	800	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	4,618	1,620	6,238
AM 12-HR PERIOD (00:00-12:00)	5,727	1,907	7,634
PM 6-HR PERIOD (12:00-18:00)	2,617	4,827	7,444
PM 12-HR PERIOD (12:00-24:00)	3,555	7,734	11,289
24 HOUR PERIOD	9,282	9,641	18,923
D (%)	49.05	50.95	100.00

Run Date: 2016/05/18

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2015 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 20000
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 08/13/2015															
12:00-12:15	25	23	48	06:00-06:15	250	29	279	12:00-12:15	115	99	214	06:00-06:15	62	205	267
12:15-12:30	13	29	42	06:15-06:30	294	27	321	12:15-12:30	149	129	278	06:15-06:30	71	193	264
12:30-12:45	11	22	33	06:30-06:45	314	23	337	12:30-12:45	139	144	283	06:30-06:45	61	161	222
12:45-01:00	7	9	16	06:45-07:00	239	0	239	12:45-01:00	152	128	280	06:45-07:00	55	165	220
01:00-01:15	17	9	26	07:00-07:15	248	0	248	01:00-01:15	127	115	242	07:00-07:15	42	178	220
01:15-01:30	14	13	27	07:15-07:30	212	0	212	01:15-01:30	148	123	271	07:15-07:30	49	132	181
01:30-01:45	8	14	22	07:30-07:45	179	0	179	01:30-01:45	152	154	306	07:30-07:45	52	139	191
01:45-02:00	9	11	20	07:45-08:00	198	48	246	01:45-02:00	139	139	278	07:45-08:00	60	111	171
02:00-02:15	16	10	26	08:00-08:15	154	123	277	02:00-02:15	150	129	279	08:00-08:15	42	96	138
02:15-02:30	11	8	19	08:15-08:30	191	82	273	02:15-02:30	140	166	306	08:15-08:30	32	114	146
02:30-02:45	15	10	25	08:30-08:45	201	71	272	02:30-02:45	130	174	304	08:30-08:45	40	92	132
02:45-03:00	18	11	29	08:45-09:00	184	83	267	02:45-03:00	98	186	284	08:45-09:00	45	116	161
03:00-03:15	15	6	21	09:00-09:15	194	85	279	03:00-03:15	88	225	313	09:00-09:15	39	113	152
03:15-03:30	9	8	17	09:15-09:30	200	60	260	03:15-03:30	84	242	326	09:15-09:30	40	68	108
03:30-03:45	35	8	43	09:30-09:45	135	102	237	03:30-03:45	89	241	330	09:30-09:45	43	77	120
03:45-04:00	26	6	32	09:45-10:00	198	89	287	03:45-04:00	67	267	334	09:45-10:00	38	73	111
04:00-04:15	35	8	43	10:00-10:15	145	84	229	04:00-04:15	71	268	339	10:00-10:15	23	71	94
04:15-04:30	54	11	65	10:15-10:30	158	91	249	04:15-04:30	83	250	333	10:15-10:30	30	59	89
04:30-04:45	86	21	107	10:30-10:45	154	94	248	04:30-04:45	58	267	325	10:30-10:45	18	58	76
04:45-05:00	98	9	107	10:45-11:00	133	89	222	04:45-05:00	45	272	317	10:45-11:00	21	52	73
05:00-05:15	108	10	118	11:00-11:15	126	123	249	05:00-05:15	9	209	218	11:00-11:15	14	46	60
05:15-05:30	134	18	152	11:15-11:30	157	119	276	05:15-05:30	17	282	299	11:15-11:30	13	44	57
05:30-05:45	160	26	186	11:30-11:45	149	133	282	05:30-05:45	67	228	295	11:30-11:45	13	36	49
05:45-06:00	165	22	187	11:45-12:00	115	116	231	05:45-06:00	59	232	291	11:45-12:00	12	21	33

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM		
AM - PEAK HR VOLUME	1097	79	1176
AM - K FACTOR (%)			6.54
AM - D (%)	93.28	6.72	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM	08:00 AM to 09:00 AM	
AM - PEAK HR VOLUME	1097	359	

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	310	1026	1336
PM - K FACTOR (%)			7.43
PM - D (%)	23.20	76.80	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	04:00 PM to 05:00 PM	
PM - PEAK HR VOLUME	328	1057	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM		
AM - PEAK HR VOLUME	1097	79	1176
AM - K FACTOR (%)			6.54
AM - D (%)	93.28	6.72	100.00

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 PM to 04:30 PM		
PM - PEAK HR VOLUME	310	1026	1336
PM - K FACTOR (%)			7.43
PM - D (%)	23.20	76.80	100.00

NON-COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	518	655	1173
DIRECTIONAL PEAK			
PEAK HR TIME	09:00 AM to 10:00 AM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	727	655	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	4,528	1,671	6,199
AM 12-HR PERIOD (00:00-12:00)	5,617	1,993	7,610
PM 6-HR PERIOD (12:00-18:00)	2,376	4,669	7,045
PM 12-HR PERIOD (12:00-24:00)	3,291	7,089	10,380
24 HOUR PERIOD	8,908	9,082	17,990
D (%)	49.52	50.48	100.00

Run Date: 2016/05/19

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2015

Site ID: B71013000420 **Route No:** 130 **Date From:** 2015/08/12 0:00
Town: Hawaii **Direction:** +MP **Date To:** 2015/08/13 23:45
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

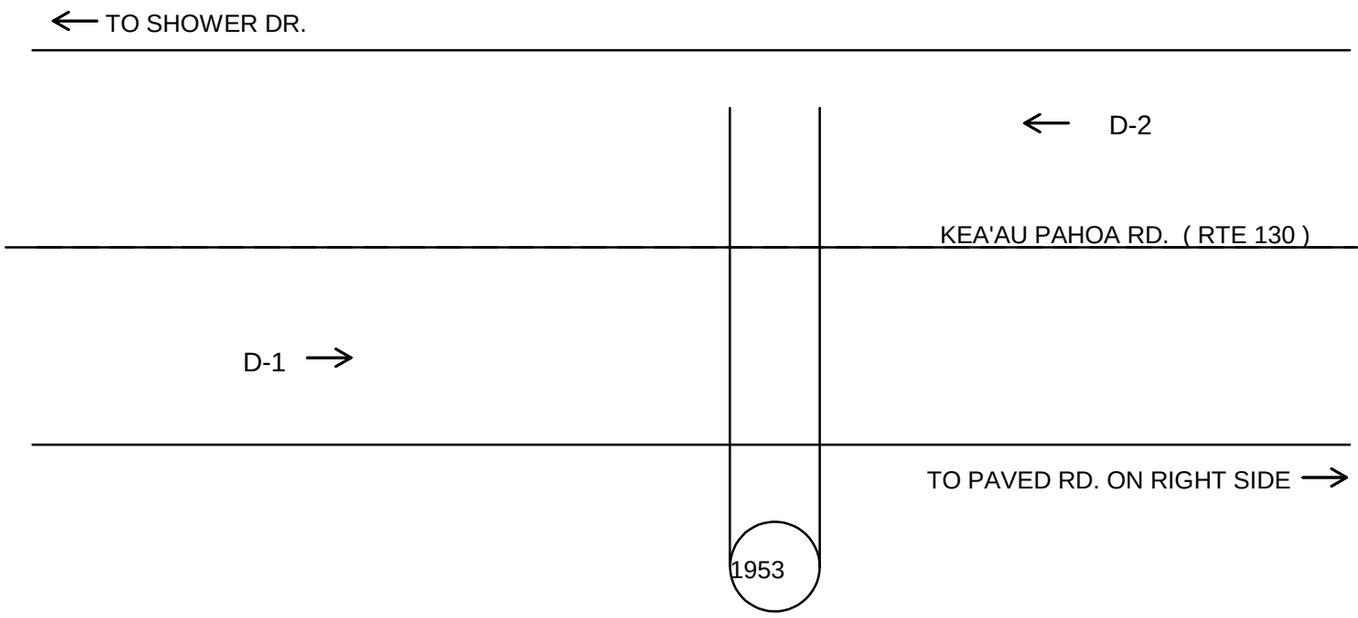
	VOLUME	%	NUMBER OF AXLES
Cycles	52	0.14%	103
PC	28465	77.11%	56930
2A-4T	7822	21.19%	15644
LIGHT VEHICLE TOTALS	36339	98.44%	72677
	HEAVY VEHICLES		
Bus	120	0.33%	300
SINGLE UNIT TRUCK			
2A-6T	279	0.76%	558
3A-SU	49	0.13%	147
4A-SU	27	0.07%	108
SINGLE-TRAILER TRUCKS			
4A-ST	74	0.20%	296
5A-ST	6	0.02%	30
6A-ST	0	0.00%	0
MULTI-TRAILER TRUCKS			
5A-MT	0	0.00%	0
6A-MT	3	0.01%	18
7A-MT	15	0.04%	105
HEAVY VEHICLE TOTALS	573	1.55%	1562
CLASSIFIED VEHICLES TOTALS	36912 (A)	100.00%	74239 (B)
UNCLASSIFIED VEHICLES TOTALS	1	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.994

ROADTUBE EQUIVALENT(B/2) = 37120 (C)

PEAK HOUR VOLUME : 1314 **2015/08/13 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)	**11**	**(65A-1) 0.84%**	**237**	**20000**	**(65A-2) 1.19%**	**6.57%**
COMBINATION (TYPE 8-13)	**0**	**(65B-1) 0.00%**	**49**		**(65B-2) 0.25%**	**6.57%**

ISLAND: HAWAII
AREA: PARADISE PARK



Station No:	B71 0130 00420

Station Location:			
Kea'au Pahoa Road between Shower Drive and Pohaku Place			
Station Mileage:	4.60	GPS Coord (Latitude):	19.58083 N
		GPS Coord (Longitude):	155.0074 W
Begin Survey (Date/Time):	4-4-16 0000	End Survey (Date/Time):	4-7-16 0000
Survey Method: LOOP **HOSE** OTHER		Survey Type: VOL **CLASS** SPEED OTHER	
Survey Crew:	FIELD CREW	Module No.:	

HPMS DATA

Segment Description:

KEA'AU PAHOA ROAD - PAVED ROAD TO AINALOA BOULEVARD

Segment Begin LRS	4.20	Segment End LRS	4.78	Length	0.58

Facility Name	Juris	Func Class	Area Type	Route No.	Route Mile	D-1 = Direction to End of Route / D-2 = Direction to Beginning of Route	
KEA'AU PAHOA ROAD	S	6	1	130	4.60	D-1	TO KAIMU-CHAIN OF CRATER ROAD
						D-2	TO VOLCANO ROAD

Sketch By: RG Date: 3/15/2016 SLD: 2005

Run Date: 2017/07/05

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2016 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 23300
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/05/2016															
12:00-12:15	38	12	50	06:00-06:15	31	243	274	12:00-12:15	164	161	325	06:00-06:15	253	102	355
12:15-12:30	20	10	30	06:15-06:30	50	307	357	12:15-12:30	136	168	304	06:15-06:30	251	83	334
12:30-12:45	18	6	24	06:30-06:45	52	293	345	12:30-12:45	166	144	310	06:30-06:45	312	65	377
12:45-01:00	15	9	24	06:45-07:00	43	157	200	12:45-01:00	147	162	309	06:45-07:00	274	61	335
01:00-01:15	18	5	23	07:00-07:15	57	139	196	01:00-01:15	158	149	307	07:00-07:15	260	67	327
01:15-01:30	15	9	24	07:15-07:30	66	149	215	01:15-01:30	166	147	313	07:15-07:30	220	58	278
01:30-01:45	9	10	19	07:30-07:45	94	162	256	01:30-01:45	176	124	300	07:30-07:45	214	58	272
01:45-02:00	10	12	22	07:45-08:00	126	162	288	01:45-02:00	163	150	313	07:45-08:00	192	48	240
02:00-02:15	9	6	15	08:00-08:15	101	230	331	02:00-02:15	166	158	324	08:00-08:15	153	37	190
02:15-02:30	6	12	18	08:15-08:30	102	260	362	02:15-02:30	190	146	336	08:15-08:30	162	44	206
02:30-02:45	8	16	24	08:30-08:45	105	236	341	02:30-02:45	249	139	388	08:30-08:45	141	42	183
02:45-03:00	11	13	24	08:45-09:00	93	247	340	02:45-03:00	207	155	362	08:45-09:00	131	35	166
03:00-03:15	7	13	20	09:00-09:15	88	256	344	03:00-03:15	224	142	366	09:00-09:15	109	43	152
03:15-03:30	4	16	20	09:15-09:30	93	256	349	03:15-03:30	217	151	368	09:15-09:30	91	49	140
03:30-03:45	12	35	47	09:30-09:45	107	227	334	03:30-03:45	219	148	367	09:30-09:45	107	46	153
03:45-04:00	5	24	29	09:45-10:00	119	186	305	03:45-04:00	232	151	383	09:45-10:00	85	25	110
04:00-04:15	9	44	53	10:00-10:15	126	185	311	04:00-04:15	251	105	356	10:00-10:15	82	31	113
04:15-04:30	6	68	74	10:15-10:30	126	178	304	04:15-04:30	263	114	377	10:15-10:30	85	34	119
04:30-04:45	17	78	95	10:30-10:45	99	203	302	04:30-04:45	235	124	359	10:30-10:45	57	27	84
04:45-05:00	4	101	105	10:45-11:00	119	193	312	04:45-05:00	268	106	374	10:45-11:00	50	20	70
05:00-05:15	14	81	95	11:00-11:15	138	156	294	05:00-05:15	360	54	414	11:00-11:15	38	21	59
05:15-05:30	19	138	157	11:15-11:30	117	165	282	05:15-05:30	309	90	399	11:15-11:30	49	13	62
05:30-05:45	14	147	161	11:30-11:45	119	190	309	05:30-05:45	255	70	325	11:30-11:45	31	16	47
05:45-06:00	28	172	200	11:45-12:00	172	135	307	05:45-06:00	310	56	366	11:45-12:00	39	18	57

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM		
AM - PEAK HR VOLUME	401	973	1374
AM - K FACTOR (%)			6.43
AM - D (%)	29.18	70.82	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM	05:45 AM to 06:45 AM	
AM - PEAK HR VOLUME	434	1015	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:30 PM to 05:30 PM		
PM - PEAK HR VOLUME	1172	374	1546
PM - K FACTOR (%)			7.23
PM - D (%)	75.81	24.19	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:00 PM to 06:00 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	1234	592	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:15 AM to 09:15 AM		
AM - PEAK HR VOLUME	388	999	1387
AM - K FACTOR (%)			6.49
AM - D (%)	27.97	72.03	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:30 PM to 05:30 PM		
PM - PEAK HR VOLUME	1172	374	1546
PM - K FACTOR (%)			7.23
PM - D (%)	75.81	24.19	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	812	598	1410
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	09:00 AM to 10:00 AM	
PEAK HR VOLUME	812	925	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,343	4,915	7,258
AM 12-HR PERIOD (00:00-12:00)	2,659	5,952	8,611
PM 6-HR PERIOD (12:00-18:00)	5,231	3,114	8,345
PM 12-HR PERIOD (12:00-24:00)	8,617	4,157	12,774
24 HOUR PERIOD	11,276	10,109	21,385
D (%)	52.73	47.27	100.00

Run Date: 2017/07/05

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2016 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 23300
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/06/2016															
12:00-12:15	36	11	47	06:00-06:15	35	271	306	12:00-12:15	166	142	308	06:00-06:15	197	59	256
12:15-12:30	29	12	41	06:15-06:30	44	274	318	12:15-12:30	125	203	328	06:15-06:30	254	69	323
12:30-12:45	32	6	38	06:30-06:45	40	248	288	12:30-12:45	145	177	322	06:30-06:45	237	79	316
12:45-01:00	22	9	31	06:45-07:00	43	175	218	12:45-01:00	170	147	317	06:45-07:00	245	56	301
01:00-01:15	10	12	22	07:00-07:15	58	139	197	01:00-01:15	130	160	290	07:00-07:15	267	64	331
01:15-01:30	17	15	32	07:15-07:30	70	133	203	01:15-01:30	204	145	349	07:15-07:30	231	46	277
01:30-01:45	14	11	25	07:30-07:45	91	132	223	01:30-01:45	199	150	349	07:30-07:45	172	58	230
01:45-02:00	13	2	15	07:45-08:00	97	222	319	01:45-02:00	166	105	271	07:45-08:00	162	40	202
02:00-02:15	9	6	15	08:00-08:15	106	207	313	02:00-02:15	241	79	320	08:00-08:15	154	45	199
02:15-02:30	4	14	18	08:15-08:30	114	233	347	02:15-02:30	227	116	343	08:15-08:30	127	45	172
02:30-02:45	12	11	23	08:30-08:45	95	212	307	02:30-02:45	194	124	318	08:30-08:45	144	44	188
02:45-03:00	1	16	17	08:45-09:00	96	210	306	02:45-03:00	211	125	336	08:45-09:00	128	50	178
03:00-03:15	8	24	32	09:00-09:15	100	212	312	03:00-03:15	218	122	340	09:00-09:15	111	42	153
03:15-03:30	4	21	25	09:15-09:30	82	250	332	03:15-03:30	230	109	339	09:15-09:30	129	50	179
03:30-03:45	10	35	45	09:30-09:45	94	260	354	03:30-03:45	243	107	350	09:30-09:45	81	49	130
03:45-04:00	8	30	38	09:45-10:00	108	190	298	03:45-04:00	302	108	410	09:45-10:00	97	46	143
04:00-04:15	8	47	55	10:00-10:15	111	217	328	04:00-04:15	260	99	359	10:00-10:15	79	35	114
04:15-04:30	12	66	78	10:15-10:30	105	189	294	04:15-04:30	282	97	379	10:15-10:30	79	36	115
04:30-04:45	9	68	77	10:30-10:45	94	178	272	04:30-04:45	255	107	362	10:30-10:45	54	33	87
04:45-05:00	9	92	101	10:45-11:00	142	170	312	04:45-05:00	319	86	405	10:45-11:00	49	23	72
05:00-05:15	11	100	111	11:00-11:15	120	146	266	05:00-05:15	251	106	357	11:00-11:15	51	23	74
05:15-05:30	19	134	153	11:15-11:30	117	165	282	05:15-05:30	221	87	308	11:15-11:30	44	18	62
05:30-05:45	18	162	180	11:30-11:45	114	164	278	05:30-05:45	183	61	244	11:30-11:45	34	28	62
05:45-06:00	26	170	196	11:45-12:00	145	153	298	05:45-06:00	247	72	319	11:45-12:00	35	19	54

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	412	874	1286
AM - K FACTOR (%)			6.23
AM - D (%)	32.04	67.96	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM	06:00 AM to 07:00 AM	
AM - PEAK HR VOLUME	412	968	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	1099	411	1510
PM - K FACTOR (%)			7.32
PM - D (%)	72.78	27.22	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 PM to 05:00 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	1116	446	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	09:15 AM to 10:15 AM		
AM - PEAK HR VOLUME	395	917	1312
AM - K FACTOR (%)			6.36
AM - D (%)	30.11	69.89	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	1099	411	1510
PM - K FACTOR (%)			7.32
PM - D (%)	72.78	27.22	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	873	444	1317
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	09:15 AM to 10:15 AM	
PEAK HR VOLUME	873	917	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	2,221	4,750	6,971
AM 12-HR PERIOD (00:00-12:00)	2,562	5,824	8,386
PM 6-HR PERIOD (12:00-18:00)	5,189	2,834	8,023
PM 12-HR PERIOD (12:00-24:00)	8,350	3,891	12,241
24 HOUR PERIOD	10,912	9,715	20,627
D (%)	52.90	47.10	100.00

Run Date: 2017/07/05

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2016

Site ID: B71013000420 **Route No:** 130 **Date From:** 2016/04/05 0:00
Town: Hawaii **Direction:** +MP **Date To:** 2016/04/06 23:45
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	727	1.73%	1454
PC	35098	83.54%	70196
2A-4T	1351	3.22%	2702
LIGHT VEHICLE TOTALS	37176	88.49%	74352
	HEAVY VEHICLES		
Bus	2835	6.75%	7088
SINGLE UNIT TRUCK			
2A-6T	792	1.89%	1584
3A-SU	78	0.19%	234
4A-SU	3	0.01%	12
SINGLE-TRAILER TRUCKS			
4A-ST	739	1.76%	2956
5A-ST	96	0.23%	480
6A-ST	2	0.00%	12
MULTI-TRAILER TRUCKS			
5A-MT	228	0.54%	1140
6A-MT	10	0.02%	60
7A-MT	55	0.13%	385
HEAVY VEHICLE TOTALS	4838	11.52%	13951
CLASSIFIED VEHICLES TOTALS	42014 (A)	100.00%	88302 (B)
UNCLASSIFIED VEHICLES TOTALS	-2	-0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.952

ROADTUBE EQUIVALENT(B/2) = 44151 (C)

PEAK HOUR VOLUME : 1505 **2016/04/06 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)	**194**	**(65A-1) 12.89%**	**1854**	**23300**	**(65A-2) 7.96%**	**6.46%**
COMBINATION (TYPE 8-13)	**54**	**(65B-1) 3.59%**	**565**		**(65B-2) 2.42%**	**6.46%**

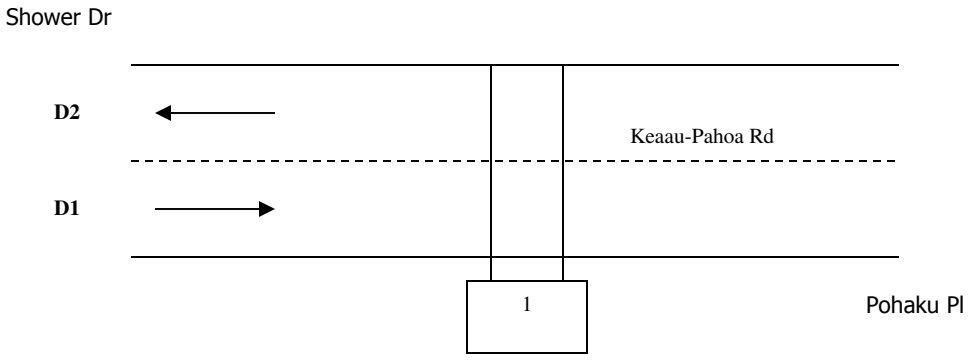
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii
Area: Paradise Park

Section ID/Station #: B71013000420



	Meter #	File Name	GPS
1.	bg66	D0504021_B71013000420	19.58083, -155.0074
2.		D0504022_B71013000420	

Station Description: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Survey Beginning Date/Time: 5/4/16 @ 0000		Survey Ending Date/Time: 5/5/16 @ 2400

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	1298		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Keaau-Pahoa Rd		16		0130	

D1= Direction to End — D1: Pohaku Pl / end of rte (.83 mi past Royal Palm Dr)

D2= Direction to Begin — D2: Shower Dr / VOLCANO ROAD

Run Date: 2017/08/08

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2016 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 23300
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 05/04/2016															
12:00-12:15	14	31	45	06:00-06:15	291	54	345	12:00-12:15	189	221	410	06:00-06:15	130	295	425
12:15-12:30	11	40	51	06:15-06:30	318	72	390	12:15-12:30	191	184	375	06:15-06:30	108	289	397
12:30-12:45	2	16	18	06:30-06:45	359	77	436	12:30-12:45	204	237	441	06:30-06:45	86	300	386
12:45-01:00	2	19	21	06:45-07:00	364	88	452	12:45-01:00	199	181	380	06:45-07:00	70	269	339
01:00-01:15	15	11	26	07:00-07:15	370	101	471	01:00-01:15	225	219	444	07:00-07:15	79	203	282
01:15-01:30	5	18	23	07:15-07:30	340	126	466	01:15-01:30	222	231	453	07:15-07:30	89	220	309
01:30-01:45	7	10	17	07:30-07:45	326	165	491	01:30-01:45	195	284	479	07:30-07:45	66	196	262
01:45-02:00	12	8	20	07:45-08:00	288	208	496	01:45-02:00	205	274	479	07:45-08:00	67	188	255
02:00-02:15	8	6	14	08:00-08:15	276	173	449	02:00-02:15	191	240	431	08:00-08:15	57	154	211
02:15-02:30	7	8	15	08:15-08:30	301	135	436	02:15-02:30	177	306	483	08:15-08:30	68	156	224
02:30-02:45	13	11	24	08:30-08:45	281	132	413	02:30-02:45	189	282	471	08:30-08:45	70	159	229
02:45-03:00	16	7	23	08:45-09:00	270	119	389	02:45-03:00	181	277	458	08:45-09:00	55	129	184
03:00-03:15	14	9	23	09:00-09:15	241	112	353	03:00-03:15	193	314	507	09:00-09:15	55	142	197
03:15-03:30	26	4	30	09:15-09:30	251	142	393	03:15-03:30	194	277	471	09:15-09:30	47	118	165
03:30-03:45	27	5	32	09:30-09:45	257	113	370	03:30-03:45	201	323	524	09:30-09:45	63	121	184
03:45-04:00	40	14	54	09:45-10:00	211	128	339	03:45-04:00	179	340	519	09:45-10:00	49	100	149
04:00-04:15	47	4	51	10:00-10:15	213	144	357	04:00-04:15	177	329	506	10:00-10:15	42	86	128
04:15-04:30	68	13	81	10:15-10:30	228	143	371	04:15-04:30	155	358	513	10:15-10:30	43	101	144
04:30-04:45	99	1	100	10:30-10:45	219	152	371	04:30-04:45	156	341	497	10:30-10:45	34	73	107
04:45-05:00	89	15	104	10:45-11:00	224	177	401	04:45-05:00	140	379	519	10:45-11:00	16	52	68
05:00-05:15	97	9	106	11:00-11:15	180	176	356	05:00-05:15	142	370	512	11:00-11:15	30	56	86
05:15-05:30	157	16	173	11:15-11:30	225	171	396	05:15-05:30	165	393	558	11:15-11:30	24	41	65
05:30-05:45	185	26	211	11:30-11:45	194	182	376	05:30-05:45	152	380	532	11:30-11:45	20	40	60
05:45-06:00	209	39	248	11:45-12:00	183	159	342	05:45-06:00	114	354	468	11:45-12:00	18	40	58

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	1324	600	1924
AM - K FACTOR (%)			6.99
AM - D (%)	68.81	31.19	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM	07:30 AM to 08:30 AM	
AM - PEAK HR VOLUME	1433	681	

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	599	1522	2121
PM - K FACTOR (%)			7.71
PM - D (%)	28.24	71.76	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	04:45 PM to 05:45 PM	
PM - PEAK HR VOLUME	767	1522	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	1324	600	1924
AM - K FACTOR (%)			6.99
AM - D (%)	68.81	31.19	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:45 PM to 05:45 PM		
PM - PEAK HR VOLUME	599	1522	2121
PM - K FACTOR (%)			7.71
PM - D (%)	28.24	71.76	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:30 PM to 02:30 PM		
PEAK HR VOLUME	768	1104	1872
DIRECTIONAL PEAK			
PEAK HR TIME	09:00 AM to 10:00 AM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	960	1105	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	6,410	3,249	9,659
AM 12-HR PERIOD (00:00-12:00)	7,580	3,589	11,169
PM 6-HR PERIOD (12:00-18:00)	4,336	7,094	11,430
PM 12-HR PERIOD (12:00-24:00)	5,722	10,622	16,344
24 HOUR PERIOD	13,302	14,211	27,513
D (%)	48.35	51.65	100.00

Run Date: 2017/08/08

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2016 Program Count - Summary

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 23300
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

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 : 05/05/2016															
12:00-12:15	8	39	47	06:00-06:15	278	61	339	12:00-12:15	187	221	408	06:00-06:15	119	289	408
12:15-12:30	11	36	47	06:15-06:30	368	72	440	12:15-12:30	212	185	397	06:15-06:30	112	298	410
12:30-12:45	11	27	38	06:30-06:45	325	79	404	12:30-12:45	210	200	410	06:30-06:45	98	282	380
12:45-01:00	13	20	33	06:45-07:00	360	65	425	12:45-01:00	208	193	401	06:45-07:00	118	293	411
01:00-01:15	10	20	30	07:00-07:15	362	113	475	01:00-01:15	168	223	391	07:00-07:15	100	253	353
01:15-01:30	13	23	36	07:15-07:30	369	120	489	01:15-01:30	225	173	398	07:15-07:30	77	212	289
01:30-01:45	13	17	30	07:30-07:45	322	152	474	01:30-01:45	226	254	480	07:30-07:45	85	192	277
01:45-02:00	9	9	18	07:45-08:00	329	207	536	01:45-02:00	210	218	428	07:45-08:00	78	191	269
02:00-02:15	4	11	15	08:00-08:15	270	176	446	02:00-02:15	220	214	434	08:00-08:15	68	183	251
02:15-02:30	7	11	18	08:15-08:30	294	148	442	02:15-02:30	228	292	520	08:15-08:30	63	170	233
02:30-02:45	12	3	15	08:30-08:45	313	140	453	02:30-02:45	242	332	574	08:30-08:45	59	158	217
02:45-03:00	19	8	27	08:45-09:00	242	118	360	02:45-03:00	201	298	499	08:45-09:00	52	140	192
03:00-03:15	9	7	16	09:00-09:15	277	147	424	03:00-03:15	223	281	504	09:00-09:15	57	122	179
03:15-03:30	25	7	32	09:15-09:30	283	134	417	03:15-03:30	206	333	539	09:15-09:30	59	127	186
03:30-03:45	28	2	30	09:30-09:45	287	143	430	03:30-03:45	214	342	556	09:30-09:45	56	127	183
03:45-04:00	25	5	30	09:45-10:00	277	140	417	03:45-04:00	208	311	519	09:45-10:00	38	100	138
04:00-04:15	40	8	48	10:00-10:15	219	165	384	04:00-04:15	177	330	507	10:00-10:15	39	102	141
04:15-04:30	69	15	84	10:15-10:30	237	157	394	04:15-04:30	157	370	527	10:15-10:30	36	118	154
04:30-04:45	83	17	100	10:30-10:45	224	151	375	04:30-04:45	163	360	523	10:30-10:45	19	87	106
04:45-05:00	85	9	94	10:45-11:00	211	162	373	04:45-05:00	163	274	437	10:45-11:00	19	61	80
05:00-05:15	105	16	121	11:00-11:15	219	168	387	05:00-05:15	119	302	421	11:00-11:15	18	64	82
05:15-05:30	149	25	174	11:15-11:30	170	170	340	05:15-05:30	120	283	403	11:15-11:30	18	53	71
05:30-05:45	164	25	189	11:30-11:45	189	194	383	05:30-05:45	141	314	455	11:30-11:45	19	42	61
05:45-06:00	213	36	249	11:45-12:00	187	208	395	05:45-06:00	106	258	364	11:45-12:00	12	29	41

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	1382	592	1974
AM - K FACTOR (%)			7.12
AM - D (%)	70.01	29.99	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:30 AM to 07:30 AM	07:30 AM to 08:30 AM	
AM - PEAK HR VOLUME	1416	683	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM		
PM - PEAK HR VOLUME	805	1316	2121
PM - K FACTOR (%)			7.65
PM - D (%)	37.95	62.05	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	03:45 PM to 04:45 PM	
PM - PEAK HR VOLUME	851	1371	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM		
AM - PEAK HR VOLUME	1382	592	1974
AM - K FACTOR (%)			7.12
AM - D (%)	70.01	29.99	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM		
PM - PEAK HR VOLUME	805	1316	2121
PM - K FACTOR (%)			7.65
PM - D (%)	37.95	62.05	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	891	1136	2027
DIRECTIONAL PEAK			
PEAK HR TIME	09:00 AM to 10:00 AM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	1124	1136	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	6,612	3,390	10,002
AM 12-HR PERIOD (00:00-12:00)	7,737	3,786	11,523
PM 6-HR PERIOD (12:00-18:00)	4,534	6,561	11,095
PM 12-HR PERIOD (12:00-24:00)	5,953	10,254	16,207
24 HOUR PERIOD	13,690	14,040	27,730
D (%)	49.37	50.63	100.00

Run Date: 2017/08/08

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2016

Site ID: B71013000420 **Route No:** 130 **Date From:** 2016/05/04 0:00
Town: Hawaii **Direction:** +MP **Date To:** 2016/05/05 23:45
Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

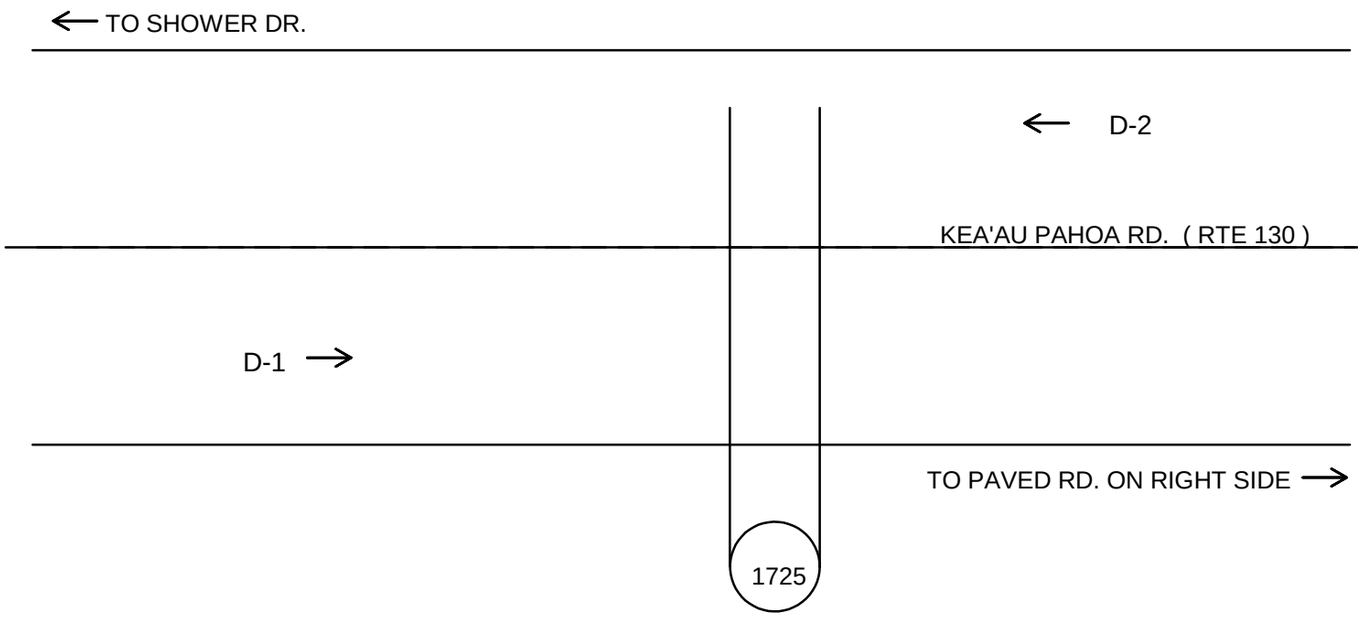
	VOLUME	%	NUMBER OF AXLES
Cycles	122	0.22%	243
PC	38851	70.33%	77702
2A-4T	15317	27.73%	30634
LIGHT VEHICLE TOTALS	54290	98.27%	108579
	HEAVY VEHICLES		
Bus	224	0.41%	560
SINGLE UNIT TRUCK			
2A-6T	215	0.39%	430
3A-SU	160	0.29%	480
4A-SU	42	0.08%	168
SINGLE-TRAILER TRUCKS			
4A-ST	190	0.34%	760
5A-ST	56	0.10%	280
6A-ST	30	0.05%	180
MULTI-TRAILER TRUCKS			
5A-MT	14	0.03%	70
6A-MT	2	0.00%	12
7A-MT	21	0.04%	147
HEAVY VEHICLE TOTALS	954	1.73%	3087
CLASSIFIED VEHICLES TOTALS	55243 (A)	100.00%	111666 (B)
UNCLASSIFIED VEHICLES TOTALS	-0	-0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.989

ROADTUBE EQUIVALENT(B/2) = 55833 (C)

PEAK HOUR VOLUME : 2118 **2016/05/05 15:00**	**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)	**26**	**(65A-1) 1.23%**	**320**	**23300**	**(65A-2) 1.37%**	**9.09%**
COMBINATION (TYPE 8-13)	**2**	**(65B-1) 0.09%**	**156**		**(65B-2) 0.67%**	**9.09%**

ISLAND: HAWAII
AREA: PARADISE PARK



Station No:	B71 0130 00420

Station Location:			
Kea'au Pahoa Road between Shower Drive and Pohaku Place			
Station Mileage:	4.60	GPS Coord (Latitude):	19.58083 N
		GPS Coord (Longitude):	155.0074 W
Begin Survey (Date/Time):	09/18/18	End Survey (Date/Time):	09/20/18
Survey Method: LOOP **HOSE** OTHER		Survey Type: VOL **CLASS** SPEED OTHER	
Survey Crew:	FIELD CREW	Module No.:	

HPMS DATA

Segment Description:

KEA'AU PAHOA ROAD - PAVED ROAD TO AINALOA BOULEVARD

Segment Begin LRS	1.80	Segment End LRS	7.70	Length	5.90

Facility Name	Juris	Func Class	Area Type	Route No.	Route Mile	D-1 = Direction to End of Route / D-2 = Direction to Beginning of Route	
KEA'AU PAHOA ROAD	S	6	1	130	4.60	D-1	TO KAIMU-CHAIN OF CRATER ROAD
						D-2	TO VOLCANO ROAD

Sketch By: RG Date: 3/19/2018 SLD: 2005

Run Date: 22-OCT-20

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:
Town: Hawaii
Count Type: CLASS
DATE: 18-SEP-18
DIR 1: +MP
Counter Type: Tube
DIR 2: -MP
Final AADT: 22000
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM		
AM - PEAK HR VOLUME	579	711	1,290
AM - K FACTOR(%)			6.07
AM - D(%)	44.88	55.12	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM	05:30 AM to 06:30 AM	
AM - PEAK HR VOLUME	614	858	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	4:15 PM to 5:15 PM		
PM - PEAK HR VOLUME	1,200	497	1,697
PM - K FACTOR(%)			7.98
PM -D(%)	70.71	29.29	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	4:00 PM to 5:00 PM	3:00 PM to 4:00 PM	
PM - PEAK HR VOLUME	1,218	587	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM		
AM - PEAK HR VOLUME	579	614	1,290
AM - K FACTOR(%)			6.07
AM - D(%)	44.88	55.12	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	4:15 PM to 5:15 PM		
PM - PEAK HR VOLUME	1,200	1,218	1,697
PM - K FACTOR(%)			7.98
PM -D(%)	70.71	29.29	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	2:00 PM to 3:00 PM		
PEAK HR VOLUME	865	688	1,553
DIRECTIONAL PEAK			
PEAK HR TIME	2:00 PM to 3:00 PM	09:00 AM to 112:00 AM	
PEAK HR VOLUME	865	761	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	2,556	4,009	6,565
AM 12-HR PERIOD (00:00-12:00)	2,853	5,118	7,971
PM 6-HR PERIOD (12:00-18:00)	5,561	3,415	8,976
PM 12-HR PERIOD (12:00-24:00)	8,903	4,385	13,288
24-HR PERIOD (12:00-24:00)	11,756	9,503	21,259
D%	55.3	44.7	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	21	4	25
12:15 - 12:30	23	2	25
12:30 - 12:45	21	2	23
12:45 - 01:00	13	2	15
01:00 - 01:15	8	4	12
01:15 - 01:30	11	10	21
01:30 - 01:45	6	13	19
01:45 - 02:00	16	4	20
02:00 - 02:15	11	10	21
02:15 - 02:30	12	9	21
02:30 - 02:45	9	17	26
02:45 - 03:00	4	14	18
03:00 - 03:15	5	20	25
03:15 - 03:30	4	17	21
03:30 - 03:45	8	24	32
03:45 - 04:00	6	33	39
04:00 - 04:15	6	45	51
04:15 - 04:30	19	71	90
04:30 - 04:45	16	83	99
04:45 - 05:00	9	105	114
05:00 - 05:15	10	103	113
05:15 - 05:30	18	148	166
05:30 - 05:45	14	176	190
05:45 - 06:00	27	193	220

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	34	267	301
06:15 - 06:30	43	222	265
06:30 - 06:45	60	158	218
06:45 - 07:00	82	74	156
07:00 - 07:15	76	72	148
07:15 - 07:30	111	111	222
07:30 - 07:45	131	110	241
07:45 - 08:00	176	133	309
08:00 - 08:15	165	183	348
08:15 - 08:30	142	177	319
08:30 - 08:45	96	218	314
08:45 - 09:00	105	196	301
09:00 - 09:15	102	196	298
09:15 - 09:30	92	194	286
09:30 - 09:45	84	191	275
09:45 - 10:00	92	180	272
10:00 - 10:15	101	163	264
10:15 - 10:30	92	186	278
10:30 - 10:45	59	183	242
10:45 - 11:00	146	160	306
11:00 - 11:15	153	148	301
11:15 - 11:30	126	166	292
11:30 - 11:45	140	158	298
11:45 - 12:00	148	163	311

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	189	131	320
12:15 - 12:30	160	151	311
12:30 - 12:45	152	149	301
12:45 - 01:00	149	164	313
01:00 - 01:15	154	135	289
01:15 - 01:30	170	181	351
01:30 - 01:45	173	179	352
01:45 - 02:00	163	157	320
02:00 - 02:15	205	166	371
02:15 - 02:30	218	183	401
02:30 - 02:45	211	164	375
02:45 - 03:00	231	175	406
03:00 - 03:15	293	148	441
03:15 - 03:30	241	153	394
03:30 - 03:45	298	144	442
03:45 - 04:00	238	142	380
04:00 - 04:15	261	115	376
04:15 - 04:30	298	151	449
04:30 - 04:45	330	112	442
04:45 - 05:00	329	94	423
05:00 - 05:15	243	140	383
05:15 - 05:30	305	94	399
05:30 - 05:45	257	100	357
05:45 - 06:00	293	87	380

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	306	73	379
06:15 - 06:30	263	99	362
06:30 - 06:45	300	72	372
06:45 - 07:00	262	72	334
07:00 - 07:15	226	59	285
07:15 - 07:30	194	56	250
07:30 - 07:45	198	53	251
07:45 - 08:00	134	61	195
08:00 - 08:15	160	41	201
08:15 - 08:30	168	33	201
08:30 - 08:45	155	36	191
08:45 - 09:00	132	34	166
09:00 - 09:15	123	39	162
09:15 - 09:30	112	53	165
09:30 - 09:45	94	48	142
09:45 - 10:00	98	13	111
10:00 - 10:15	69	21	90
10:15 - 10:30	77	15	92
10:30 - 10:45	55	22	77
10:45 - 11:00	43	17	60
11:00 - 11:15	53	15	68
11:15 - 11:30	55	9	64
11:30 - 11:45	36	18	54
11:45 - 12:00	29	11	40

Run Date: 22-OCT-20

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:
Town: Hawaii
Count Type: CLASS
DATE: 19-SEP-18
DIR 1: +MP
Counter Type: Tube
DIR 2: -MP
Final AADT: 22000
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM		
AM - PEAK HR VOLUME	563	751	1,314
AM - K FACTOR(%)			6.04
AM - D(%)	42.85	57.15	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 AM to 08:15 AM	05:30 AM to 06:30 AM	
AM - PEAK HR VOLUME	627	889	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	3:15 PM to 4:15 PM		
PM - PEAK HR VOLUME	1,094	543	1,637
PM - K FACTOR(%)			7.53
PM -D(%)	66.83	33.17	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	4:45 PM to 5:45 PM	3:00 PM to 4:00 PM	
PM - PEAK HR VOLUME	1,253	568	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM		
AM - PEAK HR VOLUME	563	627	1,314
AM - K FACTOR(%)			6.04
AM - D(%)	42.85	57.15	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	3:15 PM to 4:15 PM		
PM - PEAK HR VOLUME	1,094	1,253	1,637
PM - K FACTOR(%)			7.53
PM -D(%)	66.83	33.17	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	2:00 PM to 3:00 PM		
PEAK HR VOLUME	990	603	1,593
DIRECTIONAL PEAK			
PEAK HR TIME	2:00 PM to 3:00 PM	09:00 AM to 112:00 AM	
PEAK HR VOLUME	990	829	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	2,841	4,109	6,950
AM 12-HR PERIOD (00:00-12:00)	3,129	5,250	8,379
PM 6-HR PERIOD (12:00-18:00)	5,743	3,297	9,040
PM 12-HR PERIOD (12:00-24:00)	8,889	4,482	13,371
24-HR PERIOD (12:00-24:00)	12,018	9,732	21,750
D%	55.26	44.74	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	20	2	22
12:15 - 12:30	26	7	33
12:30 - 12:45	16	11	27
12:45 - 01:00	11	6	17
01:00 - 01:15	9	8	17
01:15 - 01:30	11	12	23
01:30 - 01:45	8	13	21
01:45 - 02:00	12	10	22
02:00 - 02:15	11	10	21
02:15 - 02:30	7	11	18
02:30 - 02:45	9	13	22
02:45 - 03:00	5	18	23
03:00 - 03:15	3	12	15
03:15 - 03:30	8	22	30
03:30 - 03:45	6	30	36
03:45 - 04:00	4	32	36
04:00 - 04:15	9	35	44
04:15 - 04:30	18	70	88
04:30 - 04:45	10	75	85
04:45 - 05:00	11	76	87
05:00 - 05:15	11	136	147
05:15 - 05:30	15	154	169
05:30 - 05:45	17	180	197
05:45 - 06:00	31	198	229

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	44	267	311
06:15 - 06:30	49	244	293
06:30 - 06:45	79	120	199
06:45 - 07:00	87	96	183
07:00 - 07:15	91	90	181
07:15 - 07:30	141	78	219
07:30 - 07:45	146	118	264
07:45 - 08:00	164	164	328
08:00 - 08:15	176	166	342
08:15 - 08:30	118	221	339
08:30 - 08:45	105	200	305
08:45 - 09:00	97	204	301
09:00 - 09:15	107	207	314
09:15 - 09:30	111	220	331
09:30 - 09:45	117	198	315
09:45 - 10:00	115	204	319
10:00 - 10:15	139	166	305
10:15 - 10:30	107	191	298
10:30 - 10:45	143	182	325
10:45 - 11:00	132	151	283
11:00 - 11:15	134	145	279
11:15 - 11:30	145	154	299
11:30 - 11:45	137	165	302
11:45 - 12:00	157	158	315

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	140	151	291
12:15 - 12:30	189	155	344
12:30 - 12:45	166	187	353
12:45 - 01:00	138	168	306
01:00 - 01:15	147	163	310
01:15 - 01:30	144	208	352
01:30 - 01:45	196	168	364
01:45 - 02:00	231	136	367
02:00 - 02:15	239	149	388
02:15 - 02:30	252	158	410
02:30 - 02:45	249	145	394
02:45 - 03:00	250	151	401
03:00 - 03:15	235	140	375
03:15 - 03:30	234	175	409
03:30 - 03:45	263	143	406
03:45 - 04:00	308	110	418
04:00 - 04:15	289	115	404
04:15 - 04:30	286	109	395
04:30 - 04:45	283	111	394
04:45 - 05:00	303	97	400
05:00 - 05:15	316	81	397
05:15 - 05:30	308	95	403
05:30 - 05:45	326	80	406
05:45 - 06:00	251	102	353

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	243	91	334
06:15 - 06:30	276	74	350
06:30 - 06:45	226	92	318
06:45 - 07:00	236	69	305
07:00 - 07:15	226	75	301
07:15 - 07:30	225	64	289
07:30 - 07:45	182	55	237
07:45 - 08:00	160	55	215
08:00 - 08:15	136	55	191
08:15 - 08:30	147	64	211
08:30 - 08:45	122	66	188
08:45 - 09:00	145	54	199
09:00 - 09:15	135	37	172
09:15 - 09:30	109	55	164
09:30 - 09:45	80	36	116
09:45 - 10:00	85	39	124
10:00 - 10:15	67	33	100
10:15 - 10:30	71	43	114
10:30 - 10:45	64	32	96
10:45 - 11:00	56	23	79
11:00 - 11:15	46	20	66
11:15 - 11:30	46	19	65
11:30 - 11:45	43	24	67
11:45 - 12:00	20	10	30

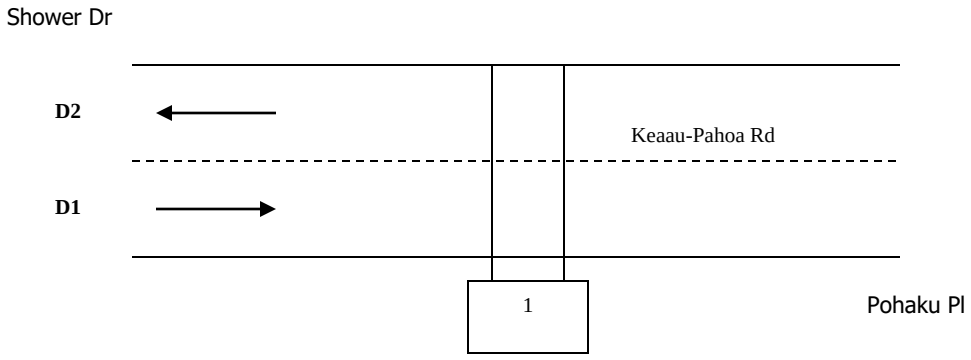
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii

Section ID/Station #: B71013000420



	Meter #	File Name	GPS
1.	MK33	D1016023_B71013000420	19.58048, -155.0071
2.		D1016024_B71013000420	

Station Description: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Survey Beginning Date/Time: 10/16/19 0:00		Survey Ending Date/Time: 10/18/19 0:00

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	E = SE 1298		

FACILITY NAME	JURI		AREA TYPE	ROUTE NO.	ROUTE MILE
Keaau-Pahoa Rd				0130	

D1= Direction to End D1: Pohaku Pl

D2= Direction to Begin D2: Shower Dr

Run Date: 06-JUL-20

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:

Town: Hawaii
Count Type: VOLUME
DATE: 16-OCT-19

DIR 1: +MP
Counter Type: Tube

DIR 2: -MP

Final AADT: 26700
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM		
AM - PEAK HR VOLUME	1,317	705	2,022
AM - K FACTOR(%)			7.13
AM - D(%)	65.13	34.87	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM	08:45 to 09:45 AM	
AM - PEAK HR VOLUME	1,317	973	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 to 04:45 PM		
PM - PEAK HR VOLUME	1,540	733	2,273
PM - K FACTOR(%)			8.01
PM -D(%)	67.75	32.25	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 to 05:00 PM	03:00 to 04:00 PM	
PM - PEAK HR VOLUME	1,586	838	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM		
AM - PEAK HR VOLUME	1,317	705	2,022
AM - K FACTOR(%)			7.13
AM - D(%)	65.13	34.87	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 to 04:45 PM		
PM - PEAK HR VOLUME	1,540	733	2,273
PM - K FACTOR(%)			8.01
PM -D(%)	67.75	32.25	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM		
PEAK HR VOLUME	1,240	787	2,027
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	09:15 to 10:15 AM	
PEAK HR VOLUME	1,240	1,060	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	5,036	4,917	9,953
AM 12-HR PERIOD (00:00-12:00)	5,542	6,019	11,561
PM 6-HR PERIOD (12:00-18:00)	7,457	4,505	11,962
PM 12-HR PERIOD (12:00-24:00)	11,042	5,768	16,810
24-HR PERIOD (12:00-24:00)	16,584	11,787	28,371
D%	58.45	41.55	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	29	6	35
12:15 - 12:30	29	5	34
12:30 - 12:45	25	5	30
12:45 - 01:00	9	8	17
01:00 - 01:15	10	4	14
01:15 - 01:30	17	7	24
01:30 - 01:45	15	11	26
01:45 - 02:00	11	10	21
02:00 - 02:15	9	6	15
02:15 - 02:30	8	19	27
02:30 - 02:45	6	19	25
02:45 - 03:00	5	16	21
03:00 - 03:15	5	12	17
03:15 - 03:30	7	24	31
03:30 - 03:45	9	42	51
03:45 - 04:00	5	28	33
04:00 - 04:15	6	55	61
04:15 - 04:30	5	65	70
04:30 - 04:45	6	90	96
04:45 - 05:00	11	89	100
05:00 - 05:15	31	131	162
05:15 - 05:30	56	138	194
05:30 - 05:45	91	149	240
05:45 - 06:00	101	163	264

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	175	165	340
06:15 - 06:30	219	163	382
06:30 - 06:45	302	174	476
06:45 - 07:00	297	176	473
07:00 - 07:15	334	183	517
07:15 - 07:30	352	178	530
07:30 - 07:45	323	168	491
07:45 - 08:00	308	176	484
08:00 - 08:15	280	205	485
08:15 - 08:30	224	179	403
08:30 - 08:45	159	217	376
08:45 - 09:00	156	228	384
09:00 - 09:15	140	224	364
09:15 - 09:30	126	254	380
09:30 - 09:45	137	267	404
09:45 - 10:00	165	302	467
10:00 - 10:15	133	237	370
10:15 - 10:30	146	240	386
10:30 - 10:45	161	211	372
10:45 - 11:00	178	199	377
11:00 - 11:15	183	197	380
11:15 - 11:30	172	186	358
11:30 - 11:45	176	193	369
11:45 - 12:00	190	195	385

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	190	191	381
12:15 - 12:30	204	216	420
12:30 - 12:45	229	256	485
12:45 - 01:00	220	223	443
01:00 - 01:15	201	203	404
01:15 - 01:30	219	242	461
01:30 - 01:45	300	199	499
01:45 - 02:00	279	194	473
02:00 - 02:15	281	216	497
02:15 - 02:30	334	204	538
02:30 - 02:45	268	200	468
02:45 - 03:00	282	189	471
03:00 - 03:15	279	210	489
03:15 - 03:30	339	198	537
03:30 - 03:45	340	190	530
03:45 - 04:00	350	240	590
04:00 - 04:15	393	175	568
04:15 - 04:30	399	158	557
04:30 - 04:45	398	160	558
04:45 - 05:00	396	118	514
05:00 - 05:15	380	124	504
05:15 - 05:30	412	142	554
05:30 - 05:45	396	141	537
05:45 - 06:00	368	116	484

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	344	105	449
06:15 - 06:30	330	125	455
06:30 - 06:45	337	100	437
06:45 - 07:00	289	111	400
07:00 - 07:15	235	74	309
07:15 - 07:30	222	55	277
07:30 - 07:45	213	70	283
07:45 - 08:00	151	57	208
08:00 - 08:15	133	50	183
08:15 - 08:30	162	61	223
08:30 - 08:45	156	49	205
08:45 - 09:00	121	46	167
09:00 - 09:15	111	58	169
09:15 - 09:30	141	40	181
09:30 - 09:45	87	50	137
09:45 - 10:00	98	33	131
10:00 - 10:15	88	36	124
10:15 - 10:30	85	38	123
10:30 - 10:45	59	28	87
10:45 - 11:00	48	15	63
11:00 - 11:15	53	19	72
11:15 - 11:30	37	16	53
11:30 - 11:45	51	20	71
11:45 - 12:00	34	7	41

Run Date: 06-JUL-20

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:

Town: Hawaii
Count Type: VOLUME
DATE: 17-OCT-19

DIR 1: +MP
Counter Type: Tube

DIR 2: -MP

Final AADT: 26700
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 to 07:45 AM		
AM - PEAK HR VOLUME	1,356	667	2,023
AM - K FACTOR(%)			7.17
AM - D(%)	67.03	32.97	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 to 07:45 AM	08:45 to 09:45 AM	
AM - PEAK HR VOLUME	1,356	1,036	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 to 04:15 PM		
PM - PEAK HR VOLUME	1,431	817	2,248
PM - K FACTOR(%)			7.96
PM -D(%)	63.66	36.34	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:45 to 05:45 PM	03:00 to 04:00 PM	
PM - PEAK HR VOLUME	1,529	866	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 to 07:45 AM		
AM - PEAK HR VOLUME	1,356	667	2,023
AM - K FACTOR(%)			7.17
AM - D(%)	67.03	32.97	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 to 04:15 PM		
PM - PEAK HR VOLUME	1,431	817	2,248
PM - K FACTOR(%)			7.96
PM -D(%)	63.66	36.34	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:30 to 03:30 PM		
PEAK HR VOLUME	1,281	911	2,192
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	09:00 to 10:00 AM	
PEAK HR VOLUME	1,284	1,041	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	5,260	4,819	10,079
AM 12-HR PERIOD (00:00-12:00)	5,842	5,888	11,730
PM 6-HR PERIOD (12:00-18:00)	7,085	4,613	11,698
PM 12-HR PERIOD (12:00-24:00)	10,689	5,815	16,504
24-HR PERIOD (12:00-24:00)	16,531	11,703	28,234
D%	58.55	41.45	100

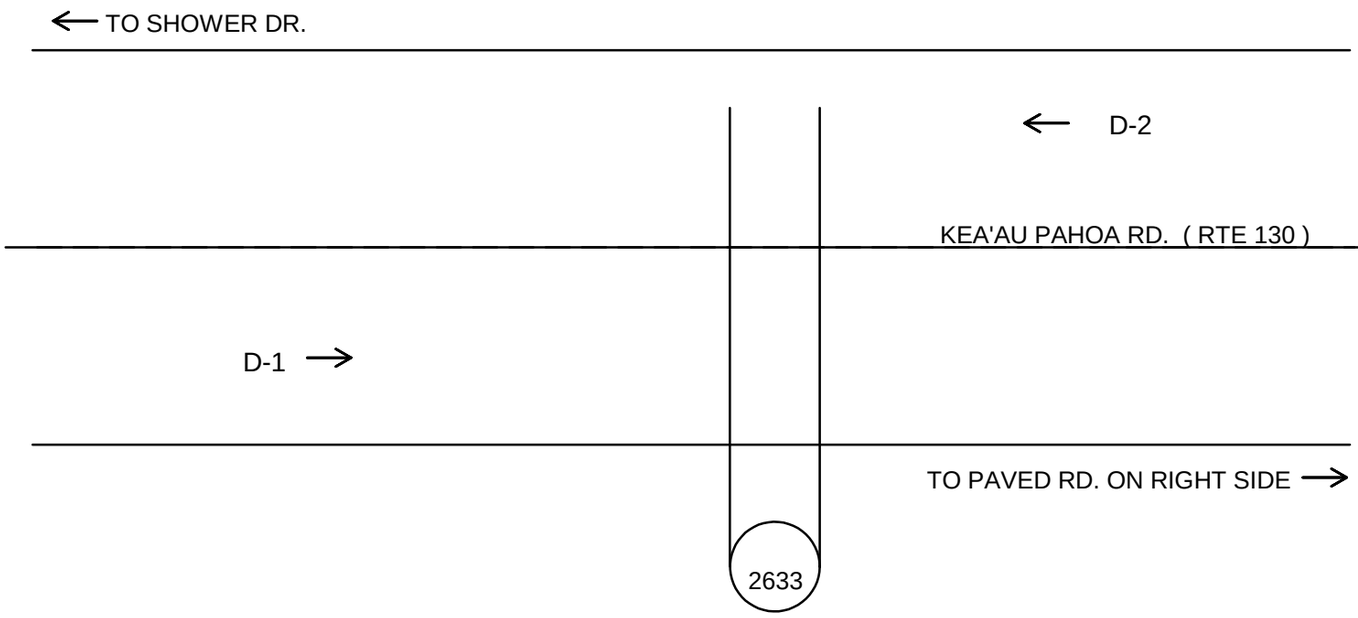
TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	33	13	46
12:15 - 12:30	29	9	38
12:30 - 12:45	13	11	24
12:45 - 01:00	15	10	25
01:00 - 01:15	12	6	18
01:15 - 01:30	18	7	25
01:30 - 01:45	14	6	20
01:45 - 02:00	13	12	25
02:00 - 02:15	14	10	24
02:15 - 02:30	10	16	26
02:30 - 02:45	11	16	27
02:45 - 03:00	9	17	26
03:00 - 03:15	3	17	20
03:15 - 03:30	9	21	30
03:30 - 03:45	9	34	43
03:45 - 04:00	9	36	45
04:00 - 04:15	3	46	49
04:15 - 04:30	8	55	63
04:30 - 04:45	11	98	109
04:45 - 05:00	10	89	99
05:00 - 05:15	34	120	154
05:15 - 05:30	51	142	193
05:30 - 05:45	123	134	257
05:45 - 06:00	121	144	265

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	176	159	335
06:15 - 06:30	244	162	406
06:30 - 06:45	303	169	472
06:45 - 07:00	344	186	530
07:00 - 07:15	339	161	500
07:15 - 07:30	317	158	475
07:30 - 07:45	356	162	518
07:45 - 08:00	339	163	502
08:00 - 08:15	295	163	458
08:15 - 08:30	239	192	431
08:30 - 08:45	189	231	420
08:45 - 09:00	136	248	384
09:00 - 09:15	166	247	413
09:15 - 09:30	130	262	392
09:30 - 09:45	147	279	426
09:45 - 10:00	136	253	389
10:00 - 10:15	167	202	369
10:15 - 10:30	177	201	378
10:30 - 10:45	171	228	399
10:45 - 11:00	182	227	409
11:00 - 11:15	171	158	329
11:15 - 11:30	188	226	414
11:30 - 11:45	168	183	351
11:45 - 12:00	180	199	379

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	203	216	419
12:15 - 12:30	160	170	330
12:30 - 12:45	195	216	411
12:45 - 01:00	207	180	387
01:00 - 01:15	170	188	358
01:15 - 01:30	227	209	436
01:30 - 01:45	222	235	457
01:45 - 02:00	209	256	465
02:00 - 02:15	223	212	435
02:15 - 02:30	297	245	542
02:30 - 02:45	346	249	595
02:45 - 03:00	299	224	523
03:00 - 03:15	310	219	529
03:15 - 03:30	326	219	545
03:30 - 03:45	349	218	567
03:45 - 04:00	372	210	582
04:00 - 04:15	384	170	554
04:15 - 04:30	357	170	527
04:30 - 04:45	340	163	503
04:45 - 05:00	378	144	522
05:00 - 05:15	377	128	505
05:15 - 05:30	380	124	504
05:30 - 05:45	394	123	517
05:45 - 06:00	360	125	485

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	328	139	467
06:15 - 06:30	311	142	453
06:30 - 06:45	353	111	464
06:45 - 07:00	289	83	372
07:00 - 07:15	228	67	295
07:15 - 07:30	235	64	299
07:30 - 07:45	181	60	241
07:45 - 08:00	175	53	228
08:00 - 08:15	147	52	199
08:15 - 08:30	132	50	182
08:30 - 08:45	133	34	167
08:45 - 09:00	114	36	150
09:00 - 09:15	135	31	166
09:15 - 09:30	121	47	168
09:30 - 09:45	118	36	154
09:45 - 10:00	119	40	159
10:00 - 10:15	66	20	86
10:15 - 10:30	85	30	115
10:30 - 10:45	73	26	99
10:45 - 11:00	65	12	77
11:00 - 11:15	49	12	61
11:15 - 11:30	64	19	83
11:30 - 11:45	44	23	67
11:45 - 12:00	39	15	54

ISLAND: HAWAII
AREA: PARADISE PARK



Station No:	B71 0130 00420

Station Location:			
Kea'au Pahoa Road between Shower Drive and Pohaku Place			
Station Mileage:	4.60	GPS Coord (Latitude):	19.58083 N
		GPS Coord (Longitude):	155.0074 W
Begin Survey (Date/Time):	09/29/20	End Survey (Date/Time):	10/01/20
Survey Method: LOOP **HOSE** OTHER		Survey Type: VOL **CLASS** SPEED OTHER	
Survey Crew:	FIELD CREW	Module No.:	

HPMS DATA

Segment Description:

KEA'AU PAHOA ROAD - PAVED ROAD TO AINALOA BOULEVARD

Segment Begin LRS	4.20	Segment End LRS	4.78	Length	0.58

Facility Name	Juris	Func Class	Area Type	Route No.	Route Mile	D-1 = Direction to End of Route / D-2 = Direction to Beginning of Route	
KEA'AU PAHOA ROAD	S	6	1	130	4.60	D-1	TO KAIMU-CHAIN OF CRATER ROAD
						D-2	TO VOLCANO ROAD

Sketch By: RG Date: 3/15/2016 SLD: 2005

Run Date: 24-NOV-21

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:
Town: Hawaii
Count Type: CLASS
DATE: 29-SEP-20
DIR 1: +MP
Counter Type: Tube
DIR 2: -MP
Final AADT: 21500
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 to 08:30 AM		
AM - PEAK HR VOLUME	468	815	1,283
AM - K FACTOR(%)			6.51
AM - D(%)	36.48	63.52	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 to 08:30 AM	06:30 to 07:30 AM	
AM - PEAK HR VOLUME	468	886	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 to 04:15 PM		
PM - PEAK HR VOLUME	955	614	1,569
PM - K FACTOR(%)			7.96
PM -D(%)	60.87	39.13	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:45 to 05:45 PM	03:00 to 04:00 PM	
PM - PEAK HR VOLUME	991	665	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 to 08:30 AM		
AM - PEAK HR VOLUME	468	815	1,283
AM - K FACTOR(%)			6.51
AM - D(%)	36.48	63.52	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 to 04:15 PM		
PM - PEAK HR VOLUME	955	614	1,569
PM - K FACTOR(%)			7.96
PM -D(%)	60.87	39.13	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM		
PEAK HR VOLUME	758	698	1,456
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	12:45 to 01:45 PM	
PEAK HR VOLUME	758	747	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	2,387	4,685	7,072
AM 12-HR PERIOD (00:00-12:00)	2,640	5,690	8,330
PM 6-HR PERIOD (12:00-18:00)	4,520	3,741	8,261
PM 12-HR PERIOD (12:00-24:00)	6,728	4,653	11,381
24-HR PERIOD (12:00-24:00)	9,368	10,343	19,711
D%	47.53	52.47	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	16	6	22
12:15 - 12:30	23	8	31
12:30 - 12:45	13	10	23
12:45 - 01:00	9	3	12
01:00 - 01:15	7	2	9
01:15 - 01:30	13	11	24
01:30 - 01:45	6	9	15
01:45 - 02:00	5	9	14
02:00 - 02:15	7	8	15
02:15 - 02:30	10	9	19
02:30 - 02:45	8	17	25
02:45 - 03:00	8	8	16
03:00 - 03:15	6	13	19
03:15 - 03:30	9	19	28
03:30 - 03:45	6	34	40
03:45 - 04:00	7	19	26
04:00 - 04:15	6	53	59
04:15 - 04:30	9	65	74
04:30 - 04:45	6	76	82
04:45 - 05:00	10	82	92
05:00 - 05:15	11	104	115
05:15 - 05:30	23	130	153
05:30 - 05:45	17	167	184
05:45 - 06:00	18	143	161

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	27	188	215
06:15 - 06:30	57	227	284
06:30 - 06:45	73	227	300
06:45 - 07:00	65	207	272
07:00 - 07:15	81	221	302
07:15 - 07:30	77	231	308
07:30 - 07:45	134	194	328
07:45 - 08:00	117	208	325
08:00 - 08:15	110	202	312
08:15 - 08:30	107	211	318
08:30 - 08:45	96	215	311
08:45 - 09:00	75	208	283
09:00 - 09:15	107	179	286
09:15 - 09:30	113	191	304
09:30 - 09:45	113	183	296
09:45 - 10:00	94	185	279
10:00 - 10:15	98	187	285
10:15 - 10:30	91	182	273
10:30 - 10:45	113	160	273
10:45 - 11:00	110	189	299
11:00 - 11:15	123	146	269
11:15 - 11:30	112	189	301
11:30 - 11:45	144	177	321
11:45 - 12:00	150	178	328

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	134	155	289
12:15 - 12:30	149	190	339
12:30 - 12:45	154	147	301
12:45 - 01:00	136	185	321
01:00 - 01:15	136	202	338
01:15 - 01:30	124	197	321
01:30 - 01:45	144	163	307
01:45 - 02:00	153	157	310
02:00 - 02:15	133	184	317
02:15 - 02:30	224	150	374
02:30 - 02:45	153	187	340
02:45 - 03:00	153	175	328
03:00 - 03:15	164	192	356
03:15 - 03:30	225	166	391
03:30 - 03:45	216	165	381
03:45 - 04:00	268	142	410
04:00 - 04:15	246	141	387
04:15 - 04:30	201	145	346
04:30 - 04:45	183	164	347
04:45 - 05:00	234	139	373
05:00 - 05:15	226	111	337
05:15 - 05:30	296	104	400
05:30 - 05:45	235	104	339
05:45 - 06:00	233	76	309

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	220	69	289
06:15 - 06:30	205	75	280
06:30 - 06:45	214	78	292
06:45 - 07:00	172	62	234
07:00 - 07:15	168	60	228
07:15 - 07:30	144	44	188
07:30 - 07:45	128	54	182
07:45 - 08:00	107	53	160
08:00 - 08:15	75	41	116
08:15 - 08:30	92	46	138
08:30 - 08:45	66	21	87
08:45 - 09:00	74	41	115
09:00 - 09:15	68	25	93
09:15 - 09:30	51	52	103
09:30 - 09:45	55	29	84
09:45 - 10:00	51	34	85
10:00 - 10:15	56	24	80
10:15 - 10:30	48	19	67
10:30 - 10:45	42	20	62
10:45 - 11:00	35	15	50
11:00 - 11:15	45	11	56
11:15 - 11:30	34	20	54
11:30 - 11:45	33	12	45
11:45 - 12:00	25	7	32

Run Date: 24-NOV-21

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:
Town: Hawaii
Count Type: CLASS
DATE: 30-SEP-20
DIR 1: +MP
Counter Type: Tube
DIR 2: -MP
Final AADT: 21500
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM		
AM - PEAK HR VOLUME	394	892	1,286
AM - K FACTOR(%)			6.38
AM - D(%)	30.64	69.36	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 to 08:45 AM	06:45 to 07:45 AM	
AM - PEAK HR VOLUME	457	943	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 to 04:45 PM		
PM - PEAK HR VOLUME	1,005	626	1,631
PM - K FACTOR(%)			8.1
PM -D(%)	61.62	38.38	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:45 to 05:45 PM	03:30 to 04:30 PM	
PM - PEAK HR VOLUME	1,046	648	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM		
AM - PEAK HR VOLUME	394	892	1,286
AM - K FACTOR(%)			6.38
AM - D(%)	30.64	69.36	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 to 04:45 PM		
PM - PEAK HR VOLUME	1,005	626	1,631
PM - K FACTOR(%)			8.1
PM -D(%)	61.62	38.38	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM		
PEAK HR VOLUME	801	694	1,495
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	10:30 to 11:30 AM	
PEAK HR VOLUME	801	776	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	2,244	4,765	7,009
AM 12-HR PERIOD (00:00-12:00)	2,496	5,729	8,225
PM 6-HR PERIOD (12:00-18:00)	4,785	3,804	8,589
PM 12-HR PERIOD (12:00-24:00)	7,050	4,873	11,923
24-HR PERIOD (12:00-24:00)	9,546	10,602	20,148
D%	47.38	52.62	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	25	7	32
12:15 - 12:30	21	14	35
12:30 - 12:45	12	9	21
12:45 - 01:00	9	2	11
01:00 - 01:15	12	7	19
01:15 - 01:30	5	7	12
01:30 - 01:45	3	9	12
01:45 - 02:00	9	10	19
02:00 - 02:15	7	7	14
02:15 - 02:30	7	10	17
02:30 - 02:45	9	14	23
02:45 - 03:00	5	11	16
03:00 - 03:15	7	12	19
03:15 - 03:30	14	18	32
03:30 - 03:45	9	37	46
03:45 - 04:00	5	37	42
04:00 - 04:15	11	47	58
04:15 - 04:30	4	54	58
04:30 - 04:45	3	76	79
04:45 - 05:00	7	79	86
05:00 - 05:15	8	104	112
05:15 - 05:30	14	118	132
05:30 - 05:45	23	150	173
05:45 - 06:00	23	125	148

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	30	198	228
06:15 - 06:30	28	234	262
06:30 - 06:45	55	227	282
06:45 - 07:00	63	238	301
07:00 - 07:15	60	227	287
07:15 - 07:30	113	239	352
07:30 - 07:45	104	239	343
07:45 - 08:00	117	187	304
08:00 - 08:15	109	169	278
08:15 - 08:30	121	194	315
08:30 - 08:45	110	186	296
08:45 - 09:00	70	199	269
09:00 - 09:15	88	191	279
09:15 - 09:30	107	192	299
09:30 - 09:45	83	186	269
09:45 - 10:00	96	194	290
10:00 - 10:15	95	197	292
10:15 - 10:30	90	178	268
10:30 - 10:45	116	188	304
10:45 - 11:00	121	191	312
11:00 - 11:15	113	198	311
11:15 - 11:30	111	199	310
11:30 - 11:45	123	174	297
11:45 - 12:00	121	140	261

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	123	211	334
12:15 - 12:30	119	177	296
12:30 - 12:45	146	190	336
12:45 - 01:00	148	160	308
01:00 - 01:15	168	152	320
01:15 - 01:30	186	186	372
01:30 - 01:45	127	194	321
01:45 - 02:00	164	158	322
02:00 - 02:15	187	170	357
02:15 - 02:30	168	159	327
02:30 - 02:45	209	166	375
02:45 - 03:00	174	181	355
03:00 - 03:15	221	164	385
03:15 - 03:30	190	175	365
03:30 - 03:45	216	174	390
03:45 - 04:00	301	110	411
04:00 - 04:15	224	179	403
04:15 - 04:30	223	185	408
04:30 - 04:45	257	152	409
04:45 - 05:00	231	124	355
05:00 - 05:15	292	105	397
05:15 - 05:30	253	118	371
05:30 - 05:45	270	99	369
05:45 - 06:00	188	115	303

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	200	108	308
06:15 - 06:30	208	101	309
06:30 - 06:45	203	70	273
06:45 - 07:00	177	79	256
07:00 - 07:15	143	81	224
07:15 - 07:30	121	59	180
07:30 - 07:45	139	47	186
07:45 - 08:00	128	42	170
08:00 - 08:15	83	60	143
08:15 - 08:30	86	45	131
08:30 - 08:45	83	53	136
08:45 - 09:00	87	42	129
09:00 - 09:15	74	44	118
09:15 - 09:30	81	45	126
09:30 - 09:45	68	48	116
09:45 - 10:00	58	19	77
10:00 - 10:15	67	21	88
10:15 - 10:30	41	21	62
10:30 - 10:45	51	20	71
10:45 - 11:00	28	21	49
11:00 - 11:15	44	13	57
11:15 - 11:30	39	9	48
11:30 - 11:45	32	11	43
11:45 - 12:00	24	10	34

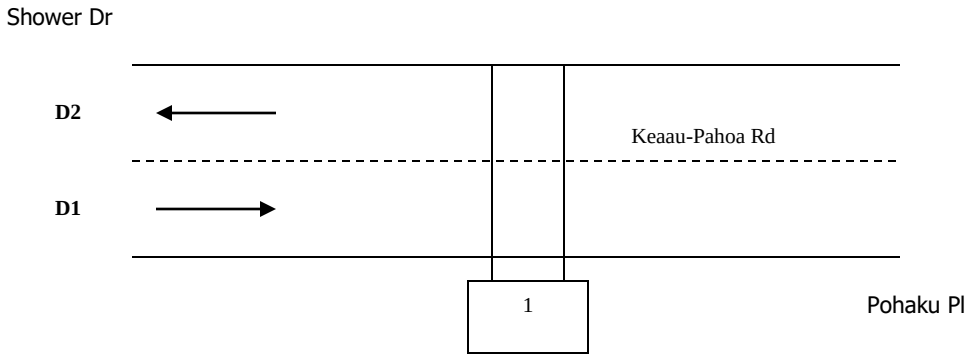
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii

Section ID/Station #: B71013000420



	Meter #	File Name	GPS
1.	MK33	D1221095_B71013000420	19.5796, -155.0063
2.		D1221096_B71013000420	

Station Description: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Survey Beginning Date/Time:		Survey Ending Date/Time:
12/21/20 0:00		12/22/20 24:00

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

Remarks:	E = SE 1298

FACILITY NAME	JURI		AREA TYPE	ROUTE NO.	ROUTE MILE
Keaau-Pahoa Rd				130	

D1= Direction to End D1: Pohaku Pl

D2= Direction to Begin D2: Shower Dr

Run Date: 27-DEC-21

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 21500
Functional Class: URBAN:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 130
Location: **DATE: 21-DEC-20**

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 to 07:45 AM		
AM - PEAK HR VOLUME	364	1,067	1,431
AM - K FACTOR(%)			5.51
AM - D(%)	25.44	74.56	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:45 to 09:45 AM	06:45 to 07:45 AM	
AM - PEAK HR VOLUME	474	1,067	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 to 05:00 PM		
PM - PEAK HR VOLUME	1,345	738	2,083
PM - K FACTOR(%)			8.01
PM -D(%)	64.57	35.43	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:45 to 05:45 PM	03:00 to 04:00 PM	
PM - PEAK HR VOLUME	1,386	777	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	11:45 to 12:45 PM		
AM - PEAK HR VOLUME	782	910	1,692
AM - K FACTOR(%)			6.51
AM - D(%)	25.44	74.56	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:00 to 05:00 PM		
PM - PEAK HR VOLUME	1,345	738	2,083
PM - K FACTOR(%)			8.01
PM -D(%)	64.57	35.43	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM		
PEAK HR VOLUME	1,140	805	1,945
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	11:45 to 12:45 PM	
PEAK HR VOLUME	1,140	910	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	2,904	5,570	8,474
AM 12-HR PERIOD (00:00-12:00)	3,280	6,708	9,988
PM 6-HR PERIOD (12:00-18:00)	6,623	4,627	11,250
PM 12-HR PERIOD (12:00-24:00)	9,996	6,007	16,003
24-HR PERIOD (12:00-24:00)	13,276	12,715	25,991
D%	51.08	48.92	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	11	12	23
12:15 - 12:30	27	19	46
12:30 - 12:45	22	20	42
12:45 - 01:00	26	9	35
01:00 - 01:15	16	14	30
01:15 - 01:30	31	12	43
01:30 - 01:45	23	15	38
01:45 - 02:00	16	8	24
02:00 - 02:15	23	18	41
02:15 - 02:30	10	12	22
02:30 - 02:45	8	19	27
02:45 - 03:00	8	13	21
03:00 - 03:15	14	14	28
03:15 - 03:30	6	23	29
03:30 - 03:45	16	42	58
03:45 - 04:00	11	29	40
04:00 - 04:15	8	51	59
04:15 - 04:30	16	62	78
04:30 - 04:45	14	86	100
04:45 - 05:00	7	73	80
05:00 - 05:15	11	104	115
05:15 - 05:30	15	135	150
05:30 - 05:45	18	191	209
05:45 - 06:00	19	157	176

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	44	201	245
06:15 - 06:30	52	229	281
06:30 - 06:45	68	251	319
06:45 - 07:00	90	276	366
07:00 - 07:15	74	246	320
07:15 - 07:30	107	275	382
07:30 - 07:45	93	270	363
07:45 - 08:00	130	217	347
08:00 - 08:15	113	218	331
08:15 - 08:30	115	262	377
08:30 - 08:45	102	245	347
08:45 - 09:00	121	242	363
09:00 - 09:15	108	224	332
09:15 - 09:30	112	227	339
09:30 - 09:45	133	222	355
09:45 - 10:00	145	214	359
10:00 - 10:15	163	229	392
10:15 - 10:30	162	226	388
10:30 - 10:45	124	202	326
10:45 - 11:00	133	207	340
11:00 - 11:15	170	229	399
11:15 - 11:30	174	217	391
11:30 - 11:45	174	224	398
11:45 - 12:00	197	217	414

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	184	223	407
12:15 - 12:30	204	225	429
12:30 - 12:45	197	245	442
12:45 - 01:00	229	216	445
01:00 - 01:15	222	215	437
01:15 - 01:30	207	217	424
01:30 - 01:45	230	229	459
01:45 - 02:00	239	224	463
02:00 - 02:15	257	193	450
02:15 - 02:30	245	200	445
02:30 - 02:45	268	197	465
02:45 - 03:00	278	200	478
03:00 - 03:15	283	202	485
03:15 - 03:30	289	208	497
03:30 - 03:45	290	195	485
03:45 - 04:00	314	172	486
04:00 - 04:15	333	199	532
04:15 - 04:30	320	171	491
04:30 - 04:45	337	193	530
04:45 - 05:00	355	175	530
05:00 - 05:15	343	126	469
05:15 - 05:30	340	144	484
05:30 - 05:45	348	137	485
05:45 - 06:00	311	121	432

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	305	150	455
06:15 - 06:30	288	125	413
06:30 - 06:45	241	112	353
06:45 - 07:00	219	91	310
07:00 - 07:15	197	92	289
07:15 - 07:30	169	83	252
07:30 - 07:45	194	78	272
07:45 - 08:00	165	70	235
08:00 - 08:15	175	55	230
08:15 - 08:30	161	58	219
08:30 - 08:45	150	73	223
08:45 - 09:00	140	40	180
09:00 - 09:15	133	46	179
09:15 - 09:30	89	49	138
09:30 - 09:45	97	38	135
09:45 - 10:00	93	29	122
10:00 - 10:15	84	28	112
10:15 - 10:30	77	34	111
10:30 - 10:45	101	25	126
10:45 - 11:00	69	15	84
11:00 - 11:15	85	23	108
11:15 - 11:30	65	22	87
11:30 - 11:45	44	21	65
11:45 - 12:00	32	23	55

Run Date: 27-DEC-21

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:
Town: Hawaii
Count Type: CLASS
DATE: 22-DEC-20
DIR 1: +MP
Counter Type: Tube
DIR 2: -MP
Final AADT: 21500
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 to 07:45 AM		
AM - PEAK HR VOLUME	390	1,112	1,502
AM - K FACTOR(%)			5.65
AM - D(%)	25.97	74.03	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 to 08:45 AM	06:45 to 07:45 AM	
AM - PEAK HR VOLUME	522	1,112	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 to 04:30 PM		
PM - PEAK HR VOLUME	1,319	740	2,059
PM - K FACTOR(%)			7.74
PM -D(%)	64.06	35.94	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	05:30 to 06:30 PM	03:00 to 04:00 PM	
PM - PEAK HR VOLUME	1,409	765	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	11:45 to 12:45 PM		
AM - PEAK HR VOLUME	710	934	1,644
AM - K FACTOR(%)			6.18
AM - D(%)	25.97	74.03	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 to 04:30 PM		
PM - PEAK HR VOLUME	1,319	740	2,059
PM - K FACTOR(%)			7.74
PM -D(%)	64.06	35.94	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM		
PEAK HR VOLUME	1,192	782	1,974
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	12:45 to 01:45 PM	
PEAK HR VOLUME	1,192	971	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	2,995	5,573	8,568
AM 12-HR PERIOD (00:00-12:00)	3,338	6,652	9,990
PM 6-HR PERIOD (12:00-18:00)	6,723	4,730	11,453
PM 12-HR PERIOD (12:00-24:00)	10,368	6,233	16,601
24-HR PERIOD (12:00-24:00)	13,706	12,885	26,591
D%	51.54	48.46	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	47	9	56
12:15 - 12:30	22	8	30
12:30 - 12:45	31	12	43
12:45 - 01:00	23	5	28
01:00 - 01:15	11	5	16
01:15 - 01:30	18	10	28
01:30 - 01:45	23	13	36
01:45 - 02:00	7	10	17
02:00 - 02:15	11	7	18
02:15 - 02:30	8	11	19
02:30 - 02:45	7	17	24
02:45 - 03:00	8	9	17
03:00 - 03:15	8	21	29
03:15 - 03:30	5	24	29
03:30 - 03:45	7	34	41
03:45 - 04:00	8	26	34
04:00 - 04:15	10	39	49
04:15 - 04:30	9	58	67
04:30 - 04:45	7	88	95
04:45 - 05:00	11	93	104
05:00 - 05:15	10	95	105
05:15 - 05:30	11	122	133
05:30 - 05:45	17	188	205
05:45 - 06:00	24	175	199

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	33	213	246
06:15 - 06:30	68	240	308
06:30 - 06:45	69	276	345
06:45 - 07:00	73	277	350
07:00 - 07:15	83	281	364
07:15 - 07:30	114	276	390
07:30 - 07:45	120	278	398
07:45 - 08:00	123	224	347
08:00 - 08:15	122	216	338
08:15 - 08:30	137	235	372
08:30 - 08:45	140	245	385
08:45 - 09:00	120	249	369
09:00 - 09:15	114	225	339
09:15 - 09:30	135	216	351
09:30 - 09:45	153	206	359
09:45 - 10:00	159	200	359
10:00 - 10:15	130	221	351
10:15 - 10:30	136	204	340
10:30 - 10:45	171	211	382
10:45 - 11:00	157	224	381
11:00 - 11:15	153	206	359
11:15 - 11:30	148	206	354
11:30 - 11:45	173	207	380
11:45 - 12:00	164	237	401

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	187	246	433
12:15 - 12:30	187	227	414
12:30 - 12:45	172	224	396
12:45 - 01:00	216	241	457
01:00 - 01:15	236	255	491
01:15 - 01:30	237	240	477
01:30 - 01:45	229	235	464
01:45 - 02:00	230	231	461
02:00 - 02:15	238	209	447
02:15 - 02:30	262	221	483
02:30 - 02:45	271	202	473
02:45 - 03:00	294	208	502
03:00 - 03:15	271	196	467
03:15 - 03:30	294	192	486
03:30 - 03:45	333	186	519
03:45 - 04:00	337	191	528
04:00 - 04:15	332	174	506
04:15 - 04:30	317	189	506
04:30 - 04:45	360	147	507
04:45 - 05:00	319	148	467
05:00 - 05:15	368	147	515
05:15 - 05:30	338	168	506
05:30 - 05:45	369	129	498
05:45 - 06:00	326	124	450

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	373	136	509
06:15 - 06:30	341	127	468
06:30 - 06:45	304	114	418
06:45 - 07:00	278	105	383
07:00 - 07:15	199	102	301
07:15 - 07:30	190	82	272
07:30 - 07:45	181	80	261
07:45 - 08:00	193	76	269
08:00 - 08:15	179	58	237
08:15 - 08:30	183	58	241
08:30 - 08:45	147	64	211
08:45 - 09:00	146	48	194
09:00 - 09:15	131	52	183
09:15 - 09:30	105	65	170
09:30 - 09:45	108	62	170
09:45 - 10:00	92	43	135
10:00 - 10:15	89	48	137
10:15 - 10:30	77	44	121
10:30 - 10:45	68	30	98
10:45 - 11:00	54	19	73
11:00 - 11:15	68	34	102
11:15 - 11:30	57	22	79
11:30 - 11:45	41	18	59
11:45 - 12:00	41	16	57

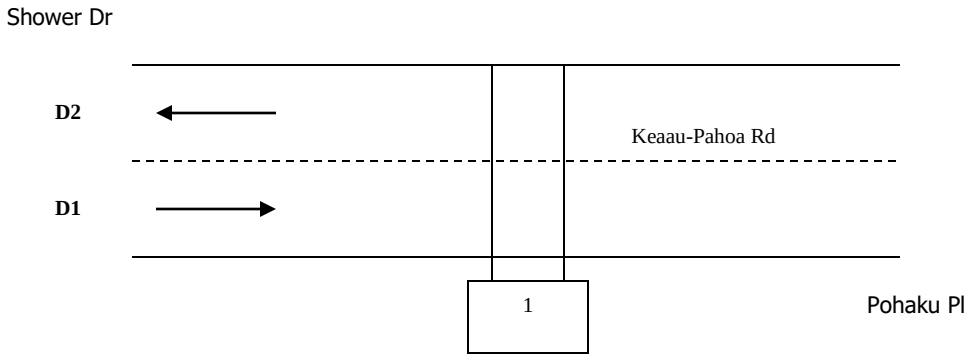
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii

Section ID/Station #: B71013000420



	Meter #	File Name	GPS
1.	MK33	D1214045_B71013000420	19.575994, -155.003616
2.		D1214046_B71013000420	

Station Description: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Survey Beginning Date/Time: 4/26/2021		Survey Ending Date/Time: 4/27/2021

Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	E = SE 1298		

FACILITY NAME	JURI		AREA TYPE	ROUTE NO.	ROUTE MILE
Keaau-Pahoa Rd				0130	

D1= Direction to End D1: Pohaku Pl

D2= Direction to Begin D2: Shower Dr

Run Date: 08-JUL-22

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:
Town: Hawaii
Count Type: CLASS
DATE: 26-APR-21
DIR 1: +MP
Counter Type: Tube
DIR 2: -MP
Final AADT: 23100
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM		
AM - PEAK HR VOLUME	610	1,198	1,808
AM - K FACTOR(%)			6.84
AM - D(%)	33.74	66.26	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 to 08:45 AM	06:30 to 07:30 AM	
AM - PEAK HR VOLUME	723	1,286	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 to 04:30 PM		
PM - PEAK HR VOLUME	1,342	789	2,131
PM - K FACTOR(%)			8.06
PM -D(%)	62.98	37.02	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:15 to 05:15 PM	03:00 to 04:00 PM	
PM - PEAK HR VOLUME	1,424	853	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM		
AM - PEAK HR VOLUME	610	1,198	1,808
AM - K FACTOR(%)			6.84
AM - D(%)	33.74	66.26	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:30 to 04:30 PM		
PM - PEAK HR VOLUME	1,342	789	2,131
PM - K FACTOR(%)			8.06
PM -D(%)	62.98	37.02	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM		
PEAK HR VOLUME	1,093	822	1,915
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	10:15 to 11:15 AM	
PEAK HR VOLUME	1,093	871	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	3,515	5,823	9,338
AM 12-HR PERIOD (00:00-12:00)	3,828	7,104	10,932
PM 6-HR PERIOD (12:00-18:00)	6,725	4,405	11,130
PM 12-HR PERIOD (12:00-24:00)	9,847	5,649	15,496
24-HR PERIOD (12:00-24:00)	13,675	12,753	26,428
D%	51.74	48.26	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	20	13	33
12:15 - 12:30	24	9	33
12:30 - 12:45	13	11	24
12:45 - 01:00	14	8	22
01:00 - 01:15	14	8	22
01:15 - 01:30	15	5	20
01:30 - 01:45	19	4	23
01:45 - 02:00	10	8	18
02:00 - 02:15	8	11	19
02:15 - 02:30	10	11	21
02:30 - 02:45	10	22	32
02:45 - 03:00	8	20	28
03:00 - 03:15	1	23	24
03:15 - 03:30	8	22	30
03:30 - 03:45	6	40	46
03:45 - 04:00	9	39	48
04:00 - 04:15	8	45	53
04:15 - 04:30	14	70	84
04:30 - 04:45	9	110	119
04:45 - 05:00	11	117	128
05:00 - 05:15	12	123	135
05:15 - 05:30	16	148	164
05:30 - 05:45	34	197	231
05:45 - 06:00	20	217	237

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	54	235	289
06:15 - 06:30	66	319	385
06:30 - 06:45	108	312	420
06:45 - 07:00	98	320	418
07:00 - 07:15	110	318	428
07:15 - 07:30	144	336	480
07:30 - 07:45	157	301	458
07:45 - 08:00	199	243	442
08:00 - 08:15	191	215	406
08:15 - 08:30	162	251	413
08:30 - 08:45	171	235	406
08:45 - 09:00	145	207	352
09:00 - 09:15	153	215	368
09:15 - 09:30	143	227	370
09:30 - 09:45	154	215	369
09:45 - 10:00	135	192	327
10:00 - 10:15	144	184	328
10:15 - 10:30	153	213	366
10:30 - 10:45	168	206	374
10:45 - 11:00	142	218	360
11:00 - 11:15	166	234	400
11:15 - 11:30	178	212	390
11:30 - 11:45	167	203	370
11:45 - 12:00	207	212	419

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	201	197	398
12:15 - 12:30	227	200	427
12:30 - 12:45	206	191	397
12:45 - 01:00	219	179	398
01:00 - 01:15	219	183	402
01:15 - 01:30	222	188	410
01:30 - 01:45	219	222	441
01:45 - 02:00	231	191	422
02:00 - 02:15	229	215	444
02:15 - 02:30	298	201	499
02:30 - 02:45	270	216	486
02:45 - 03:00	264	186	450
03:00 - 03:15	254	214	468
03:15 - 03:30	253	192	445
03:30 - 03:45	322	230	552
03:45 - 04:00	323	217	540
04:00 - 04:15	340	179	519
04:15 - 04:30	357	163	520
04:30 - 04:45	369	151	520
04:45 - 05:00	330	128	458
05:00 - 05:15	368	137	505
05:15 - 05:30	331	159	490
05:30 - 05:45	319	138	457
05:45 - 06:00	354	128	482

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	319	96	415
06:15 - 06:30	280	107	387
06:30 - 06:45	260	95	355
06:45 - 07:00	233	78	311
07:00 - 07:15	188	85	273
07:15 - 07:30	204	79	283
07:30 - 07:45	197	74	271
07:45 - 08:00	159	59	218
08:00 - 08:15	119	64	183
08:15 - 08:30	128	45	173
08:30 - 08:45	105	46	151
08:45 - 09:00	116	45	161
09:00 - 09:15	90	51	141
09:15 - 09:30	101	50	151
09:30 - 09:45	82	40	122
09:45 - 10:00	87	54	141
10:00 - 10:15	68	38	106
10:15 - 10:30	83	29	112
10:30 - 10:45	68	23	91
10:45 - 11:00	61	14	75
11:00 - 11:15	59	19	78
11:15 - 11:30	46	23	69
11:30 - 11:45	40	18	58
11:45 - 12:00	29	12	41

Run Date: 08-JUL-22

State of Hawaii, Department of Transportation, Highways Division
15 Minute Volume Report

Site ID: B71013000420
Functional Class: URBAN:MINOR ARTERIAL
Location:
Town: Hawaii
Count Type: CLASS
DATE: 27-APR-21
DIR 1: +MP
Counter Type: Tube
DIR 2: -MP
Final AADT: 23100
Route No: 130

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 to 08:00 AM		
AM - PEAK HR VOLUME	594	1,192	1,786
AM - K FACTOR(%)			6.7
AM - D(%)	33.26	66.74	100
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:15 to 08:15 AM	06:15 to 07:15 AM	
AM - PEAK HR VOLUME	640	1,283	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 to 04:00 PM		
PM - PEAK HR VOLUME	1,282	788	2,070
PM - K FACTOR(%)			7.76
PM -D(%)	61.93	38.07	100
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:30 to 05:30 PM	03:00 to 04:00 PM	
PM - PEAK HR VOLUME	1,375	788	

AM PERIOD (00:00-12:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	11:45 to 12:45 PM		
AM - PEAK HR VOLUME	1,101	852	1,953
AM - K FACTOR(%)			7.33
AM - D(%)	33.26	66.74	100

PM PERIOD (12:00-24:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 to 04:00 PM		
PM - PEAK HR VOLUME	1,282	788	2,070
PM - K FACTOR(%)			7.76
PM -D(%)	61.93	38.07	100

NON COMMUTER PERIOD (09:00-15:00)	DIR 1	DIR 2	TOTAL
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM		
PEAK HR VOLUME	1,280	781	2,061
DIRECTIONAL PEAK			
PEAK HR TIME	02:45 to 03:45 PM	12:00 to 01:00 PM	
PEAK HR VOLUME	1,280	873	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	TOTAL
AM 6-HR PERIOD (06:00-12:00)	3,643	5,637	9,280
AM 12-HR PERIOD (00:00-12:00)	3,987	6,945	10,932
PM 6-HR PERIOD (12:00-18:00)	7,041	4,320	11,361
PM 12-HR PERIOD (12:00-24:00)	10,181	5,546	15,727
24-HR PERIOD (12:00-24:00)	14,168	12,491	26,659
D%	53.15	46.85	100

TIME - AM	DIR1	DIR 2	TOTAL
12:00 - 12:15	26	11	37
12:15 - 12:30	20	11	31
12:30 - 12:45	16	5	21
12:45 - 01:00	22	12	34
01:00 - 01:15	18	12	30
01:15 - 01:30	13	6	19
01:30 - 01:45	2	10	12
01:45 - 02:00	6	9	15
02:00 - 02:15	5	10	15
02:15 - 02:30	15	18	33
02:30 - 02:45	10	17	27
02:45 - 03:00	4	17	21
03:00 - 03:15	7	18	25
03:15 - 03:30	7	27	34
03:30 - 03:45	7	52	59
03:45 - 04:00	13	34	47
04:00 - 04:15	14	52	66
04:15 - 04:30	9	61	70
04:30 - 04:45	9	127	136
04:45 - 05:00	13	106	119
05:00 - 05:15	18	119	137
05:15 - 05:30	24	167	191
05:30 - 05:45	23	188	211
05:45 - 06:00	43	219	262

TIME - AM	DIR1	DIR 2	TOTAL
06:00 - 06:15	48	237	285
06:15 - 06:30	68	330	398
06:30 - 06:45	82	303	385
06:45 - 07:00	111	321	432
07:00 - 07:15	97	329	426
07:15 - 07:30	154	325	479
07:30 - 07:45	142	283	425
07:45 - 08:00	201	255	456
08:00 - 08:15	143	226	369
08:15 - 08:30	138	243	381
08:30 - 08:45	152	240	392
08:45 - 09:00	144	219	363
09:00 - 09:15	142	204	346
09:15 - 09:30	117	242	359
09:30 - 09:45	152	202	354
09:45 - 10:00	120	174	294
10:00 - 10:15	158	202	360
10:15 - 10:30	161	187	348
10:30 - 10:45	195	150	345
10:45 - 11:00	229	191	420
11:00 - 11:15	208	162	370
11:15 - 11:30	199	217	416
11:30 - 11:45	217	197	414
11:45 - 12:00	265	198	463

TIME - PM	DIR1	DIR 2	TOTAL
12:00 - 12:15	260	213	473
12:15 - 12:30	282	218	500
12:30 - 12:45	294	223	517
12:45 - 01:00	292	219	511
01:00 - 01:15	230	181	411
01:15 - 01:30	208	222	430
01:30 - 01:45	230	202	432
01:45 - 02:00	210	165	375
02:00 - 02:15	225	215	440
02:15 - 02:30	286	189	475
02:30 - 02:45	270	202	472
02:45 - 03:00	316	173	489
03:00 - 03:15	320	211	531
03:15 - 03:30	307	214	521
03:30 - 03:45	337	183	520
03:45 - 04:00	318	180	498
04:00 - 04:15	319	152	471
04:15 - 04:30	346	180	526
04:30 - 04:45	325	168	493
04:45 - 05:00	347	123	470
05:00 - 05:15	356	134	490
05:15 - 05:30	347	120	467
05:30 - 05:45	292	124	416
05:45 - 06:00	324	109	433

TIME - PM	DIR1	DIR 2	TOTAL
06:00 - 06:15	317	100	417
06:15 - 06:30	309	87	396
06:30 - 06:45	260	75	335
06:45 - 07:00	225	89	314
07:00 - 07:15	202	71	273
07:15 - 07:30	204	91	295
07:30 - 07:45	179	72	251
07:45 - 08:00	152	52	204
08:00 - 08:15	127	67	194
08:15 - 08:30	127	54	181
08:30 - 08:45	131	60	191
08:45 - 09:00	98	57	155
09:00 - 09:15	110	45	155
09:15 - 09:30	111	50	161
09:30 - 09:45	85	49	134
09:45 - 10:00	89	40	129
10:00 - 10:15	72	25	97
10:15 - 10:30	72	40	112
10:30 - 10:45	51	30	81
10:45 - 11:00	51	13	64
11:00 - 11:15	54	20	74
11:15 - 11:30	51	13	64
11:30 - 11:45	39	12	51
11:45 - 12:00	24	14	38

Run Date: 2022/06/27

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2021

Site ID: B71013000420 **Route No:** 130 **Date From:** 2021/04/26 0:00

Town: Hawaii **Direction:** +MP **Date To:** 2021/04/27 23:45

Location: Keaau-Pahoa Rd: Shower Dr to Pohaku Pl

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	191	0.36%	382
PC	37133	69.95%	74266
2A-4T	14096	26.55%	28192
LIGHT VEHICLE TOTALS	51420	96.86%	102840
	HEAVY VEHICLES		
Bus	213	0.40%	532
SINGLE UNIT TRUCK			
2A-6T	148	0.28%	296
3A-SU	439	0.83%	1317
4A-SU	241	0.45%	964
SINGLE-TRAILER TRUCKS			
4A-ST	342	0.64%	1368
5A-ST	76	0.14%	380
6A-ST	78	0.15%	468
MULTI-TRAILER TRUCKS			
5A-MT	63	0.12%	315
6A-MT	18	0.03%	108
7A-MT	51	0.10%	357
HEAVY VEHICLE TOTALS	1669	3.14%	6105
CLASSIFIED VEHICLES TOTALS	53089 (A)	100.00%	108946 (B)
UNCLASSIFIED VEHICLES TOTALS	-2	-0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.975

ROADTUBE EQUIVALENT(B/2) = 54473 (C)

PEAK HOUR VOLUME : 2070 **2021/04/27 15:00**	**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)	**46**	**(65A-1) 2.22%**	**520**	**23100**	**(65A-2) 2.25%**	**8.96%**
COMBINATION (TYPE 8-13)	**28**	**(65B-1) 1.35%**	**314**		**(65B-2) 1.36%**	**8.96%**

Appendix C –
Analysis Reports –
Existing (2023) Conditions

Intersection	
Int Delay, s/veh	48.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	186	560	641	26	33	482
Future Vol, veh/h	186	560	641	26	33	482
Conflicting Peds, #/hr	0	0	0	0	3	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	445	-	-	-	0	100
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	211	636	728	30	38	548

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	758	0	-	0	1804	743
Stage 1	-	-	-	-	743	-
Stage 2	-	-	-	-	1061	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	853	-	-	-	87	~ 415
Stage 1	-	-	-	-	470	-
Stage 2	-	-	-	-	333	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	853	-	-	-	66	~ 415
Mov Cap-2 Maneuver	-	-	-	-	238	-
Stage 1	-	-	-	-	354	-
Stage 2	-	-	-	-	333	-

Approach	EB	WB	SB
HCM Control Delay, s	2.6	0	176.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	853	-	-	-	238	415
HCM Lane V/C Ratio	0.248	-	-	-	0.158	1.32
HCM Control Delay (s)	10.6	-	-	-	22.9	187.3
HCM Lane LOS	B	-	-	-	C	F
HCM 95th %tile Q(veh)	1	-	-	-	0.5	24.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	3	12	12	15	2	16	122	8	2	286	5
Future Vol, veh/h	0	3	12	12	15	2	16	122	8	2	286	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	13	13	16	2	17	133	9	2	311	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	499	494	314	498	492	138	316	0	0	142	0	0
Stage 1	318	318	-	172	172	-	-	-	-	-	-	-
Stage 2	181	176	-	326	320	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	482	476	726	483	478	910	1244	-	-	1441	-	-
Stage 1	693	654	-	830	756	-	-	-	-	-	-	-
Stage 2	821	753	-	687	652	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	462	468	726	466	470	910	1244	-	-	1441	-	-
Mov Cap-2 Maneuver	462	468	-	466	470	-	-	-	-	-	-	-
Stage 1	683	653	-	818	745	-	-	-	-	-	-	-
Stage 2	789	742	-	670	651	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	13	0.9	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1244	-	-	654	484	1441	-	-
HCM Lane V/C Ratio	0.014	-	-	0.025	0.065	0.002	-	-
HCM Control Delay (s)	7.9	0	-	10.6	13	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	1	13	8	5	1	6	118	3	0	283	5
Future Vol, veh/h	4	1	13	8	5	1	6	118	3	0	283	5
Conflicting Peds, #/hr	1	0	1	1	0	1	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	1	14	8	5	1	6	123	3	0	295	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	440	437	300	443	438	126	301	0	0	126	0	0
Stage 1	299	299	-	137	137	-	-	-	-	-	-	-
Stage 2	141	138	-	306	301	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	527	513	740	525	512	924	1260	-	-	1460	-	-
Stage 1	710	666	-	866	783	-	-	-	-	-	-	-
Stage 2	862	782	-	704	665	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	519	510	739	512	509	923	1259	-	-	1460	-	-
Mov Cap-2 Maneuver	519	510	-	512	509	-	-	-	-	-	-	-
Stage 1	706	665	-	862	779	-	-	-	-	-	-	-
Stage 2	850	778	-	689	664	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	12	0.4	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1259	-	-	660	528	1460	-	-
HCM Lane V/C Ratio	0.005	-	-	0.028	0.028	-	-	-
HCM Control Delay (s)	7.9	0	-	10.6	12	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	310	1040	474	100	23	136
Future Vol, veh/h	310	1040	474	100	23	136
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	445	-	-	-	0	100
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	316	1061	484	102	23	139

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	586	0	-	0	2228	535
Stage 1	-	-	-	-	535	-
Stage 2	-	-	-	-	1693	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	989	-	-	-	47	545
Stage 1	-	-	-	-	587	-
Stage 2	-	-	-	-	164	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	989	-	-	-	32	545
Mov Cap-2 Maneuver	-	-	-	-	145	-
Stage 1	-	-	-	-	399	-
Stage 2	-	-	-	-	164	-

Approach	EB	WB	SB
HCM Control Delay, s	2.4	0	16.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	989	-	-	-	145	545
HCM Lane V/C Ratio	0.32	-	-	-	0.162	0.255
HCM Control Delay (s)	10.3	-	-	-	34.6	13.8
HCM Lane LOS	B	-	-	-	D	B
HCM 95th %tile Q(veh)	1.4	-	-	-	0.6	1

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	6	8	4	10	1	11	355	10	2	170	5
Future Vol, veh/h	3	6	8	4	10	1	11	355	10	2	170	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	6	8	4	11	1	12	374	11	2	179	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	596	595	182	597	592	380	184	0	0	385	0	0
Stage 1	186	186	-	404	404	-	-	-	-	-	-	-
Stage 2	410	409	-	193	188	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	415	417	861	415	419	667	1391	-	-	1173	-	-
Stage 1	816	746	-	623	599	-	-	-	-	-	-	-
Stage 2	619	596	-	809	745	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	402	412	861	402	414	667	1391	-	-	1173	-	-
Mov Cap-2 Maneuver	402	412	-	402	414	-	-	-	-	-	-	-
Stage 1	807	745	-	616	592	-	-	-	-	-	-	-
Stage 2	600	589	-	793	744	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.9	13.9	0.2	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1391	-	-	543	421	1173	-	-
HCM Lane V/C Ratio	0.008	-	-	0.033	0.038	0.002	-	-
HCM Control Delay (s)	7.6	0	-	11.9	13.9	8.1	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	13	8	4	3	4	98	7	352	2	4	183	16
Future Vol, veh/h	13	8	4	3	4	98	7	352	2	4	183	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	10	5	4	5	118	8	424	2	5	220	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	743	682	230	688	690	425	239	0	0	426	0	0
Stage 1	240	240	-	441	441	-	-	-	-	-	-	-
Stage 2	503	442	-	247	249	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	331	372	809	360	368	629	1328	-	-	1133	-	-
Stage 1	763	707	-	595	577	-	-	-	-	-	-	-
Stage 2	551	576	-	757	701	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	263	367	809	347	363	629	1328	-	-	1133	-	-
Mov Cap-2 Maneuver	263	367	-	347	363	-	-	-	-	-	-	-
Stage 1	757	703	-	590	572	-	-	-	-	-	-	-
Stage 2	440	571	-	738	697	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.1	12.6	0.1	0.2
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1328	-	-	328	598	1133	-	-
HCM Lane V/C Ratio	0.006	-	-	0.092	0.212	0.004	-	-
HCM Control Delay (s)	7.7	0	-	17.1	12.6	8.2	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.8	0	-	-

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	186	560	641	26	33	482
Future Volume (veh/h)	186	560	641	26	33	482
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	211	636	728	30	38	548
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	297	1087	766	32	525	467
Arrive On Green	0.09	0.58	0.43	0.43	0.29	0.29
Sat Flow, veh/h	1781	1870	1784	74	1781	1585
Grp Volume(v), veh/h	211	636	0	758	38	548
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1857	1781	1585
Q Serve(g_s), s	3.9	13.9	0.0	25.4	1.0	19.0
Cycle Q Clear(g_c), s	3.9	13.9	0.0	25.4	1.0	19.0
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	297	1087	0	798	525	467
V/C Ratio(X)	0.71	0.59	0.00	0.95	0.07	1.17
Avail Cap(c_a), veh/h	303	1103	0	807	525	467
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	8.6	0.0	17.7	16.4	22.7
Incr Delay (d2), s/veh	7.4	0.8	0.0	20.4	0.1	98.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	4.0	0.0	13.0	0.4	19.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	21.5	9.4	0.0	38.1	16.4	121.1
LnGrp LOS	C	A	A	D	B	F
Approach Vol, veh/h		847	758		586	
Approach Delay, s/veh		12.4	38.1		114.4	
Approach LOS		B	D		F	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	9.8	31.7				41.5	23.0
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	6.0	28.0				38.0	19.0
Max Q Clear Time (g_c+I1), s	5.9	27.4				15.9	21.0
Green Ext Time (p_c), s	0.0	0.3				3.9	0.0

Intersection Summary	
HCM 6th Ctrl Delay	48.6
HCM 6th LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	310	1040	474	100	23	136
Future Volume (veh/h)	310	1040	474	100	23	136
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	316	1061	484	102	23	139
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	574	1279	672	142	214	190
Arrive On Green	0.14	0.68	0.45	0.45	0.12	0.12
Sat Flow, veh/h	1781	1870	1498	316	1781	1585
Grp Volume(v), veh/h	316	1061	0	586	23	139
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1814	1781	1585
Q Serve(g_s), s	3.2	16.9	0.0	10.7	0.5	3.4
Cycle Q Clear(g_c), s	3.2	16.9	0.0	10.7	0.5	3.4
Prop In Lane	1.00			0.17	1.00	1.00
Lane Grp Cap(c), veh/h	574	1279	0	813	214	190
V/C Ratio(X)	0.55	0.83	0.00	0.72	0.11	0.73
Avail Cap(c_a), veh/h	855	1975	0	1203	831	740
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.5	4.7	0.0	9.1	16.0	17.3
Incr Delay (d2), s/veh	0.8	1.8	0.0	1.2	0.2	5.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.7	0.0	2.6	0.2	1.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.3	6.5	0.0	10.4	16.2	22.6
LnGrp LOS	A	A	A	B	B	C
Approach Vol, veh/h		1377	586		162	
Approach Delay, s/veh		6.7	10.4		21.7	
Approach LOS		A	B		C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	9.6	22.3				31.8	8.9
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	12.0	27.0				43.0	19.0
Max Q Clear Time (g_c+I1), s	5.2	12.7				18.9	5.4
Green Ext Time (p_c), s	0.5	3.1				8.9	0.4

Intersection Summary	
HCM 6th Ctrl Delay	8.9
HCM 6th LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	186	560	641	26	33	482
Future Volume (veh/h)	186	560	641	26	33	482
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	211	636	728	30	38	548
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	315	1117	800	33	505	590
Arrive On Green	0.09	0.60	0.45	0.45	0.28	0.28
Sat Flow, veh/h	1781	1870	1784	74	1781	1585
Grp Volume(v), veh/h	211	636	0	758	38	548
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1857	1781	1585
Q Serve(g_s), s	3.9	13.9	0.0	25.5	1.0	19.0
Cycle Q Clear(g_c), s	3.9	13.9	0.0	25.5	1.0	19.0
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	315	1117	0	833	505	590
V/C Ratio(X)	0.67	0.57	0.00	0.91	0.08	0.93
Avail Cap(c_a), veh/h	421	1339	0	941	505	590
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.3	8.2	0.0	17.2	17.6	20.2
Incr Delay (d2), s/veh	2.5	0.5	0.0	11.7	0.1	21.1
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	3.9	0.0	11.3	0.4	10.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.8	8.7	0.0	29.0	17.7	41.3
LnGrp LOS	B	A	A	C	B	D
Approach Vol, veh/h		847	758		586	
Approach Delay, s/veh		10.7	29.0		39.8	
Approach LOS		B	C		D	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	10.0	34.1				44.1	23.0
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	10.0	34.0				48.0	19.0
Max Q Clear Time (g_c+I1), s	5.9	27.5				15.9	21.0
Green Ext Time (p_c), s	0.2	2.6				4.2	0.0

Intersection Summary			
HCM 6th Ctrl Delay		24.8	
HCM 6th LOS		C	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	310	1040	474	100	23	136
Future Volume (veh/h)	310	1040	474	100	23	136
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	316	1061	484	102	23	139
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	586	1295	683	144	196	392
Arrive On Green	0.14	0.69	0.46	0.46	0.11	0.11
Sat Flow, veh/h	1781	1870	1498	316	1781	1585
Grp Volume(v), veh/h	316	1061	0	586	23	139
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1814	1781	1585
Q Serve(g_s), s	3.1	16.3	0.0	10.5	0.5	2.9
Cycle Q Clear(g_c), s	3.1	16.3	0.0	10.5	0.5	2.9
Prop In Lane	1.00			0.17	1.00	1.00
Lane Grp Cap(c), veh/h	586	1295	0	826	196	392
V/C Ratio(X)	0.54	0.82	0.00	0.71	0.12	0.35
Avail Cap(c_a), veh/h	957	2220	0	1345	837	963
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.3	4.4	0.0	8.8	16.2	12.5
Incr Delay (d2), s/veh	0.8	1.3	0.0	1.1	0.3	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.5	0.0	2.5	0.2	0.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.0	5.8	0.0	10.0	16.5	13.1
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		1377	586		162	
Approach Delay, s/veh		6.1	10.0		13.6	
Approach LOS		A	A		B	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	9.6	22.4				32.0	8.4
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	14.0	30.0				48.0	19.0
Max Q Clear Time (g_c+I1), s	5.1	12.5				18.3	4.9
Green Ext Time (p_c), s	0.6	3.3				9.7	0.4

Intersection Summary	
HCM 6th Ctrl Delay	7.7
HCM 6th LOS	A

Appendix D –
Analysis Reports –
Future (2028) Without Project Conditions

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	205	669	726	26	33	500
Future Volume (veh/h)	205	669	726	26	33	500
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	233	727	825	30	38	568
Peak Hour Factor	0.88	0.92	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	304	1205	902	33	446	537
Arrive On Green	0.09	0.64	0.50	0.50	0.25	0.25
Sat Flow, veh/h	1781	1870	1793	65	1781	1585
Grp Volume(v), veh/h	233	727	0	855	38	568
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1859	1781	1585
Q Serve(g_s), s	4.4	17.2	0.0	32.1	1.2	19.0
Cycle Q Clear(g_c), s	4.4	17.2	0.0	32.1	1.2	19.0
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	304	1205	0	935	446	537
V/C Ratio(X)	0.77	0.60	0.00	0.91	0.09	1.06
Avail Cap(c_a), veh/h	498	1553	0	1078	446	537
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.3	7.9	0.0	17.4	21.8	25.1
Incr Delay (d2), s/veh	4.1	0.5	0.0	10.9	0.1	54.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	4.8	0.0	13.8	0.5	17.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.4	8.3	0.0	28.3	21.9	79.8
LnGrp LOS	C	A	A	C	C	F
Approach Vol, veh/h		960	855		606	
Approach Delay, s/veh		11.3	28.3		76.2	
Approach LOS		B	C		E	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	10.7	42.1				52.9	23.0
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	15.0	44.0				63.0	19.0
Max Q Clear Time (g_c+I1), s	6.4	34.1				19.2	21.0
Green Ext Time (p_c), s	0.4	4.0				5.3	0.0

Intersection Summary	
HCM 6th Ctrl Delay	33.5
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	3	13	13	15	2	18	138	9	2	303	5
Future Vol, veh/h	0	3	13	13	15	2	18	138	9	2	303	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	14	14	16	2	20	150	10	2	329	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	540	536	332	539	533	155	334	0	0	160	0	0
Stage 1	336	336	-	195	195	-	-	-	-	-	-	-
Stage 2	204	200	-	344	338	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	453	451	710	453	453	891	1225	-	-	1419	-	-
Stage 1	678	642	-	807	739	-	-	-	-	-	-	-
Stage 2	798	736	-	671	641	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	433	442	710	435	444	891	1225	-	-	1419	-	-
Mov Cap-2 Maneuver	433	442	-	435	444	-	-	-	-	-	-	-
Stage 1	666	641	-	792	726	-	-	-	-	-	-	-
Stage 2	764	723	-	653	640	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	13.5	0.9	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1225	-	-	638	455	1419	-	-
HCM Lane V/C Ratio	0.016	-	-	0.027	0.072	0.002	-	-
HCM Control Delay (s)	8	0	-	10.8	13.5	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	1	14	8	5	1	7	133	3	0	299	5
Future Vol, veh/h	4	1	14	8	5	1	7	133	3	0	299	5
Conflicting Peds, #/hr	1	0	1	1	0	1	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	1	15	8	5	1	7	139	3	0	311	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	474	471	316	478	472	142	317	0	0	142	0	0
Stage 1	315	315	-	155	155	-	-	-	-	-	-	-
Stage 2	159	156	-	323	317	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	501	491	724	498	490	906	1243	-	-	1441	-	-
Stage 1	696	656	-	847	769	-	-	-	-	-	-	-
Stage 2	843	769	-	689	654	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	493	488	723	485	487	905	1242	-	-	1441	-	-
Mov Cap-2 Maneuver	493	488	-	485	487	-	-	-	-	-	-	-
Stage 1	691	655	-	842	764	-	-	-	-	-	-	-
Stage 2	830	764	-	673	653	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	12.4	0.4	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1242	-	-	643	502	1441	-	-
HCM Lane V/C Ratio	0.006	-	-	0.031	0.029	-	-	-
HCM Control Delay (s)	7.9	0	-	10.8	12.4	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	14	30	0	0	0
Future Vol, veh/h	0	14	30	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	15	33	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	33	0	-	0	48	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	15	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1579	-	-	-	962	1041
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	1008	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1579	-	-	-	962	1041
Mov Cap-2 Maneuver	-	-	-	-	962	-
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	1008	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1579	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	4	0	0	14	0	0
Future Vol, veh/h	4	0	0	14	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	0	0	15	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	4	0	19	4
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	15	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1618	-	998	1080
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	1008	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1618	-	998	1080
Mov Cap-2 Maneuver	-	-	-	-	998	-
Stage 1	-	-	-	-	1019	-
Stage 2	-	-	-	-	1008	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1618	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	338	1234	620	100	23	165
Future Volume (veh/h)	338	1234	620	100	23	165
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	345	1259	633	102	23	168
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	521	1405	911	147	221	370
Arrive On Green	0.11	0.75	0.58	0.58	0.12	0.12
Sat Flow, veh/h	1781	1870	1572	253	1781	1585
Grp Volume(v), veh/h	345	1259	0	735	23	168
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1825	1781	1585
Q Serve(g_s), s	4.3	32.9	0.0	18.2	0.7	5.8
Cycle Q Clear(g_c), s	4.3	32.9	0.0	18.2	0.7	5.8
Prop In Lane	1.00			0.14	1.00	1.00
Lane Grp Cap(c), veh/h	521	1405	0	1058	221	370
V/C Ratio(X)	0.66	0.90	0.00	0.69	0.10	0.45
Avail Cap(c_a), veh/h	769	1832	0	1220	526	642
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.2	6.1	0.0	9.5	25.0	21.1
Incr Delay (d2), s/veh	1.5	5.1	0.0	1.4	0.2	0.9
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	5.3	0.0	5.3	0.3	2.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	10.7	11.1	0.0	10.9	25.2	22.0
LnGrp LOS	B	B	A	B	C	C
Approach Vol, veh/h		1604	735		191	
Approach Delay, s/veh		11.0	10.9		22.4	
Approach LOS		B	B		C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	11.0	41.3				52.3	12.0
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	16.0	43.0				63.0	19.0
Max Q Clear Time (g_c+I1), s	6.3	20.2				34.9	7.8
Green Ext Time (p_c), s	0.7	4.9				13.4	0.4

Intersection Summary	
HCM 6th Ctrl Delay	11.9
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	6	9	5	10	1	12	382	11	2	197	5
Future Vol, veh/h	3	6	9	5	10	1	12	382	11	2	197	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	6	9	5	11	1	13	402	12	2	207	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	654	654	210	655	650	408	212	0	0	414	0	0
Stage 1	214	214	-	434	434	-	-	-	-	-	-	-
Stage 2	440	440	-	221	216	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	380	386	830	379	388	643	1358	-	-	1145	-	-
Stage 1	788	725	-	600	581	-	-	-	-	-	-	-
Stage 2	596	578	-	781	724	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	367	381	830	366	383	643	1358	-	-	1145	-	-
Mov Cap-2 Maneuver	367	381	-	366	383	-	-	-	-	-	-	-
Stage 1	779	724	-	593	574	-	-	-	-	-	-	-
Stage 2	577	571	-	764	723	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	14.7	0.2	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1358	-	-	518	387	1145	-	-
HCM Lane V/C Ratio	0.009	-	-	0.037	0.044	0.002	-	-
HCM Control Delay (s)	7.7	0	-	12.2	14.7	8.2	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	13	8	5	3	4	98	8	378	2	4	209	16
Future Vol, veh/h	13	8	5	3	4	98	8	378	2	4	209	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	10	6	4	5	118	10	455	2	5	252	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	810	749	262	756	757	456	271	0	0	457	0	0
Stage 1	272	272	-	476	476	-	-	-	-	-	-	-
Stage 2	538	477	-	280	281	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	298	341	777	325	337	604	1292	-	-	1104	-	-
Stage 1	734	685	-	570	557	-	-	-	-	-	-	-
Stage 2	527	556	-	727	678	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	235	336	777	312	332	604	1292	-	-	1104	-	-
Mov Cap-2 Maneuver	235	336	-	312	332	-	-	-	-	-	-	-
Stage 1	727	682	-	564	551	-	-	-	-	-	-	-
Stage 2	416	550	-	708	675	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.2	13.1	0.2	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1292	-	-	304	571	1104	-	-
HCM Lane V/C Ratio	0.007	-	-	0.103	0.222	0.004	-	-
HCM Control Delay (s)	7.8	0	-	18.2	13.1	8.3	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.8	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	19	16	0	0	0
Future Vol, veh/h	0	19	16	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	21	17	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	17	0	-	0	38	17
Stage 1	-	-	-	-	17	-
Stage 2	-	-	-	-	21	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1600	-	-	-	974	1062
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	1002	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1600	-	-	-	974	1062
Mov Cap-2 Maneuver	-	-	-	-	974	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	1002	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1600	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	14	0	0	105	0	0
Future Vol, veh/h	14	0	0	105	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	0	0	114	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	15	0	129	15
Stage 1	-	-	-	-	15	-
Stage 2	-	-	-	-	114	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1603	-	865	1065
Stage 1	-	-	-	-	1008	-
Stage 2	-	-	-	-	911	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1603	-	865	1065
Mov Cap-2 Maneuver	-	-	-	-	865	-
Stage 1	-	-	-	-	1008	-
Stage 2	-	-	-	-	911	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1603	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	205	669	726	26	33	500
Future Volume (veh/h)	205	669	726	26	33	500
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	233	727	825	30	38	568
Peak Hour Factor	0.88	0.92	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	277	1162	860	31	500	593
Arrive On Green	0.09	0.62	0.48	0.48	0.28	0.28
Sat Flow, veh/h	1781	1870	1793	65	1781	1585
Grp Volume(v), veh/h	233	727	0	855	38	568
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1859	1781	1585
Q Serve(g_s), s	5.3	19.7	0.0	36.3	1.3	23.0
Cycle Q Clear(g_c), s	5.3	19.7	0.0	36.3	1.3	23.0
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	277	1162	0	891	500	593
V/C Ratio(X)	0.84	0.63	0.00	0.96	0.08	0.96
Avail Cap(c_a), veh/h	437	1347	0	908	500	593
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.9	9.6	0.0	20.6	21.6	25.0
Incr Delay (d2), s/veh	8.2	0.7	0.0	20.5	0.1	26.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	6.2	0.0	18.2	0.5	14.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	27.2	10.3	0.0	41.1	21.7	51.7
LnGrp LOS	C	B	A	D	C	D
Approach Vol, veh/h		960	855		606	
Approach Delay, s/veh		14.4	41.1		49.8	
Approach LOS		B	D		D	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	11.6	43.3				54.9	27.0
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	15.0	40.0				59.0	23.0
Max Q Clear Time (g_c+I1), s	7.3	38.3				21.7	25.0
Green Ext Time (p_c), s	0.4	0.9				5.2	0.0

Intersection Summary	
HCM 6th Ctrl Delay	32.7
HCM 6th LOS	C

Appendix E –
Analysis Reports –
Future (2028) With Project

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	207	669	726	26	33	504
Future Volume (veh/h)	207	669	726	26	33	504
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	235	760	825	30	38	573
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	291	1210	888	32	404	501
Arrive On Green	0.09	0.65	0.49	0.49	0.23	0.23
Sat Flow, veh/h	1781	1870	1793	65	1781	1585
Grp Volume(v), veh/h	235	760	0	855	38	573
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1859	1781	1585
Q Serve(g_s), s	4.7	19.2	0.0	34.1	1.3	18.0
Cycle Q Clear(g_c), s	4.7	19.2	0.0	34.1	1.3	18.0
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	291	1210	0	920	404	501
V/C Ratio(X)	0.81	0.63	0.00	0.93	0.09	1.14
Avail Cap(c_a), veh/h	447	1463	0	1008	404	501
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.3	8.3	0.0	18.7	24.2	27.1
Incr Delay (d2), s/veh	6.2	0.6	0.0	13.7	0.1	86.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	5.6	0.0	15.5	0.6	20.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	23.5	8.9	0.0	32.4	24.3	113.5
LnGrp LOS	C	A	A	C	C	F
Approach Vol, veh/h		995	855		611	
Approach Delay, s/veh		12.4	32.4		108.0	
Approach LOS		B	C		F	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	12.0	44.2				56.3	23.0
Change Period (Y+Rc), s	5.0	5.0				5.0	5.0
Max Green Setting (Gmax), s	14.0	43.0				62.0	18.0
Max Q Clear Time (g_c+I1), s	6.7	36.1				21.2	20.0
Green Ext Time (p_c), s	0.4	3.1				5.7	0.0

Intersection Summary	
HCM 6th Ctrl Delay	43.1
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	4	13	15	18	2	18	138	12	2	304	5
Future Vol, veh/h	0	4	13	15	18	2	18	138	12	2	304	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	14	16	20	2	20	150	13	2	330	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	545	540	333	543	536	157	335	0	0	163	0	0
Stage 1	337	337	-	197	197	-	-	-	-	-	-	-
Stage 2	208	203	-	346	339	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	449	449	709	451	451	889	1224	-	-	1416	-	-
Stage 1	677	641	-	805	738	-	-	-	-	-	-	-
Stage 2	794	733	-	670	640	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	426	440	709	432	442	889	1224	-	-	1416	-	-
Mov Cap-2 Maneuver	426	440	-	432	442	-	-	-	-	-	-	-
Stage 1	665	640	-	791	725	-	-	-	-	-	-	-
Stage 2	757	720	-	651	639	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	13.7	0.9	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1224	-	-	620	450	1416	-	-
HCM Lane V/C Ratio	0.016	-	-	0.03	0.085	0.002	-	-
HCM Control Delay (s)	8	0	-	11	13.7	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	9	14	10	6	1	7	133	3	0	299	5
Future Vol, veh/h	4	9	14	10	6	1	7	133	3	0	299	5
Conflicting Peds, #/hr	1	0	1	1	0	1	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	9	15	10	6	1	7	139	3	0	311	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	474	471	316	482	472	142	317	0	0	142	0	0
Stage 1	315	315	-	155	155	-	-	-	-	-	-	-
Stage 2	159	156	-	327	317	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	501	491	724	495	490	906	1243	-	-	1441	-	-
Stage 1	696	656	-	847	769	-	-	-	-	-	-	-
Stage 2	843	769	-	686	654	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	492	488	723	475	487	905	1242	-	-	1441	-	-
Mov Cap-2 Maneuver	492	488	-	475	487	-	-	-	-	-	-	-
Stage 1	691	655	-	842	764	-	-	-	-	-	-	-
Stage 2	829	764	-	662	653	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.4	12.6	0.4	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1242	-	-	588	493	1441	-	-
HCM Lane V/C Ratio	0.006	-	-	0.048	0.036	-	-	-
HCM Control Delay (s)	7.9	0	-	11.4	12.6	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	14	30	9	2	6
Future Vol, veh/h	4	14	30	9	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	15	33	10	2	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	43	0	-	0	61	38
Stage 1	-	-	-	-	38	-
Stage 2	-	-	-	-	23	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1566	-	-	-	945	1034
Stage 1	-	-	-	-	984	-
Stage 2	-	-	-	-	1000	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1566	-	-	-	942	1034
Mov Cap-2 Maneuver	-	-	-	-	942	-
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	1000	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1566	-	-	-	1009
HCM Lane V/C Ratio	0.003	-	-	-	0.009
HCM Control Delay (s)	7.3	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	4	8	21	14	3	1
Future Vol, veh/h	4	8	21	14	3	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	9	23	15	3	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	13	0	70	9
Stage 1	-	-	-	-	9	-
Stage 2	-	-	-	-	61	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1606	-	934	1073
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	962	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1606	-	921	1073
Mov Cap-2 Maneuver	-	-	-	-	921	-
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	949	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	955	-	-	1606	-
HCM Lane V/C Ratio	0.005	-	-	0.014	-
HCM Control Delay (s)	8.8	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	344	1234	620	102	24	172
Future Volume (veh/h)	344	1234	620	102	24	172
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	351	1259	633	104	24	176
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	517	1401	904	149	229	379
Arrive On Green	0.11	0.75	0.58	0.58	0.13	0.13
Sat Flow, veh/h	1781	1870	1567	257	1781	1585
Grp Volume(v), veh/h	351	1259	0	737	24	176
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1824	1781	1585
Q Serve(g_s), s	4.5	33.8	0.0	18.8	0.8	6.2
Cycle Q Clear(g_c), s	4.5	33.8	0.0	18.8	0.8	6.2
Prop In Lane	1.00			0.14	1.00	1.00
Lane Grp Cap(c), veh/h	517	1401	0	1053	229	379
V/C Ratio(X)	0.68	0.90	0.00	0.70	0.10	0.46
Avail Cap(c_a), veh/h	755	1801	0	1199	517	636
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.6	6.3	0.0	9.8	25.2	21.3
Incr Delay (d2), s/veh	1.6	5.4	0.0	1.6	0.2	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	6.0	0.0	5.6	0.3	2.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	11.2	11.7	0.0	11.4	25.4	22.2
LnGrp LOS	B	B	A	B	C	C
Approach Vol, veh/h		1610	737		200	
Approach Delay, s/veh		11.6	11.4		22.6	
Approach LOS		B	B		C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	11.2	41.8				53.0	12.4
Change Period (Y+Rc), s	4.0	4.0				4.0	4.0
Max Green Setting (Gmax), s	16.0	43.0				63.0	19.0
Max Q Clear Time (g_c+I1), s	6.5	20.8				35.8	8.2
Green Ext Time (p_c), s	0.7	4.9				13.2	0.4

Intersection Summary			
HCM 6th Ctrl Delay		12.4	
HCM 6th LOS		B	

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	10	9	12	27	3	12	382	18	2	199	5
Future Vol, veh/h	3	10	9	12	27	3	12	382	18	2	199	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	11	9	13	28	3	13	402	19	2	209	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	669	663	212	664	656	412	214	0	0	421	0	0
Stage 1	216	216	-	438	438	-	-	-	-	-	-	-
Stage 2	453	447	-	226	218	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	371	382	828	374	385	640	1356	-	-	1138	-	-
Stage 1	786	724	-	597	579	-	-	-	-	-	-	-
Stage 2	586	573	-	777	723	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	344	376	828	358	379	640	1356	-	-	1138	-	-
Mov Cap-2 Maneuver	344	376	-	358	379	-	-	-	-	-	-	-
Stage 1	776	723	-	589	571	-	-	-	-	-	-	-
Stage 2	547	566	-	755	722	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.9	15.6	0.2	0.1
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1356	-	-	476	384	1138	-	-
HCM Lane V/C Ratio	0.009	-	-	0.049	0.115	0.002	-	-
HCM Control Delay (s)	7.7	0	-	12.9	15.6	8.2	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.4	0	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	13	12	5	5	6	145	8	380	2	6	209	16
Future Vol, veh/h	13	12	5	5	6	145	8	380	2	6	209	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	14	6	6	7	175	10	458	2	7	252	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	846	756	262	765	764	459	271	0	0	460	0	0
Stage 1	276	276	-	479	479	-	-	-	-	-	-	-
Stage 2	570	480	-	286	285	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	282	337	777	320	334	602	1292	-	-	1101	-	-
Stage 1	730	682	-	568	555	-	-	-	-	-	-	-
Stage 2	506	554	-	721	676	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	194	331	777	303	328	602	1292	-	-	1101	-	-
Mov Cap-2 Maneuver	194	331	-	303	328	-	-	-	-	-	-	-
Stage 1	723	677	-	562	549	-	-	-	-	-	-	-
Stage 2	351	548	-	695	671	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.2	14.5	0.2	0.2
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1292	-	-	273	566	1101	-	-
HCM Lane V/C Ratio	0.007	-	-	0.132	0.332	0.007	-	-
HCM Control Delay (s)	7.8	0	-	20.2	14.5	8.3	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	1.4	0	-	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	19	16	43	7	26
Future Vol, veh/h	11	19	16	43	7	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	21	17	47	8	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	64	0	-	0	86	41
Stage 1	-	-	-	-	41	-
Stage 2	-	-	-	-	45	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1538	-	-	-	915	1030
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	977	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1538	-	-	-	908	1030
Mov Cap-2 Maneuver	-	-	-	-	908	-
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	977	-

Approach	EB	WB	SB
HCM Control Delay, s	2.7	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1538	-	-	-	1001
HCM Lane V/C Ratio	0.008	-	-	-	0.036
HCM Control Delay (s)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	14	6	22	105	50	13
Future Vol, veh/h	14	6	22	105	50	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	7	24	114	54	14

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	22	0	181	19
Stage 1	-	-	-	-	19	-
Stage 2	-	-	-	-	162	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1593	-	808	1059
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	867	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1593	-	795	1059
Mov Cap-2 Maneuver	-	-	-	-	795	-
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	853	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	838	-	-	1593	-
HCM Lane V/C Ratio	0.082	-	-	0.015	-
HCM Control Delay (s)	9.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	207	669	726	26	33	504
Future Volume (veh/h)	207	669	726	26	33	504
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	235	760	825	30	38	573
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	273	1170	843	31	496	611
Arrive On Green	0.11	0.63	0.47	0.47	0.28	0.28
Sat Flow, veh/h	1781	1870	1793	65	1781	1585
Grp Volume(v), veh/h	235	760	0	855	38	573
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1859	1781	1585
Q Serve(g_s), s	8.7	26.7	0.0	47.0	1.6	29.0
Cycle Q Clear(g_c), s	8.7	26.7	0.0	47.0	1.6	29.0
Prop In Lane	1.00			0.04	1.00	1.00
Lane Grp Cap(c), veh/h	273	1170	0	874	496	611
V/C Ratio(X)	0.86	0.65	0.00	0.98	0.08	0.94
Avail Cap(c_a), veh/h	543	1454	0	874	496	611
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.3	12.3	0.0	27.1	27.7	30.8
Incr Delay (d2), s/veh	7.9	0.7	0.0	25.1	0.1	22.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	9.5	0.0	24.7	0.7	16.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	37.2	13.0	0.0	52.2	27.8	52.9
LnGrp LOS	D	B	A	D	C	D
Approach Vol, veh/h		995	855		611	
Approach Delay, s/veh		18.7	52.2		51.4	
Approach LOS		B	D		D	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	16.2	54.0				70.2	34.0
Change Period (Y+Rc), s	5.0	5.0				5.0	5.0
Max Green Setting (Gmax), s	27.0	49.0				81.0	29.0
Max Q Clear Time (g_c+I1), s	10.7	49.0				28.7	31.0
Green Ext Time (p_c), s	0.6	0.0				5.8	0.0

Intersection Summary	
HCM 6th Ctrl Delay	38.4
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

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APPENDIX I

Pre-Assessment Consultation Comments and Responses

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Mitchell D. Roth
Mayor

Benjamin T. Moszkowicz
Police Chief

Reed K. Mahuna
Acting 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

December 13, 2023

Ms. Jennifer Scheffel, Sr. Environmental Planner
SSFM International, Inc.
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720
Email: jscheffel@ssfm.com

Dear Ms. Scheffel:

SUBJECT: HAWAIIAN PARADISE PARK (HPP), NEW DISTRICT PARK
TAX MAP KEY (TMK): (3) 1-5-039:267
PRE-ASSESSMENT CONSULTATION FOR DRAFT ENVIRONMENTAL ASSESSMENT

This is in response to letter dated December 8, 2023, requesting input for a draft environmental pre-assessment for the new District Park in Hawaiian Paradise Park (HPP) community of Puna, on the Island of Hawaii.

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or public safety concerns.

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact Captain Todd Pataray, Puna Patrol, at 965-2716 or via email at todd.pataray@hawaiicounty.gov.

Sincerely,

KENNETH A.K. QUIOCHO
ASSISTANT POLICE CHIEF
AREA I OPERATIONS

SSFM International

October 31, 2024

SSFM 2023_046.000

Kenneth A.K. Quiocho
Assistant Police Chief
Area 1 Operations
349 Kapiolani St
Hilo, HI 96720

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai'i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your letter dated December 13, 2023, regarding the subject project. The Department of Parks and Recreation has noted that the Police Department does not anticipate any significant impact to traffic and/or public safety concerns.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

January 5, 2024

SSFM International, Inc.
Attn: Ms. Jennifer M. Scheffel
Sr. Environmental Planner
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

via email: jscheffel@ssfm.com

Dear Ms. Scheffel:

SUBJECT: Pre-Assessment Consultation for DEA for the Proposed **Hawaiian Paradise Park** (HPP), New District Park located at Kaloli Drive, Puna, Island of Hawaii; TMK: (3) 1-5-039:267 on behalf of Hawaii County Department of Parks and Recreation

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division and (b) Land Division-Hawaii District on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

December 14, 2023

MEMORANDUM

FROM: ~~TO:~~ **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division (DLNR.ENGR@hawaii.gov)
_X_ Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_ Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_ Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
_X_ Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

TO: ~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Pre-Assessment Consultation for DEA for the Proposed **Hawaiian Paradise Park** (HPP), New District Park
LOCATION: Kaloli Drive, Puna, Island of Hawaii; TMK: (3) 1-5-039:267
APPLICANT: SSFM International on behalf of Hawaii County Department of Parks and Recreation

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **January 5, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: *CSC*
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Dec 28, 2023

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji

Ref: Pre-Assessment Consultation for DEA for the Proposed Hawaiian Paradise Park (HPP), New District Park
Location: Kaloli Drive, Puna, Island of Hawaii
TMK(s): (3) 1-5-039:267
Applicant: SSFM International on behalf of Hawaii County Department of Parks and Recreation

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood zones subject to NFIP requirements are identified on FEMA's Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMA's Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (fhat.hawaii.gov) could also be used to research flood hazard information.

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4849.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: Dec 28, 2023

12/28/23

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

December 14, 2023

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division (DLNR.ENGR@hawaii.gov)
_X_Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
_X_Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Pre-Assessment Consultation for DEA for the Proposed **Hawaiian Paradise Park** (HPP), New District Park
LOCATION: Kaloli Drive, Puna, Island of Hawaii; TMK: (3) 1-5-039:267
APPLICANT: SSFM International on behalf of Hawaii County Department of Parks and Recreation

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **January 5, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

(✓) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
( ) Comments are included/attached.

Signed: _____
Print Name: GORDON C. HEIT
Division: Land Division
Date: 12/26/23

Attachments
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

January 17, 2024

SSFM International, Inc.
Attn: Ms. Jennifer M. Scheffel
Sr. Environmental Planner
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

via email: jscheffel@ssfm.com

Dear Ms. Scheffel:

SUBJECT: Pre-Assessment Consultation for DEA for the Proposed **Hawaiian Paradise Park** (HPP), New District Park located at Kaloli Drive, Puna, Island of Hawaii; TMK: (3) 1-5-039:267 on behalf of Hawaii County Department of Parks and Recreation

Thank you for the opportunity to review and comment on the subject matter. In addition to our previous comments dated January 5, 2024, enclosed are comments from the Division of Forestry & Wildlife on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

December 14, 2023

MEMORANDUM

FROM: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division (DLNR.ENGR@hawaii.gov)
_X_Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
_X_Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

TO: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Pre-Assessment Consultation for DEA for the Proposed **Hawaiian Paradise Park** (HPP), New District Park
LOCATION: Kaloli Drive, Puna, Island of Hawaii; TMK: (3) 1-5-039:267
APPLICANT: SSFM International on behalf of Hawaii County Department of Parks and Recreation

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **January 5, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(☑) Comments are included/attached.

Signed: *Afsheen Siddiqi*
Print Name: AFSHEEN A. SIDDIQI, Acting Wildlife Prog. Mgr
Division: Forestry and Wildlife
Date: Jan 16, 2024

Attachments
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA

DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

January 9, 2024

Log no. 4360

MEMORANDUM

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: AFSHEEN A. SIDDIQI, Acting Wildlife Program Manager
Division of Forestry and Wildlife

SUBJECT: Pre- Assessment Consultation for the Draft Environmental Assessment for the Proposed Hawaiian Paradise Park (HPP), New District Park

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your request for comments on the Pre-Assessment Consultation for the Draft Environmental Assessment (DEA) for the Proposed District Park in the Hawaiian Paradise Park (HPP) community of Puna on Hawai'i Island; TMK: (3) 1-5-039:267. The park is proposed to be on an approximately 20 acres parcel from Kaloli Drive and could include vehicular access from 25th and 26th Avenues, bisecting the park site near its longitudinal midpoint. It could include approximately 81 parking stalls in the north parking lot, 137 parking stalls in the south parking lot, making about 218 parking stalls in total, plus lighting for the parking lots; and fencing around the perimeter of the park with a landscape buffer. The proposed action includes numerous recreational amenities which could include: an approximately 270-feet-wide baseball/softball field, an approximately 80 X 120 yards football/soccer field, two tennis courts with nighttime lighting fixtures, three pickleball courts with nighttime lighting fixtures, a covered playcourt which would be approximately 24,120 square feet, a community pool and pool building around 9,600 square feet and 3,760 square feet respectively, an approximately 15,000 square foot skate park that may include lighting fixtures, two covered playground areas encompassing approximately 2,600 square feet for younger kids and 5,600 square feet for older kids, picnic areas, a perimeter pathway approximately 10 feet wide, and a dog park.

The State listed ʻōpeʻapeʻa or Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) could potentially occur at or in the vicinity of the project and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should also be

avoided for any construction because bats can become ensnared and killed by such fencing material during flight.

Artificial lighting can adversely impact seabirds that may pass through the area at night by causing them to become disoriented. This disorientation can result in their collision with manmade structures or the grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used be fully shielded to minimize the attraction of seabirds. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season, from September 15 through December 15, when young seabirds make their maiden voyage to sea.

If nighttime construction is required during the seabird fledgling season (September 15 to December 15), we recommend that a qualified biologist be present at the project site to monitor and assess the risk of seabirds being attracted or grounded due to the lighting. If seabirds are seen circling around the area, lights should then be turned off. If a downed seabird is detected, please follow DOFAW's recommended response protocol by visiting https://dlnr.hawaii.gov/wildlife/seabird-fallout-season/#response.

Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawai'i please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

The State listed nēnē or Hawaiian Goose (*Branta sandvicensis*) could potentially occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any are present during construction, all activities within 100 feet (30 meters) should cease and the bird or birds should not be approached. Work may continue after the bird or birds leave the area of their own accord. If a nest is discovered at any point, please contact the Hawai'i Island Branch DOFAW Office at (808) 974-4221 and establish a buffer zone around the nest.

The State listed 'io or Hawaiian Hawk (*Buteo solitarius*) may occur in the project vicinity. Prior to undertaking vegetation clearing, DOFAW recommends that pre-construction surveys of the area be conducted by a qualified biologist following appropriate survey methods[1] (Gorressen et al., 2008) to ensure no Hawaiian Hawk nests are present, which may occur during the breeding season from March to September. The survey should be conducted at least 10 days prior to the start of construction. If an 'io nest is detected, a buffer zone of 100 meters (330 feet) should be established around it where no construction shall occur until the chick or chicks have fledged, or the nest is abandoned and. DOFAW staff should be immediately notified. If adult individuals are detected in the area during construction, all activities within 30 meters (100 feet) of the bird should cease. Work may continue when the bird has left the area on its own.

[1] Gorresen, P. M., R. J. Camp, J. L. Klavitter, and T. K. Pratt. 2008. Abundance, distribution and population trend of the Hawaiian Hawk: 1998-2007. Hawai`i Cooperative Studies Unit Technical Report HCSU-009. University of Hawai`i at Hilo. 53 pp., incl. 8 figures, 3 tables & 1 appendix.

The endemic pueo or Hawaiian Short-Eared Owl (*Asio flammeus sandwichensis)* could potentially nest in the project area. Before any potential vegetative alteration, especially ground-based disturbance, we recommend that line transect surveys are conducted during crepuscular hours through the project area. If a pueo nest is discovered, a minimum buffer distance of 100 meters from the nest should be established until chicks are capable of flight.

DOFAW recommends using native plant species for landscaping that are appropriate for the area; i.e., plants for which climate conditions are suitable for them to thrive, plants that historically occurred there, etc. Please do not plant invasive species. DOFAW also recommends referring to www.plantpono.org for guidance on the selection and evaluation of landscaping plants and to determine the potential invasiveness of plants proposed for use in the project.

DOFAW recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain detrimental fungal pathogens (e.g., Rapid ʻŌhiʻa Death), vertebrate and invertebrate pests (e.g., Little Fire Ants, Coqui Frogs, etc.), or invasive plant parts (e.g., African Tulip, Octopus Tree, Trumpet Tree, etc.) that could harm our native species and ecosystems. We recommend consulting the Big Island Invasive Species Committee (BIISC) at (808) 933-3340 to help plan, design, and construct the project, learn of any high-risk invasive species in the area, and ways to mitigate their spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.

To prevent the spread of Rapid ʻŌhiʻa Death (ROD), DOFAW requests that the information and guidance at the following website be reviewed and followed if ʻōhiʻa trees are present at the project site that will be removed, trimmed, or potentially injured: https://cms.ctahr.hawaii.edu/rod.

The invasive Coconut Rhinoceros Beetle (CRB) or *Oryctes rhinoceros* has now been found on the islands of O'ahu, Hawai'i Island, Maui, and Kaua'i. On July 1, 2022, the Hawaiʻi Department of Agriculture (HDOA) approved Plant Quarantine Interim Rule 22-1. This rule restricts the movement of CRB-host material within or to and from the island of Oʻahu, which is defined as the Quarantine Area. Regulated material (host material or host plants) is considered a risk for potential CRB infestation. Host material for the beetle specifically includes a) entire dead trees, b) mulch, compost, trimmings, fruit and vegetative scraps, and c) decaying stumps. CRB host plants include the live palm plants in the following genera: Washingtonia, Livistona, and Pritchardia (all commonly known as fan palms), Cocos (coconut palms), Phoenix (date palms), and Roystonea (royal palms). When such material or these specific plants are moved there is a risk of spreading CRB because they may contain CRB in any life stage. For more information regarding CRB, please visit https://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/coconut-rhinoceros-beetle/.

DOFAW is concerned about impacts to vulnerable birds from nonnative predators such as cats, rodents, and mongooses. We recommend taking action to minimize predator presence; remove cats, place bait stations for rodents and mongoose, and provide covered trash receptacles.

We recommend that Best Management Practices are employed during and after construction to contain any soils and sediment with the purpose of preventing damage to near-shore waters and marine ecosystems.

We appreciate your efforts to work with our office for the conservation of our native species. These comments are general guidelines and should not be considered comprehensive for this site or project. It is the responsibility of the applicant to do their own due diligence to avoid any negative environmental impacts. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Myrna N. Girald Pérez, Protected Species Habitat Conservation Planning Coordinator at (808) 265-3276 or myrna.girald-perez@hawaii.gov.

Sincerely,

Afsheen Siddiqi

AFSHEEN A. SIDDIQI
Acting Wildlife Program Manager

SSFM International

October 31, 2024 SSFM 2023_046.000

Russell Y. Tsuji
Land Administrator
Department of Land and Natural Resources
Land Division
PO Box 621
Honolulu, HI 96809

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai'i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for distributing the pre-assessment consultation letter for the Draft Environmental Assessment to the divisions within the Department of Land and Natural Resources. We offer the following responses to the Engineering Division, Land Division-Hawai'i District, and Division of Forestry and Wildlife:

Engineering Division

The Department of Parks and Recreation has noted the Department of Land and Natural Resources, Engineering Division advice to research the Flood Hazard Zone designations for the project site and to check for relevant County Flood Ordinances. The Department of Parks and Recreation will do its due diligence to ensure safety and proper compliance.

Land Division-Hawaii District

The Department of Parks and Recreation has noted that the Department of Land and Natural Resources, Hawai'i District Land Division does not have any objections to the proposed project at this time.

Division of Forestry and Wildlife

The Department of Parks and Recreation appreciates your insights to consider potential wildlife impacts from the proposed project in and around the project site. A biological survey was conducted for the project site in November 2023 by Geometrician Associates, LLC to identify flora and fauna species encountered on the project site as well as the locations of any special status species.

Although the scope of the biological survey did not include the sophisticated equipment necessary to identify Hawaiian hoary bats ('ōpe'ape'a, Lasiurus cinereus semotus), it is understood that the absence of bat detections does not indicate an absence of bats. These species may visit or transit through the project site and surrounding area and it is therefore assumed that Hawaiian hoary bats are present at least some of the time. The following measures would be implemented to minimize potential impacts to this species:

- Any fences that are erected during construction of the Proposed Action would have barbless topstrand wire to prevent Hawaiian hoary bats from becoming entangled on barbed wire.
- Trees taller than 15 feet would not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15).

Although they would rarely if ever be visible, several listed seabirds may overfly Hawaiian Paradise Park between the months of May and November, including the endangered Hawaiian petrel (Pterodroma sandwichensis), the endangered band-rumped storm petrel (Oceanodroma castro), and the threatened Newell's shearwater (Puffinus auricularis newelli). The following measures would be implemented to minimize potential impacts:

- Construction activity would be restricted to daylight hours as much as practicable during the seabird peak fledgling fallout period (September 15 to December 15) to avoid the use of nighttime lighting that could attract seabirds.
- All outdoor lights would be shielded to prevent upward radiation to reduce the potential for seabird attraction and shall not be directed to travel across property boundaries toward the shoreline and ocean waters.
- Outside lights not needed for security or safety would be turned off from dusk through dawn during the fledgling fallout period.
- Outdoor lighting fixtures will comply with the Hawai‘i County Outdoor Lighting Ordinance and minimize adverse effects. Light fixtures would be shielded to ensure that light is directed to the ground only, avoiding "spill-over."

While grassy patches on the disturbed portions of the properties may occasionally host nēnē, there were no signs of them observed during the biological survey. The potential for nēnē to occasionally nest or transit through the project site is noted, however, and the following measures would be implemented to minimize potential impacts:

- If any Hawaiian waterbirds including the nēnē, are present within or adjacent to the project area during construction, then all activities within 100 feet (30 meters) would cease, and the bird or birds would not be approached. Work may continue after the bird or birds leave the area of their own accord.
- If a nest is discovered at any point, the Hawaii Island Branch DOFAW Office would be contacted.

During the biological survey a single Hawaiian hawk (‘io, Buteo solitarius) was observed perched in a moderately tall ‘ōhi‘a tree. A pre-construction survey for hawk nests would be completed if construction is initiated during the breeding season (March 1 through September 30). If hawk nests are found to be present on or near the project site, DOFAW would be contacted and a buffer zone of 100 meters (330 feet) would be established around it where no construction shall occur until the chick or chicks have fledged, or the nest is abandoned.

Similar precautions would be taken for the endemic pueo or Hawaiian Short-Eared Owl (Asio flammeus sandwichensis). While no pueo were found on the project site during the biological survey, it is reasonable to assume they could occasionally nest, hunt, or otherwise transit through the project site. If a pueo nest is discovered, a minimum buffer distance of 100 meters from the nest would be established until chicks are capable of flight.

The following additional best practice measures would be implemented to minimize impacts related to invasive species, including Rapid ʻŌhiʻa Death, vertebrate and invertebrate pests, and invasive plant parts as mentioned in your letter.

- All construction equipment and vehicles would be washed and inspected before entering the project area.
- Construction materials would be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful non-native species.
- When possible, raw materials (e.g., fill and construction materials) would be purchased from a local supplier to avoid introducing non-native species not present on the island.
- Native Hawaiian plants and/or non-invasive plants would be used in all landscaping.

In addition, the Department of Parks and Recreation intends to use native plant species wherever practical for landscaping around the proposed park facility. Our due diligence efforts are overall intended to prevent the spread of invasive species and to protect native species that particularly benefit from an abundance of native plant species to support their habitats.

Your letters, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

JOSH GREEN, M.D.
GOVERNOR
KE KIA'ĀINA

EDWIN H. SNIFFEN
DIRECTOR
KA LUNA HO'OKELE

Deputy Directors
Nā Hope Luna Ho'okele
DREANALEE K. KALILI
TAMMY L. LEE
ROBIN K. SHISHIDO

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF TRANSPORTATION | KA 'OIHANA ALAKAU

HIGHWAYS
HAWAII DISTRICT
50 MAKAALA STREET
HILO, HAWAII 96720
TELEPHONE: (808) 933-8866 ● FAX: (808) 933-8869

IN REPLY REFER TO:

HWY-H 23-2.228

December 14, 2023

Jennifer M. Scheffel
Sr. Environmental Planner
SSFM International, Inc.
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

Dear Ms. Scheffel:

Subject: Hawaiian Paradise Park, New District Park
Tax Map Key: (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment
Keaau, Puna, Hawaii

This letter is in response to your December 8, 2023, request for review and comment on the subject proposed project.

A Traffic Assessment should be prepared by a Hawaii licensed civil engineer with a specific focus on the intersection of Kaloli Drive and Route 130, Keaau-Pahoa Road for any impacts and mitigation measures to be implemented due to the project. In addition, a complete streets evaluation of the improvements required for the project along all of the road frontages and accesses should be included.

Please contact me at (808) 933-8866 or by email at harry.h.takiue@hawaii.gov if you have any questions.

Sincerely,

HARRY. H. TAKIUE
Hawaii District Engineer

SSFM International

October 31, 2024

SSFM 2023_046.000

Harry Takiue
Hawai‘i District Engineer
Department of Transportation, Highways Division
50 Maka‘ala Street
Hilo, HI 96720

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai‘i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your letter dated December 14, 2023, regarding the subject project. A Traffic Impact Analysis Report (TIAR) shall be prepared by a state-licensed professional engineer as a part of the Environmental Assessment process. The Department of Parks and Recreation will ensure this TIAR identifies potential impacts on the state-owned Pāhoa Bypass Road (Route 130) intersection with Kaloli Drive. Where impacts are identified, mitigating measures shall be proposed. These measures will also consider an evaluation of complete streets opportunities along all road frontages and proposed access points.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

From: DOH.CABPDTSS <DOH.CABPDTSS@doh.hawaii.gov>
Sent: Wednesday, December 20, 2023 10:00 AM
To: Jennifer Scheffel <jscheffel@ssfm.com>
Subject: Draft Environmental Assessment of the proposed Hawaiian Paradise Park (HPP), New District Park, Pre-Assessment Consultation

Agency: Hawaii County Department of Parks and Recreation (DPR)
Hawaiian Paradise Park Owners Association (HPPOA)

Consultant: SSFM International, Inc.
Jennifer Scheffel
Sr. Environmental Planner
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720
(808) 375-6038
jscheffel@ssfm.com

Aloha,

Thank you for the opportunity to provide comments on the subject HPP New District Park Pre-Assessment Consultation for Draft Environmental Assessment. The Clean Air Branch would like to make the following comments on the subject DEA:

- For construction and other activities associated with the project, the applicable provisions of Hawaii Administrative Rules §11-60.1-33 shall be followed to mitigate fugitive dust impacts.
- Also, please see our standard comments at:

https://health.hawaii.gov/cab/files/2022/05/Standard-Comments-for-Land-Use-Reviews-Clean-Air-Branch-2022-1.pdf

Please let us know if you have any questions or concerns.

Thank you very much,
Colby

Standard Comments for Land Use Reviews
Clean Air Branch
Hawaii State Department of Health

If your proposed project:

Requires an Air Pollution Control Permit

- You must obtain an air pollution control permit from the Clean Air Branch and comply with all applicable conditions and requirements. If you do not know if you need an air pollution control permit, please contact the Permitting Section of the Clean Air Branch.
- Permit application forms can be found here: https://health.hawaii.gov/cab/permit-application-forms/

Includes construction, demolition, or renovation activities that involve potential asbestos and lead containing materials:

- Asbestos may be present in any existing structure. Prior to demolition, you must contact the Indoor and Radiological Health Branch, Asbestos-Lead Section. Testing may be required to determine if building materials may contain asbestos, such as: drywall, vinyl floor tile, mastic, caulking, roofing materials, insulation, special coatings, etc.
- Structures built prior to 1980 may also contain lead paint. Prior to demolition, contact the Indoor and Radiological Health Branch, Asbestos-Lead Section. Testing may need to be conducted to determine if building materials contain lead.
- Some construction activities have the potential to create excessive noise and may require noise permits. For DOH Noise Permits and/or Variances and for more information on the Indoor and Radiological Health Branch, please visit: https://health.hawaii.gov/irhb/

Includes demolition of structures or land clearing

- Department of Health, Administrative Rule: Title 11, Chapter 26, Vector Control, Section 11-26-35, Rodents; Demolition of Structures and Clearing of Sites and Vacant Lots, requires that:
    - No person, firm or corporation shall demolish or clear any structure, site, or vacant lot without first ascertaining the presence or absence of rodents which may endanger the public health by dispersal from such premises.
    - Should such inspection reveal the presence of rodents, the person, firm, or corporation shall eradicate the rodents before demolishing or clearing the structure, site, or vacant lot.
    - The Department may conduct an independent inspection to monitor compliance, or request a written report.
- The purpose of this rule is to prevent rodents from dispersing into adjacent areas from infested buildings or vacant lands during demolition or land clearing.
- Contractors may either hire a pest control firm or do the job themselves with a qualified employee. Rodenticides must be inspected daily and replenished as necessary to provide a continuous supply for at least one week prior to the start of any work.

- To submit notifications or for more information, contract the Vector Control Branch: https://health.hawaii.gov/vcb/

Has the potential to generate fugitive dust

- You must reasonably control the generation of all airborne, visible fugitive dust. Note that construction activities that occur near to existing residences, businesses, public areas and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. The plan, which does *not* require Department of Health approval, should help you recognize and minimize potential airborne, visible fugitive dust problems.
- Construction activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, we strongly recommend that buffer zones be established, wherever possible, in order to alleviate potential nuisance complaints.
- You must provide reasonable measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:
    - Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
    - Providing an adequate water source at the site prior to start-up of construction activities; Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
    - Minimizing airborne, visible fugitive dust from shoulders and access roads;
    - Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
    - Controlling airborne, visible fugitive dust from debris being hauled away from the project site.
- If you have questions about fugitive dust, please contact the Enforcement Section of the Clean Air Branch

Increases the population and potential number of vehicles in an area:

- The creation of apartment buildings, complexes, and residential communities may increase the overall population in an area. Increasing the population in an area may inadvertently lead to more air pollution via vehicle exhaust. Vehicle exhaust releases molecules in the air that negatively impact human health and air quality, as they are known lung irritants, carcinogens, and greenhouse gases.
- Ensure that residents keep their vehicle idling time to three (3) minutes or less.
- Provide bike racks and/or electric vehicle charging stations for residents.
- Ensure that there are sufficient and safe pedestrian walkways and crosswalks throughout and around the development.
- Conduct a traffic study to ensure that the new development does not significantly impact traffic in the area.

Clean Air Branch (808) 586-4200 cab@doh.hawaii.gov	Indoor Radiological Health Branch (808) 586-4700	Vector Control Branch (808) 586-4400

SSFM International

October 31, 2024 SSFM 2023_046.000

Colby
State of Hawai‘i Department of Health
Clean Air Branch
Sent via email

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai‘i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your email dated December 20, 2023, regarding the subject project. The Department of Parks and Recreation will employ best management practices to address and mitigate fugitive dust impacts during the construction of the project. Such measures shall effort to be in full compliance of Hawai‘i Administrative Rules, Chapter 11-60.1-33.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

JOSH GREEN, M.D.
GOVERNOR
KE KIA'ĀINA

KEITH A. REGAN
COMPTROLLER
KA LUNA HO'OMALU HANA LAULĀ

MEOH-LENG SILLIMAN
DEPUTY COMPTROLLER
KA HOPE LUNA HO'OMALU HANA LAULĀ

STATE OF HAWAI'I | KA MOKU'ĀINA O HAWAI'I
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES | KA 'OIHANA LOIHELU A LAWELAWE LAULĀ
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)23.220

DEC 21 2023

Jennifer M. Scheffel, Sr. Environmental Planner
SSFM International
99 Aupuni Street, Suite 202
Hilo, HI 96720

Dear Jennifer Scheffel:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Hawaiian Paradise Park, New District Park
TMK: (3) 1-5-039:267

Thank you for the opportunity to comment on the subject project. The proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities and we have no comments to offer at this time.

If you have any questions, your staff may call Dora Choy-Johnson of the Public Works Division at (808) 586-0488.

Sincerely,

CHRISTINE L. KINIMAKA
Public Works Administrator

DC:mc
c: Roger Ross, HDO

SSFM International

October 31, 2024

SSFM 2023_046.000

Christine L. Kinimaka
Public Works Administrator
Department of Accounting and General Services
1151 Punchbowl St.
Honolulu, HI 96813

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai'i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your letter dated December 21, 2023, regarding the subject project. The Department of Parks and Recreation has noted that the Department of Accounting and General Services has no comments regarding the proposed project at this time.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

Mitchell D. Roth
Mayor

Lee Lord
Managing Director

Ramzi I. Mansour
Director

Brenda Iokepa-Moses
Deputy Director

County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720 · cohdem@hawaiicounty.gov
Ph: (808) 961-8083 · Fax: (808) 961-8086

MEMORANDUM

TO: SSFM International Inc.
Attn: Jennifer Scheffel
99 Aupuni St., Suite 202
Hilo, Hawai'i 96720

FROM: Ramzi I. Mansour, Director
Department of Environmental Management

DATE: December 19, 2023

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
Tax Map Key: (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

The Solid Waste Division has reviewed the subject application and provides the following comments (contact the Solid Waste Division for details):

- Commercial operations, State and Federal agencies, religious entities and non-profit organizations may not use transfer stations for disposal.
- Aggregates and any other construction/demolition waste should be responsibly reused to its fullest extent.
- Ample room should be provided for rubbish and recycling.
- Green waste may be transported to the green waste sites located at the West Hawai'i Organics Facility and East Hawai'i Organics Facility, or other suitable diversion programs.
- Construction and demolition waste is prohibited at all County Transfer Stations.
- Submit Solid Waste Management Plan in accordance with attached guidelines.
- All construction and demolition waste shall be transported to the West Hawaii Sanitary Landfill for disposal.

The Wastewater Division has reviewed the subject application and provides the following comments (contact the Wastewater Division for details):

- No County sewer system in area. Applicant shall follow Hawai'i Department of Health, and all other applicable federal, state, and county regulations.

Mitchell D. Roth
Mayor

Lee Lord
Managing Director

Ramzi I. Mansour
Director

Brenda Iokepa-Moses
Deputy Director

County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720 · cohdem@hawaiicounty.gov
Ph: (808) 961-8083 · Fax: (808) 961-8086

May 5, 2023

SOLID WASTE MANAGEMENT PLAN
Guidelines

INTENT AND PURPOSE

This is to establish guidelines for reviewing Solid Waste Management Plans, for which special conditions are placed on developments. The Solid Waste Management Plan will be used to (1) promote and implement recycling and recycling programs; (2) predict the waste generated by the proposed development to anticipate the impacts on County Solid Waste Management Facilities; and (3) predict the additional vehicular traffic being generated because of waste and recycling transfers. A State of Hawai'i licensed engineer or architect shall prepare a suitable Solid Waste Management Plan for review by the Department of Environmental Management.

REPORT

The Solid Waste Management Plan will contain the following:

1. Description of the project and the potential waste that may be generated: e.g., analysis of anticipated waste volume and composition. This includes waste generated during the construction and operation or maintenance phases. Waste types shall include (but not be limited to):
   A. Organics (including food waste and green wastes);
   B. Construction and Demolition materials;
   C. Paper (including cardboard);
   D. Metal (including ferrous and non-ferrous metals);
   E. Plastic;
   F. Special (including ash, sludge, treated medical waste, bulky items, tires);
   G. Hazardous (including paint, vehicle fluids, oil, batteries); and
   H. Glass.

2. Indicate onsite source separation by waste type, e.g., source separation bins for glass, metal, plastic, cardboard, aluminum, et cetera. Provide ample space for rubbish and recycling.

3. Identification and location of the proposed waste reduction, waste re-use, recycling facility or disposal site and associated transportation methods for the various components of the development's waste management system, including the number of vehicle

movements and associated routes that will be used to transport the waste and recycled materials.

4. The report will include identification of any impacts to County-operated waste management facilities, and the appropriate mitigation measures that will be implemented by the development to minimize these impacts.

5. Analysis will be based on the highest potential use or zoning of the development.

REQUIREMENTS AND CONDITIONS

1. A Solid Waste Management Plan will be prepared for all developments including but not limited to projects that are required to perform an EA, EIS, or Special Use Permit, as defined under the policies of the Department of Environmental Management.

2. The Department of Environmental Management will require the developer to provide or resolve all recommendations and mitigation measures as outlined in the solid waste management plan, besides any conditions placed on the applicant herein.

3. A State of Hawai'i licensed engineer or architect will draft and certify in writing the Solid Waste Management Plan as complying with applicable Federal, State, and County of Hawai'i Solid Waste laws, regulations, and administrative rules.

Should you require additional information, please contact the Solid Waste Division at swd@hawaiicounty.gov or at (808) 961-8270.

CONCUR:

Brenda Iokepa-Moses
DEPUTY DIRECTOR

(For Ramzi I. Mansour, DIRECTOR)

SSFM International

October 31, 2024

SSFM 2023_046.000

Ramzi I. Mansour
Director, County of Hawai‘i Department of
Environmental Management
345 Kekūanāo‘a St., Suite 41
Hilo, HI 96720

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai‘I, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your letter dated December 19, 2023, regarding the subject project. The Department of Parks and Recreation will submit a Solid Waste Management Plan for the project in accordance with the guidelines attached to your letter. We will appropriately dispose of any construction waste that cannot be reused/recycled and generally endeavor to employ best practices to reduce the generation of solid waste material to the extent practical.

The Department of Parks and Recreation will also ensure that the wastewater system for the project is fully compliant with all applicable federal, state, and county regulations.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

Mitchell D. Roth
Mayor

Lee E. Lord
Managing Director

Robert H. Command
Deputy Managing Director

County of Hawaii
CIVIL DEFENSE AGENCY
920 Ululani Street • Hilo, Hawai'i 96720-3958
(808) 935-0031

Talmadge J. Magno
Civil Defense Administrator

December 21, 2023

To: SSFM International

From: Talmadge Magno, Administrator

Subject: Hawaiian Paradise Park (HPP), New District Park
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Having received your letter (attached) regarding the aforementioned, Pre-Assessment Consultation for Draft Environmental Assessment, I would like to provide the following comments:

HPP Residents have proven to be active and prepared for emergencies. In the design of the community center I would like to suggest providing amenities such as a licensed kitchen, shower facilities and infrastructures suitable for an evacuation shelter.

Thank you,

Talmadge Magno
Administrator

SSFM International

October 31, 2024

SSFM 2023_046.000

Talmadge Magno
Administrator
County of Hawai‘i Civil Defense Agency
920 Ululani St
Hilo, HI 96720-3958

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai‘i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your letter dated December 21, 2023, regarding the subject project. The Department of Parks and Recreation appreciates your insights on emergency shelter needs for the Hawaiian Paradise Park community. Our design plans include consideration for use of the facility in the event of an emergency. The additional amenities you have noted such as a licensed kitchen and shower facilities will also be considered.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

12 December 2023 – Tuesday – Pasadena, CA

Dear Ms. Scheffel,

Thank you for the update concerning the development of the special public recreational area in Hawaiian Paradise Park. After so many decades of anticipation, we hope that this project will finally be realized in the near future. All the property owners in the vicinity will indubitably benefit.

– Ralph Setian

[redacted]

SSFM International

October 31, 2024
Ralph Setian
[redacted]

SSFM 2023_046.000

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai'i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your letter dated December 12, 2023 regarding the Hawaiian Paradise Park District Park environmental assessment. The Department of Parks and Recreation appreciates your support for the proposed project.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

From: Jennifer Scheffel
To: Heather Bartlett
Subject: FW: Hawaiian Paradise Park, New District Park
Date: Monday, January 8, 2024 11:48:14 AM

From: Sandy and fran Dubczak [redacted]
Sent: Monday, January 8, 2024 9:20 AM
To: Jennifer Scheffel <jscheffel@ssfm.com>
Subject: Hawaiian Paradise Park, New District Park

January 8, 2024

Dear Jennifer Scheffel,

I support the creation of this Park, however I have several concerns that I don't feel were addressed at any of the several meetings that I attended during the planning phase. My concerns are mainly or the safety of Park goers and those vehicles traveling in the area.

1. Traffic on both 25th and 26th Avenues. The traffic on the paved road of 25th Ave. is substantial and people speed. I feel there NEEDS to have some kind of speed control for this road especially at the enter and exit areas of the Park. The road on 26th Ave. should be paved fronting the Park to help keep the road safer.

2. Are there going to be any sidewalks fronting the Park from Kaloli to the Park entrances?

3. There will need to be some sort of signage on 25th Ave. (between Paradise Dr. and Kaloli) warning that there is a Stop sign ahead. The road has a drop at the end at Kaloli and the stop sign is not very visable at a distant. There have been numerous accidents where apparently the Stop sign is not noticed and people drive straight through the intersection of 25th and Kaloli, (Keaau bound). It has been brought to the attention of HPP Road Maintenance several times, however, nothing has been done. Stop sign "runners" have driven into the fences/yards of one of the houses across the street several times as well as t-boned vehicles on Kaloli.

4. Will there be crosswalks across Kaloli Dr. at 25th and 26th Avenues for people and children to safely cross Kaloli from the Shower side of Kaloli to the Park?

Will the County be responsible for the roads in all directions in the area of the Park? The people of HPP who pay for our roads and get no monetary help from the County for them should not have to pay for the added cost of fixing and maintaining these areas. Also HPPOA and its residents should not be held liable for the maintenance or lack there -of when accidents, that WILL, take place in the areas of the roads at the Park.

I live, drive and walk on 25th between Paradise and Kaloli so I see personally see the traffic problems in the area of the Park. I do hope that the above concerns are addressed. Thank you for taking the time to read my concerns.

Sincerely,

Sandra Dubczak
[redacted]

SSFM International

October 31, 2024
Sandra Dubczak
[redacted]

SSFM 2023_046.000

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai'i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your email dated January 8, 2024 regarding the Hawaiian Paradise Park (HPP) District Park environmental assessment. Your concerns regarding safety and traffic in the area are important, and I will respond to each of your listed points below:

1. Thank you for sharing your experience of drivers speeding along 25th Avenue and for the need to pave 26th Avenue as a potential additional access point for the park. Road improvement projects are unfortunately beyond the scope of the current project. This could be explored as potential additions during the design phase and included in the budget for the project in the future. This could be considered and would require higher level coordination efforts within the County and with the HPP Owners Association.

2. Regarding the addition of sidewalks along the front of the park, we currently do not have plans to incorporate this into the design of the park. The design does include a walking path that goes around the perimeter of the park. This walking path was an identified feature of the park following previous community engagement efforts. The Department of Parks and Recreation believes this may be a preferrable alternative as it would provide a space for pedestrian travel that would be sheltered from the surrounding roadways, ideally creating more separation from cars and pedestrians than a sidewalk.

3. Thank you for bringing this issue to our attention. As previously mentioned, road improvement projects are beyond the scope of the current project; however, this need is noted and could be considered in future design and funding stages of the project.

4. Mahalo for this additional feedback, please see the responses above about including future safety improvements to the project.

5. Regarding the responsibility for the costs of potential future improvement or maintenance needs on the road surrounding the project site, we understand your concerns. This consideration is also beyond the scope of the current stage of this project and could be considered when funding is identified and initiated. This would require higher level coordination efforts within the County and with the HPP Owners Association.

Thank you once again for bringing these concerns to our attention. Your email, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

1/24/24

Ms. Jennifer Scheffel
Sr. Environmental Planner

Dear Ms. Scheffel;

This is in response to the HPP, New District Park Pre-Assessment Consultation for Draft Environmental assessment.

We are in favor of the proposed project. We have waited for a long time to have this project done.

If you need more information, Please Contact us. Thank you.

Dante + Mercy Manaog

The Manaog Family
HC 1 Box 5123
Keaau, HI 96749

SSFM International

October 31, 2024
Mercy Manaog
[redacted]

SSFM 2023_046.000

SUBJECT: Hawaiian Paradise Park (HPP), New District Park
County of Hawai'i, Department of Parks and Recreation
Tax Map Key (TMK): (3) 1-5-039:267
Pre-Assessment Consultation for Draft Environmental Assessment

Aloha,

Thank you for your email dated January 24, 2024 regarding the Hawaiian Paradise Park District Park environmental assessment. The Department of Parks and Recreation appreciates your support for the proposed project.

Your email, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com.

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

APPENDIX J

Community Outreach Summary Report

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Hawaiian Paradise Park District Park Community Meeting Summary Report October 2, 2024

Prepared for
County of Hawai‘i
Department of Parks and Recreation

Prepared by
SSFM International, Inc.

October 2024

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TABLE OF CONTENTS

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Introduction

Project Background

The County of Hawai‘i Department of Parks and Recreation (DPR) plans to implement a 20-acre District Park in the Hawaiian Paradise Park (HPP) subdivision in Puna District of Hawai‘i Island. The District Park may include various sporting and recreational activity areas as identified in the Hawaiian Paradise Park District Park Master Plan.

Purpose of this Meeting

At this meeting, the project team, including representatives from DPR and the consultant team (SSFM International, Inc.) introduced and discussed the Hawaiian Paradise Park (HPP) District Park project status, timeline, features, and upcoming tasks. The project team familiarized the attendees with the Draft Environmental Assessment (EA) process and how to get involved. This meeting also gave the attendees an opportunity to provide feedback and learn about the upcoming process to update the HPP District Park Master Plan. The project team shared a presentation, received questions and mana‘o from the attendees, and answered inquiries.

Meeting Agenda

The meeting agenda was as follows:

Project Team Attendees

The following members of the project team were in attendance at the meeting:

- **County of Hawai'i DPR:** Maurice Messina, Michelle Hiaishi, James Komata, Jeffrey Ochi
- **SSFM International, Inc.:** Austen Drake, Jennifer Scheffel, Genevieve Runningwind

In addition, County Council 4 elected official, Ashley Kierkiewicz, attended the meeting and addressed the attendees.

Community Attendees

Attendees of the meeting were asked to sign in. A total of 73 people attended the meeting, as shown below.

1. Richard Sunden
2. Sharise Lance Dolera
3. Al Morren
4. Lara Kaililimoku
5. William Konya Ohumukini
6. Tisha Montesano
7. Jeff Ochi
8. Ray Holybee
9. Eddi Meschino
10. Shaun Sillapua
11. Taira Yoshimura
12. Monoo Lyon
13. Steve Sugar
14. Riffany E. Hunt
15. Nicolette Douvris
16. Summer Pakele
17. Destiny Hanohano
18. Mark Lewis
19. Travis Sutton
20. Sandy Dubczak
21. Keith Andrade
22. Lanell Lua
23. Michelle Hiraishi
24. Francisco A.
25. Rachel E.
26. Kim Whiting
27. Joni Whiting
28. Anita Lambie
29. Rick Lambie
30. Monica Suddarch
31. Lorrie C.
32. Kimberly Cornet
33. Marianne Freelong
34. Marsha Pryor
35. Paula A. Silva
36. Madeline D. Silva
37. Jeannette Keat
38. William Ahyo
39. Rod K.
40. Kainoa Torres
41. Alissa Hanshew
42. Jane Cariaga
43. Kuuhiapo Jeong
44. Simon Kattenhorn
45. Jonah Kattenhorn
46. Jason Sapan
47. Cherie Sapan
48. Judi Houle
49. Jone Sedstrom
50. Sandra Lane
51. Ming Dai
52. Noel Mocata
53. Tam Hunt
54. Jon Lochndorf
55. Debbie S.
56. Kathy Morris
57. Anne Kamau
58. Richard Kamau
59. Patricia Szot
60. Kathy Wood
61. Javelin Barco
62. Spencer Sakoda
63. Yvelle Swope-Fernando
64. Teresa Bayne
65. Charles Garrett
66. R. Kova
67. Becky Jones
68. Tallchieff Comet
69. Cheryl Kratke
70. Brian Oggama
71. David Pragen
72. David Au
73. Kathy Morris

Outreach

Various channels were used to inform the public about this upcoming meeting. These included multiple email notifications from the project team, email blasts from elected officials, and an email blast from DPR.

Flyer

The meeting flyer was shared on Hawai‘i County DPR social media Instagram and Facebook.

Press Release

A press release was drafted and sent to the Mayor’s office for distribution through their mailing list, on their website, and on the County Calendar.

Project Website

Throughout the duration of the project, information was hosted and maintained/updated on the project website at https://ssfm.konveio.com/hpp-new-district-park. The project website also hosted a form where people could join the project mailing list. The mailing list was used to provide notice of the publication of the Draft EA and invitation to the community meeting. The project website gave the community the opportunity to comment on the New District Park to provide their feedback. The comments are attached in **Appendix C**.

Partners and Press

The meeting notice was promoted through Big Island Video News by their publication of an article announcing the Draft EA and information about the October 2 community meeting.

Meeting Announcement

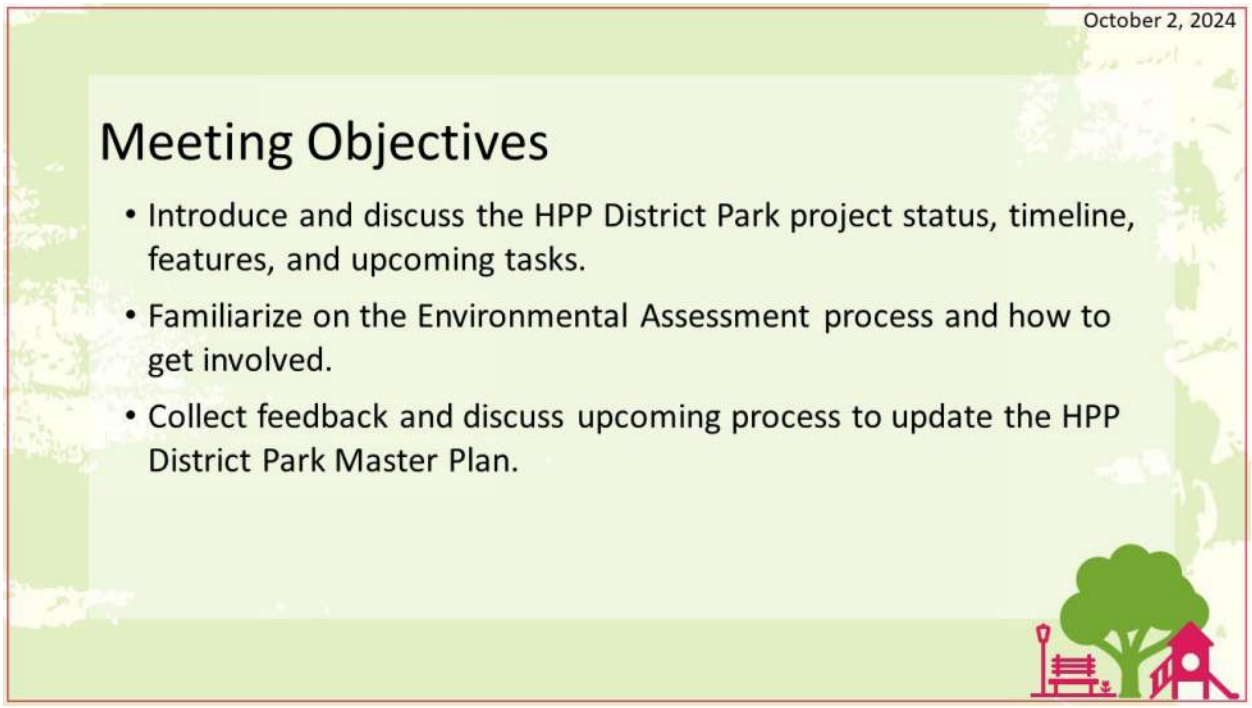
Presentation and Discussions

Maurice Messina, DPR Director, began the meeting by welcoming everyone and introducing the project team.

The consultant team then continued the presentation, which included two main parts. The full presentation is posted on the project website, https://ssfm.konveio.com/hpp-new-district-park.

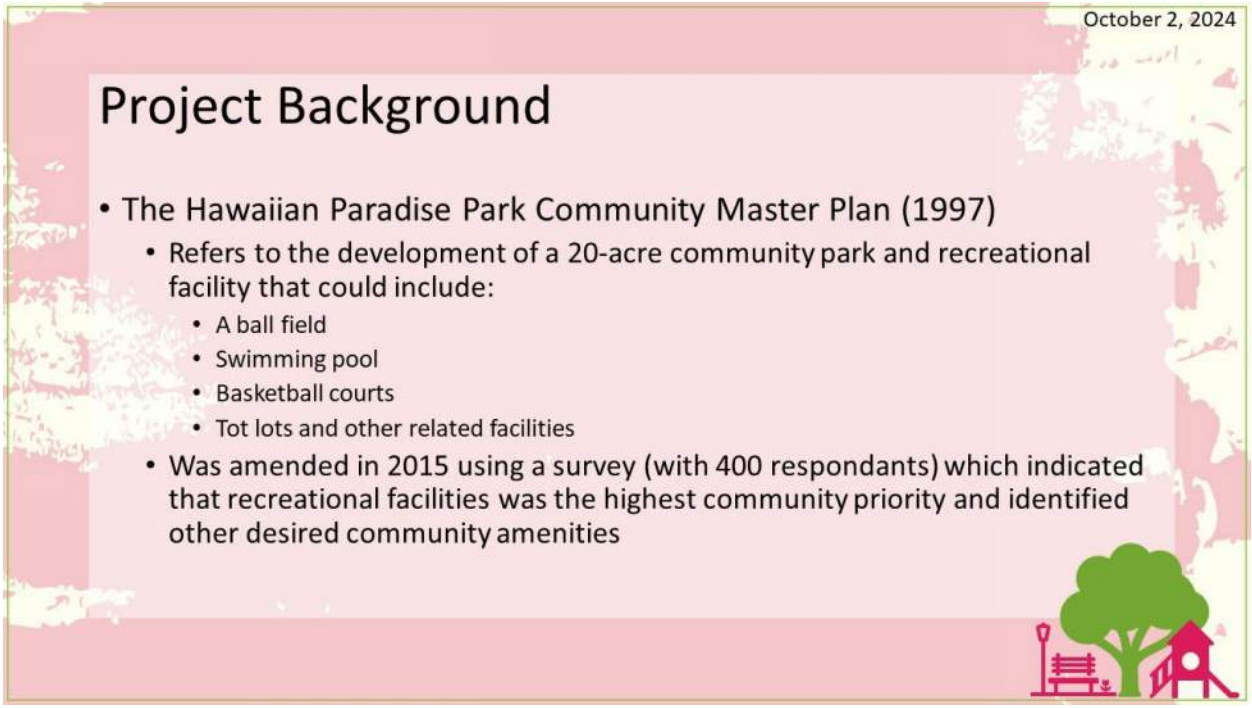
Meeting Presentation

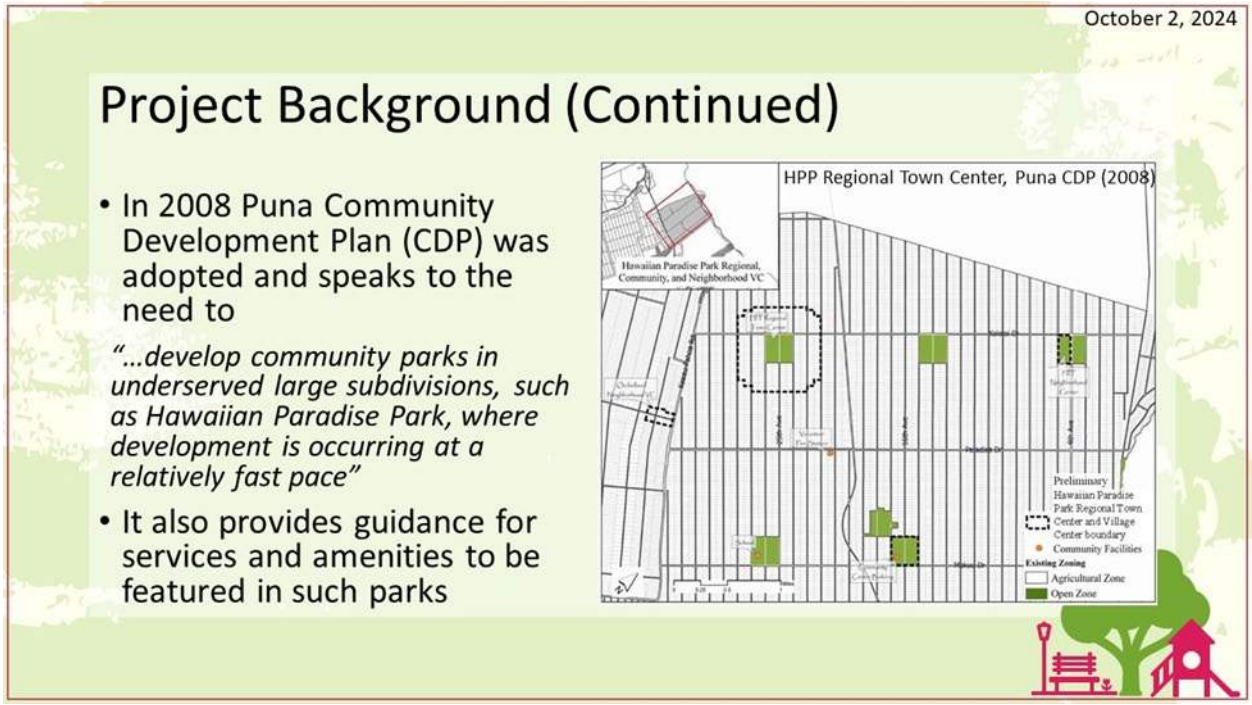
Austen Drake, of SSFM, kicked off the presentation with an overview of the meeting objective and major milestones for the project.



Project Overview

Mr. Drake provided an overall background for the project, briefly describing the history, vision, and origin for the HPP District Park concept. This part of the presentation was intended to orient the audience on the overall goals and intentions for the project for anyone who was not previously engaged in the process.





October 2, 2024

Project Background (Continued)

- In 2016 the HPPOA dedicated the project site to the County for the development of a community park
- It was paired with a petition from 232 community members in support
- As a condition of this agreement, a Master Plan was created for the park with the participation of the HPP community

October 2, 2024

Hawaiian Paradise Park District Park Master Plan

- In 2017 SSFM International was contracted by the County Department of Parks and Recreation to prepare a Master Plan for the park
- The process included several stakeholder meetings and two public meetings where the community provided feedback on the design and features of the park and voted on their favorite alternative park layout Summary of public outreach
- The plan was adopted in March 2018

Additionally, Mr. Drake shared the overall estimated costs and challenges for the HPP District Park.

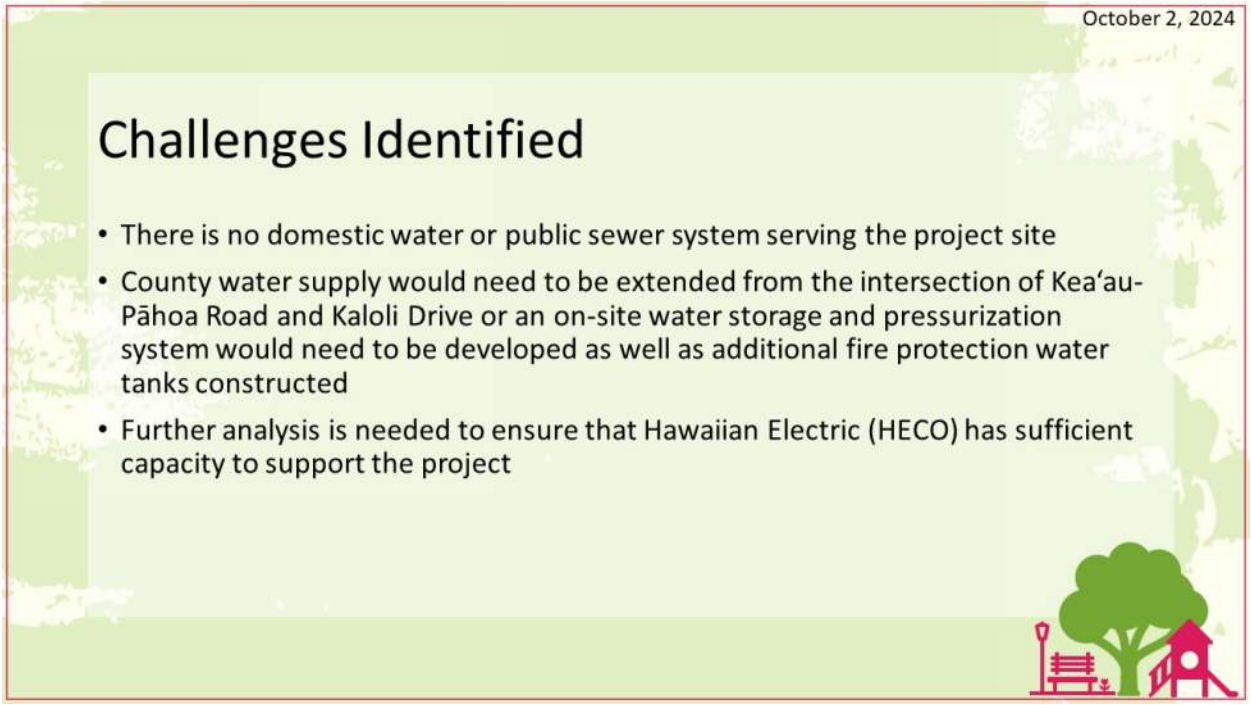
October 2, 2024

Project Cost Estimates

- The current estimated design and construction costs for the park is approximately $80,500,000
- Does not include maintenance and operation costs

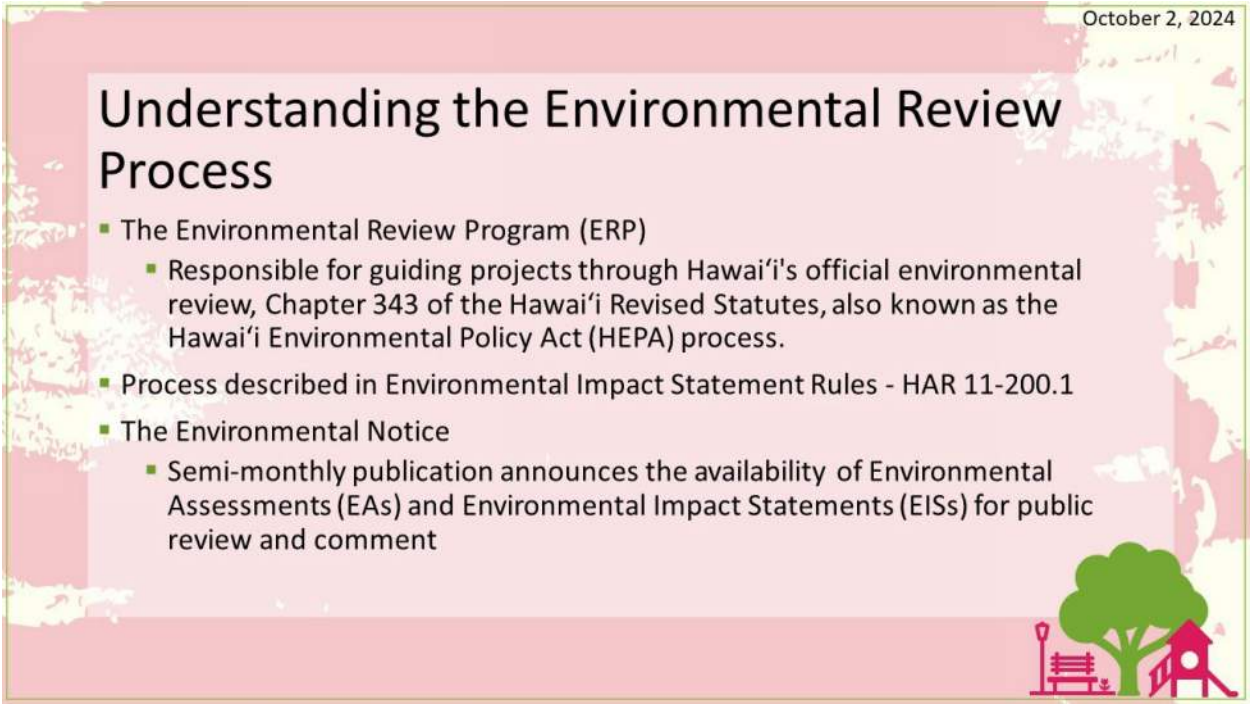
MASTER PLAN		2018 Dollars	2026 Dollars (Projected)*
SITE DEMOLITION & EROSION CONTROL		$550,000	$858,000
10' WIDE PERIMETER WALKWAY		$550,000	$858,000
SITEWORK		$8,000,000	$12,480,000
COVERED PLAYCOURT		$700,000	$1,092,000
SOFTBALL FIELD		$500,000	$780,000
SOCCER / FOOTBALL		$700,000	$1,092,000
BUILDINGS		$13,500,000	$21,060,000
SWIMMING POOL FACILITY		$7,000,000	$10,920,000
TENNIS COURTS (2 EA)		$350,000	$546,000
PICKLEBALL (3 EA)		$200,000	$312,000
PLAY EQUIPMENT		$1,200,000	$1,872,000
OFFSITE - MUNICIPAL WATER LINE		$1,300,000	$2,028,000
UTILITIES		$900,000	$1,404,000
	SUBTOTAL	$35,450,000	$55,302,000
CONCEPTUAL LEVEL DESIGN & PHASING CONTINGENCY,	10%	$3,545,000	$5,530,200
HAWAII ISLAND LOCATION FACTOR, (for Vertical Construction)	5%	$1,949,750	$3,041,610
SUBTOTAL, ESTIMATED DIRECT COST TO PRIME,		$40,944,750	$63,873,810
PRIME CONTRACTOR'S OVERHEAD,	10%	$4,094,475	$6,387,381
PRIME CONTRACTOR'S PROFIT,	6%	$2,702,354	$4,215,671
CONSTRUCTION BONDS & INSURANCE,	1.5%	$716,124	$1,117,153
G.E. TAX,	4.167%	$2,019,232	$3,150,003
TOTAL ESTIMATED CONTRACT COST,		**$50,476,935**	**$78,744,018**
DESIGN AND PERMITTING COST	10%	$5,047,693	$7,874,402
	TOTAL	$55,530,000	$86,620,000

*Reflects an approximately 56% increase in construction cost between 2018 and 2026 (Source NAVFAC Building Cost Index)

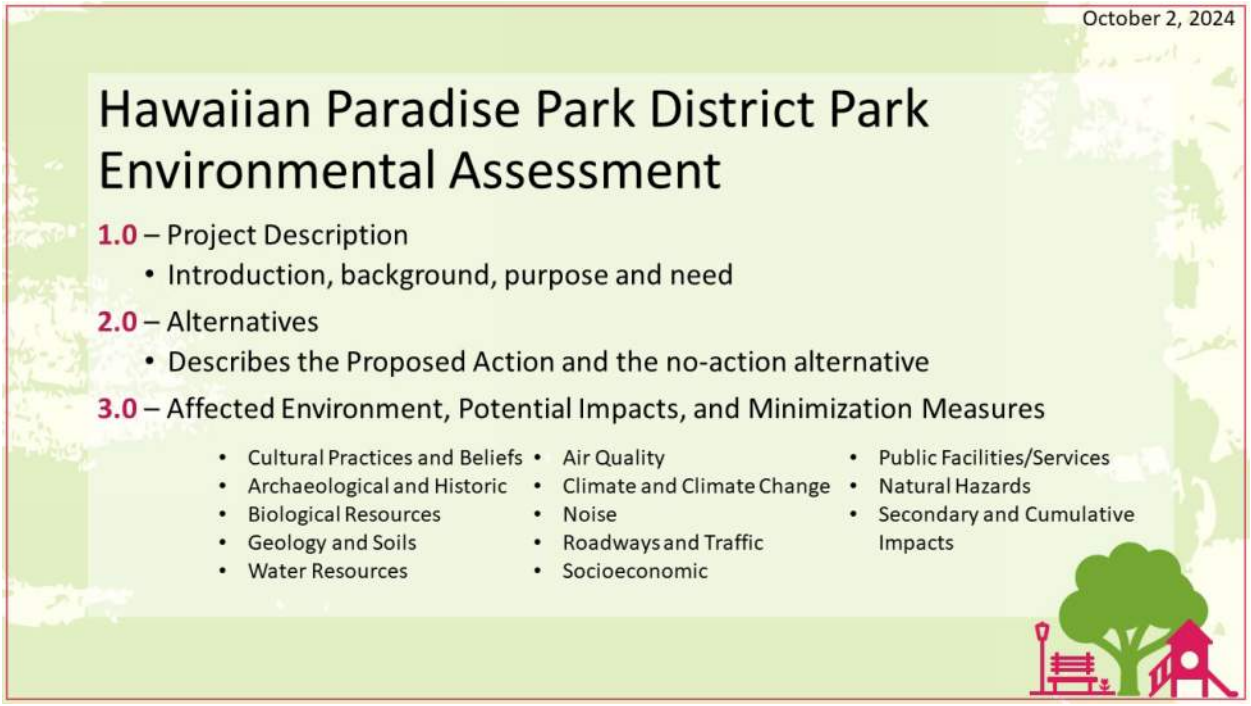


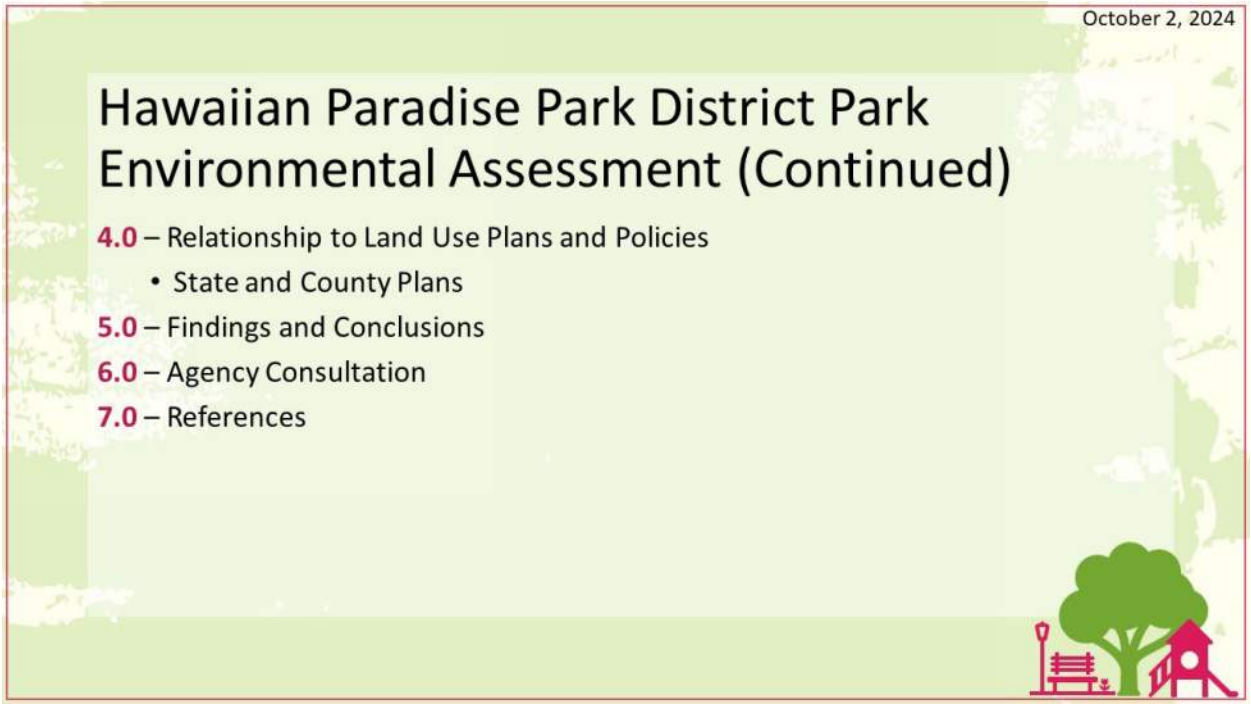
Environmental Assessment (EA) Process and Schedule

Jennifer Scheffel of SSFM then presented on the Environmental Assessment (EA) process. She described the origins of the process and "triggers" for projects to require environmental review. She invited participants to sign up for notifications from the Environmental Review Program when new Environmental Impact Statements and Environmental Assessments are published.

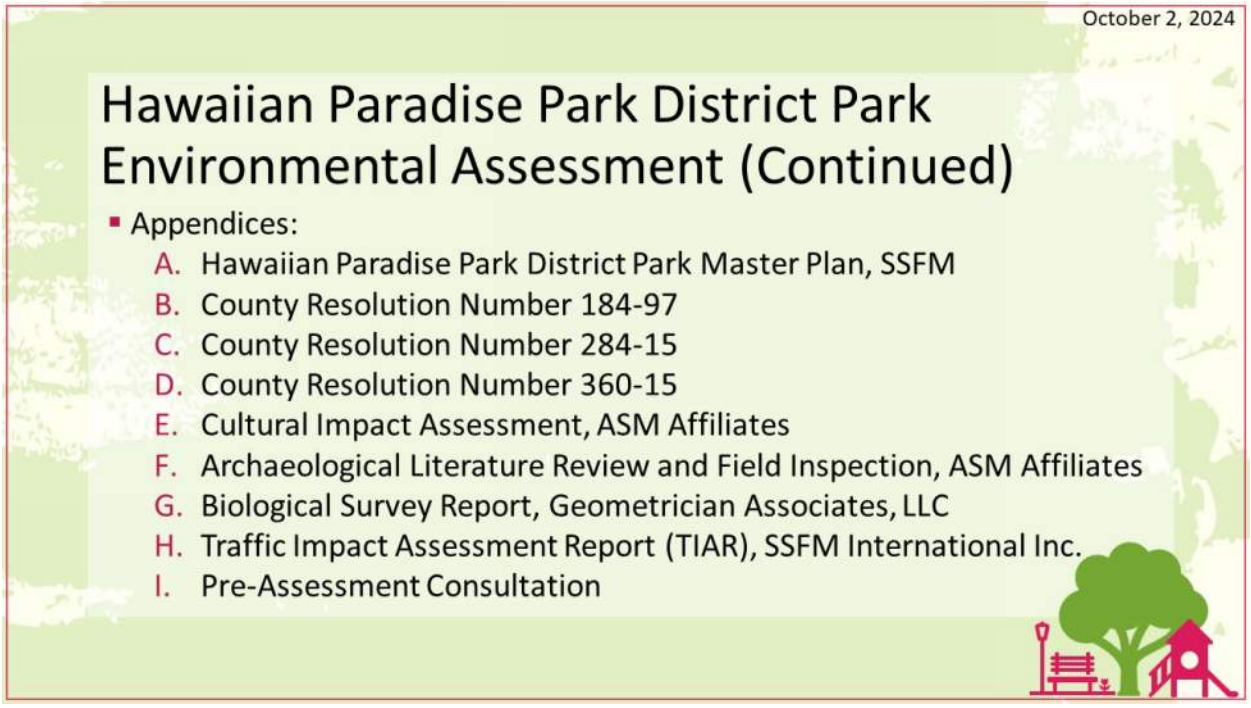


Then Ms. Scheffel walked participants through the outline of the content for the Draft EA highlighting significant topics covered.

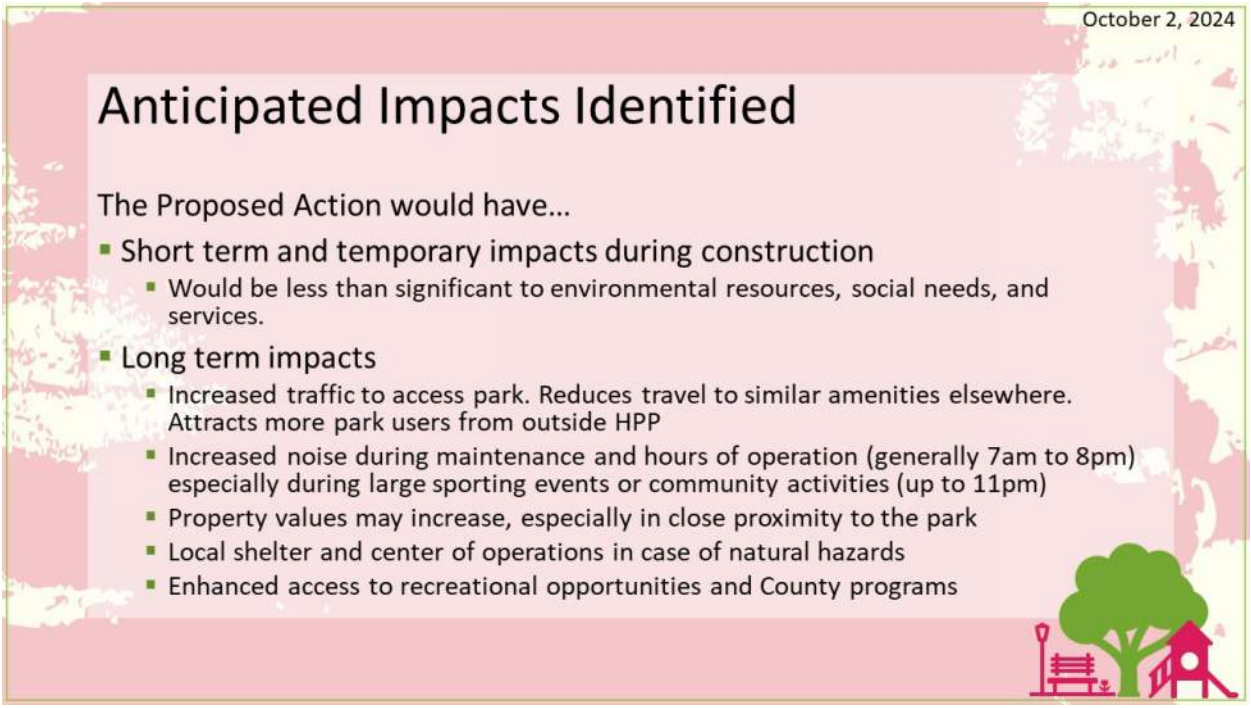




Ms. Scheffel then described the various technical studies that are included in the Draft EA that provide supporting analysis for the potential impacts and minimization measures discussed.



Ms. Scheffel shared with the attendees the potential short-term and long-terms impacts that had been identified through the EA drafting process.



The presentation concluded with a call to action for the community to remind them of how to provide comments on the Draft EA when it is published. Attendees were encouraged to sign up for the project mailing list to be notified on the publication and start of the public comment period. Sign in sheets for the meeting included an option to sign up for this mailing list and agendas included instructions on how to find more information, comment on the Draft EA, and contact the project team.

Upon closing the presentation, attendees were provided an opportunity to ask questions and provide comments. As a preface to this, James Komata, DPR Park Planner, noted that while any comments are welcome, two key questions the project team is hoping to get input on is:

- Does the 2018 masterplan reflect the current community needs?
- Are their any environmental concerns related to this parcel that the project team may not be aware of?

The following table includes the questions/comments posed as well as a summary of the discussion (in no particular order).

#	QUESTION/COMMENT	PROJECT TEAM RESPONSE
1	Is solar being considered?	Yes
2	Consider covering the parking lot and installing PV (in lieu of trees).	The County is exploring options like this on various projects through partnership with a private entity, and will be considered as applicable on this project as well.

#	QUESTION/COMMENT	PROJECT TEAM RESPONSE
3	What about utilities to benefit the overall community?	Not part of this project but noted as a topic that could be considered in collaboration between the HPP Owners Association (HPPOA) and the County. Councilmember Kierkiewicz noted that since the 2018 masterplan effort the Department of Water Supply (DWS) has committed to supplying water to the future park. There is also a 20-acre commercial project planned on the adjacent parcel that will need water.
4	Will the project be constructed all at once or in phases? ($80 to $100 million is a lot of money)	Councilmember Kierkiewicz stated that the preference would be to fund the entire park at once. The funding could come from a variety of sources including potential federal grants, donations from private property owners/organizations, matching funds from the State Legislature, or potentially a Community Facilities District (CFD).
5	Are operational/maintenance cost included in the project cost estimate?	DPR noted that these costs are considered when they choose to move forward with a project.
6	Is the cost of utilities included in the cost estimate?	Yes.
7	How does the CFD work, is this an additional tax in addition to our property taxes? Is it just for the construction cost?	Councilmember Kierkiewicz explained that the terms would be determined by the community and process is laid out in the Hawai'i County Code which is publicly available.
8	Why aren't we looking at funding sources now?	Councilmember Kierkiewicz explained that we need to finalize the EA and cost estimate to have a complete picture of the project to present to the State Legislature to request funding.
9	If the project is broken into phases, will the community get to provide input on what is constructed first?	DPR explained that that is part of the intent of this meeting. Any input the community has on the priority of the park elements will be considered in the final masterplan update.
10	Can the project Improve bike access along the roads leading to the park?	Offsite improvements, aside from utilities required for the park operations, are outside of the scope of the current project.
11	Is there funding for Phase II of Pāhoa Park (Billy Kenoi Park)?	DPR confirmed there is not at this time and that the critical needs were addressed with Phase I.
12	HPP currently has a waterline that terminates at Paradise and 26th, can you extend waterline from Paradise or Drill Well?	DPR confirmed that various options for providing water to the park are being investigated in the masterplan.
13	Recommend the project incorporate PV to illuminate park and include a dedicated well. Also, the sewer will need to be an individual wastewater system (IWS) since the County sewer does not extend into this area.	Comment noted.
14	Will the Park be County owned/operated?	Yes

#	QUESTION/COMMENT	PROJECT TEAM RESPONSE
15	Is this the only large project being planned by the County currently?	DPR stated that they have over 100 active projects at this time. The majority are to catch up on repair and maintenance of existing facilities which had inadequate funding in previous years. There are other large projects such as the Kealakehe Regional Park that are in the works.
16	Would the County consider hiring HPP residents for Park maintenance, etc.?	Yes. Encourage people to apply. Lifeguards are especially needed.
17	How will our roads hold up to big truck during construction? Also, need better roads on 25th/26th to withstand higher traffic demand, currently just "chips".	We encourage you to reference the situation as the Waiākea Uka Park which is currently under construction to see how the contractor handles traffic. If there are concerns about potential road damage due to long term traffic impacts, please submit them as part of this EA process. As with the utilities, this is a broader subdivision issues that should be coordinated through the HPPOA and the County.
18	How do I know if what I want is consistent w/ what others want?	Please submit your comments.
19	I'm concerned with traffic during construction.	Traffic control measures will be implemented. Impacts are discussed in EA; please submit comments if your concerns are not addressed.
20	Realistically, how long would it take to get this park?	If funding were available today for the entire undertaking, it would take 12-18 months to finish design, 6-8 months for permitting, and roughly 2 years for construction.
21	Private roads don't have regular police presence; will need for increased traffic and potential speeding.	Comment noted.
22	Can the project incorporate native trees/plants?	That is the policy of DPR, though every tree adds to maintenance costs for the County. The masterplan is very conceptual and doesn't show that level of detail.
23	What happens when parking lot full? How do we keep people from parking on roadside of 25th and 26th?	The selected masterplan alternative was the one with the most parking. DPR will attempt to manage parking demand as it relates to scheduling of events. This is dependent on the public who is seeking a permit for an event to accurately disclose the anticipated number of attendees. In the past this has been underreported and contributed to parking challenges.
24	The population of HPP, and associated traffic, is increasing even without the park. Best to have this facility verses opposing it.	Comment noted.

#	QUESTION/COMMENT	PROJECT TEAM RESPONSE
25	Will the park be fenced? There is concern about homeless on 25th street.	The conceptual masterplan includes perimeter fencing, both for security after hours and to keeps kids (and balls, etc.) from leaving the park in undesignated locations. DPR spent $2.3m on security this past year at their 17 facilities. In rural areas, such as Ocean View, there are "park watchers" that volunteer to help keep eyes on the park.
26	Not everyone wants a fortress around the park, allowing access to kids after hours is beneficial as it helps keep them occupied and out of trouble.	Comment noted.
27	What type of gates will we have, need to keep pigs out. Once parcel is cleared the pigs will go to adjacent areas. Some residents have been feeding them which has been an issue.	The details will be refined in the design phase.

Written Comments Received

Attendees were also provided a Feedback form to provide input to the project team regarding the meeting. Nine (9) Feedback Forms were submitted during/or after the meeting.

All comments received are provided in the following table.

#	Comment
Feedback Form 1	How did you hear about this event? I came to the original presentation, local newspaper, and Facebook. Do you have suggestions on how to better engage the HPP community? I see that as a benefit but do not know what would help. Did the meeting provide information useful to you? Yes What do you want to tell us about it? I am hoping to see walking paths for seniors – not just recreation/events for children.
Feedback Form 2	How did you hear about this event? Friend Do you have suggestions for how to better engage the HPP community? Try to be better prepared. Did the meeting provide information useful to you? N/A What do you want to tell us about it? If you want to raise our property tax, I already pay property tax and the County doesn't do a thing to fix our roads. You take our money and do nothing. Why would I approve to give you more. You don't care for our roads now – you will have to care for the road – Not back in mt like you have been doing. Once park is built how are you going to maintain the roads.
Feedback Form 3	How did you hear about this event? N/A Do you have suggestions for how to better engage the HPP community? N/A Did the meeting provide information useful to you? Yes What do you want to tell us about it? Tennis court should be pickleball
Feedback Form 4	How did you hear about this event? HPP Owners' Association Board of Directors Do you have suggestions for how to better engage the HPP community? Give them what they want! Soon! Did the meeting provide information useful to you? Yes What do you want to tell us about it? Why no track and field. Football and baseball players can stay fit all year with track and field and it's an Olympic sport!

#	Comment
Feedback Form 5	How did you hear about this event? Facebook, HPP page Do you have suggestions for how to better engage the HPP community? Via website Did the meeting provide information useful to you? Yes What do you want to tell us about it? Keep pushing out info as it is available.
Feedback Form 6	How did you hear about this event? Social media Do you have suggestions for how to better engage the community? N/A Did the meeting provide information useful to you? Yes What do you want to tell us about it? Knowledgeable presenters.
Feedback Form 7	How did you hear about this event? News Do you have suggestions for how to better engage HPP community? Send more info in mail Did the meeting provide information useful to you? Yes What do you want to tell us about it? N/A
Feedback Form 8	How did you hear about this event? Received invite from SSFM Do you have suggestions for how to better engage HPP community? N/A Did the meeting provide information useful to you? Yes What do you want to tell us about it? Want to know how to start the process for another subdivision (Ainaloa) that has land to dedicate

#	Comment
Feedback Form 9	How did you hear about this event? Facebook and Neighborhood Watch, NextDoor app Do you have suggestions for how to better engage HPP community? Signage Did the meeting provide information useful to you? Yes What do you want to tell us about it? Won't be here for the 1st phase but glad to see the positivity

Next Steps

Immediate next steps for this project would include compiling comments received in this meeting and through other means such as the website, mail, and email and incorporating that feedback in the Final EA for the project. Once compliance with the Hawai'i Revised Statutes (HRS) Chapter 343 process has been obtained, and the next phase of funding secured, the project can then proceed through the final design and construction phases.

Appendix A – Poster Boards

County of Hawai‘i Department of Parks and Recreation

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

E Komo Mai!

MEETING AGENDA

– Doors Open, Talk Story, Refreshments

– Presentation and Q&A

- *Meeting Purpose and Project Scope*
- *Project Overview and History*
- *HPP Master Plan*
- *Environmental Assessment Process and Schedule*
- *Discussion and Questions*
- *Next Steps*

– Open House and Discussion

Mahalo For Joining Us!

Hawaiian Paradise Park
New District Park
PROJECT TIMELINE

Oct. 2017 - Nov. 2017

Stakeholder Consultations

- Hawaiian Paradise Park Owners Association
- District Councilmembers
- County DPR Divisions (Elderly Activities
- Maintenance, and Recreation)
- County Planning Department

Nov. 2017 - Jan. 2018

Preparation of Conceptual Alternatives

Assessment of Opportunities and Constraints

Feb. 2018

Public presentation to present preliminary master plan

October 23, 2024

Publication of the HPP District Park Draft Environmental Assessment

October 2024

WE ARE HERE

Community Meeting to discuss HPP New District Park design and environmental assessment process

30-Day Public Comment Period

November 20, 2024

End of 30-Day Comment Period for Draft Environmental Assessment

April 2025

Revisions to the HPP District Park Master Plan

2024

2025

Jan. 2018

Visions, Goals, and Conceptual Alternatives Community Meeting

Mar. 2019

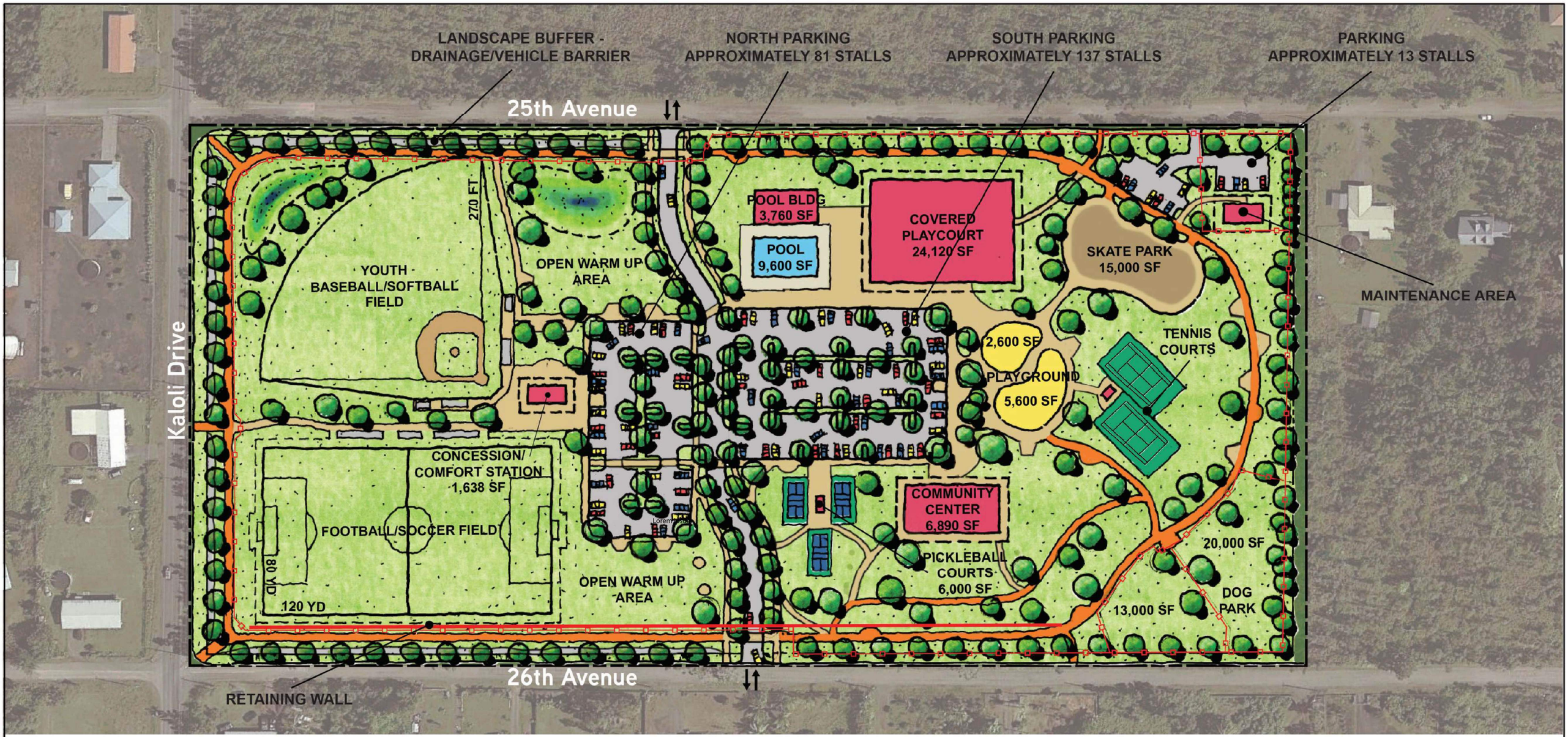
Hawaiian Paradise Park New Park Master Plan

January 2025

Anticipated Publication of the HPP District Park Final Environmental Assessment and Finding of No Significant Impact (FONSI)

Legend

- Community Input
- Preliminary Design
- Environmental Assessment



LEGEND:

Roads (Grey) Sidewalks (Brown) · Perimeter Path (Orange) · Other Path/ Paving (Beige) · Biofiltration Swale and Basins · Landscape Buffer Drainage/Vehicle Barrier · Buildings · Trees & Grass Area · Picnic Area · Exercise Stations · Fencing

COUNTY OF HAWAII
DEPARTMENT OF PARKS & RECREATION
HPP NEW PARK MASTER PLAN

0 60 120 240 FT

SCALE: 1 IN = 120 FT

FINAL MASTER PLAN

March 2019

Appendix B – Feedback Forms

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

I came to the original presentation, Local Newspaper, Facebook ~~email~~

2) Do you have any suggestions on how to better engage the HPP community?

I see that as a benefit but DO NOT know what ~~it~~ would help.

3) Did this event provide information useful to you?

YES ✓ NO _____

4) What do you want to tell us about it?

I Am hoping to see walking paths for seniors - Not just recreation / events for children

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

Friend

2) Do you have any suggestions on how to better engage the HPP community?

Try to be better prepared

3) Did this event provide information useful to you?

YES _____ NO _____

4) What do you want to tell us about it?

If you want to raise our property tax, I already pay property tax & the county doesn't do a goddam thing to fix our roads. You take our money & do NOTHING. Why would I approve to give you more. You don't care for our roads now - you will have to care(over)

for the road – Not Back nt like you have been doing.
Once park is built how are you going to maintain the roads

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

_____

2) Do you have any suggestions on how to better engage the HPP community?

_____

3) Did this event provide information useful to you?

YES ___X___ NO _____

4) What do you want to tell us about it?

Tennis court should be pickleball.

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

HPP BOD

2) Do you have any suggestions on how to better engage the HPP community?

GIVE THEM WHAT THEY WANT! SOON!

3) Did this event provide information useful to you?

YES X NO _____

4) What do you want to tell us about it?

WHY NO TRACK & FIELD. FOOTBALL & BASEBALL PLAYERS CAN STAY FIT ALL YEAR W/ TRACK & FIELD AND IT'S AN OLYMPIC SPORT!

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

Facebook, HPP page

2) Do you have any suggestions on how to better engage the HPP community?

will submit via website

3) Did this event provide information useful to you?

YES X NO _____

4) What do you want to tell us about it?

keep posting out info as it is available.

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

Social media

2) Do you have any suggestions on how to better engage the HPP community?

3) Did this event provide information useful to you?

YES X NO

4) What do you want to tell us about it?

Knowledgable presentors

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

News

2) Do you have any suggestions on how to better engage the HPP community?

Send more info through mail

3) Did this event provide information useful to you?

YES ✓ NO _____

4) What do you want to tell us about it?

_____

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

received invite from ssfm

2) Do you have any suggestions on how to better engage the HPP community?

* finalize

3) Did this event provide information useful to you?

YES ✓ NO _____

4) What do you want to tell us about it?

want to know how to start the process for another *subdivision that has land to dedicate

HAWAIIAN PARADISE PARK NEW DISTRICT PARK

Feedback Form:

1) How did you hear about this event?

Facebook & Neighborhood watch, Nextdoor

2) Do you have any suggestions on how to better engage the HPP community?

Signage

3) Did this event provide information useful to you?

YES ✓ NO _____

4) What do you want to tell us about it?

Wasn't here for the 1st phase but glad to see the positivity

Appendix C – Website and Email Comments

Comment ID	User name	Comment	Agree	Disagree
1	Nicolette Douvris	Full support for this amazing project! Safe walking / biking paths along Kaloli, Paradise and Makuu would make an excellent addition to the park. Imagine how many less cars we'd have on the roads! Mahalo to everyone pushing this project along!!	0	0
2	Josh Hill	We especially support having a Pool, Soccer field, and Pickleball courts. One input item for our small keiki would be to include a fence along Kaloli Dr to keep toys and small children from running into the busy street.	0	0
3	Jesse	The details mention that the perimeter path will be used for "leisure walking", which is not inclusive of runners or cyclists. It would be really great to see the path widened to accommodate more uses or for bike paths and sidewalks to be installed on the roads surrounding the park to allow for these other, popular activities to take place. At the very least, the language could be changed in the description and the existing 10' path could be utilized as a multiuse trail.	2	0
4	Mark	Are the Sports Fields going to be Synthetic Grass or Natural Grass?	1	0
5	Brennan Low	Consider expanding the concession station area to support one or two authorized food trucks, perhaps adjacent to the constructed facility. A vendor fee could help to offset security/maintenance costs, and provide area residents take-out options - as well as boosting the local economy. Imagine being able to grab a coffee after a morning jog, or being able to get shave ice when taking kids to the playground or park on the weekend. Is the county concession stand going to be open during those times? Some fee paying vendor may welcome the chance.	2	0
6	Karla	Love it! I hope the warm up areas will offer some workout equipment like Leilani has, or better.	0	0
7	Rod Kindel	What time of day on Oct 2nd?	0	0
8	Dee	Aloha Rod! The community meeting is from 5pm-7pm at the HPPOA Community Center.	0	0
9	Will Hanson	Please add a sand volleyball court!	1	0

10	Bri	Most veterinarians and behaviorists will tell you dog parks are breeding grounds for disease, put dogs and people at risk for serious injury, and do not encourage healthy socialization for our canine companions. As a dog owner, I'd much prefer to see almost anything else in the dog park space such as: A facility that could host dog training, 4-H events, clubs, spay/neuter clinics. An accessible, inclusive, sensory nature trail/playground for all people. (ex: The Autism Nature Trail in NY, Cambridge's Universal Design Playground in MA) A splash pad for kids (ex: Deering Oaks Ravine in ME). An accessible ropes course (ex: Root Farm in NY). A recycling/up-cycling center. A performing arts space (ex: SPACE in Seaview, where many HPP residents travel regularly now). A place for old-school, early evening, drive-in style movies. A community garden to feed anyone who is hungry and teach those who want to learn. Any of these would better serve our community than a dog park.	1	2
11	Jesse	This parking lot dedicates a very large amount of space for automobile transportation. As we are shifting towards more multimodal forms of transportation, I hope that bicycle parking will also be provided to allow and encourage the local community to choose more active means of transportation when heading to their new neighborhood park. Also, shoulder and sidewalk improvements could really be used around the perimeter to accommodate cyclists and pedestrian safety and maybe HPP could be required to make certain sidewalk improvements along Kaloli to allow children to safely access the park.	1	0
12	Brennan Low	Pickleball is a lot louder than Tennis. Consider putting the rock wall suggested by Long Nguyen in between 26th avenue and the pickleball courts, to mitigate the noise impacts on 26th avenue residences nearest to these courts. The rock wall will dampen the sound.	3	0
13	Helen Duley	I would like to propose a walking/running trail or path around the periphery of the park.	2	0
14	John	This map is hard to use because the comment box keeps popping up and there's no way to close it without making a comment	1	0

15	Brennan Low	If these exercise stations are anything like the ones at Gilbert Kahele park on Mauna Kea... Yes, please. That is a model that should be copied widely, and will help provide the 'gym like' exercise experiences in a way that is accessible to all. Leiliani Estates has a loop of fitness stations all around their park, and it is well-used.	3	0
16	Long nguyen	A climbing wall on the exterior of the community center is low cost and great for health. It's become common in other community centers	4	0
17	Maria Gacula	This plan is wonderful! The variety of uses and areas will give HPP such needed recreation and community spaces, hopefully reducing the need to drive to Pahoa or Hilo.	0	0

Jennifer Scheffel

From: Mr. Hill [redacted]@[redacted]
Sent: Thursday, September 19, 2024 4:39 PM
To: jeffrey.ochi@hawaiicounty.gov
Cc: Jennifer Scheffel
Subject: Hawaiian Paradise Park (HPP) New District Park Project

Follow Up Flag: Follow up
Flag Status: Flagged

Aloha ~
We will be unable to make it to the meeting next Weds, but as an HPP owner and resident of Puna, with 3 young daughters, this is a wonderful plan that I hope actually goes through to completion!

We especially support having a Pool, Soccer field, and Pickleball courts.

*One input item for our small keiki would be to include a fence along Kaloli Dr to keep balls and small children from running into the busy street.

Please let us know how else we can support the process!

Mahalo,
Josh Hill

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