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FEB 23 2019

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Mayor

Wil Okabe
Managing Director

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Housing Administrator

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County of Hawai'i
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February 11, 2019

RECEIVED
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OFC. OF ENVIRONMENTAL QUALITY CONTROL

Mr. Scott Glenn, Director
State of Hawaii
Office of Environmental Quality Control
Department of Health
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

SUBJECT: Draft Environmental Assessment (EA) and Anticipated Finding of No Significant Impact (AFNSI) for Nakahili, located in Waikōloa, South Kohala, Hawai'i (Tax Map Key (3) 6-8-002:005, 006, 028, 029, 030)

Dear Mr. Glenn:

With this letter, the County of Hawai'i Office of Housing and Community Development (OHCD) hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFNSI) on behalf of the Applicant, Work Force Developers, for Nakahili, situated at TMKs: 3-6-8-002:005, 006, 028, 029, 030, in the Waikōloa District of Hawai'i for publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form, one (1) copy of the DEA-AFNSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word.

If there are any questions, please contact me at (808) 961-8379.

Very Truly Yours,

NEIL S. GYOTOKU
Housing Administrator

Attachments

c: Greg Brown, Work Force Developers
Tom Schnell, PBR HAWAII

EQUAL HOUSING OPPORTUNITY
HAWAI I COUNTY IS AN EQUAL OPPORTUNITY PROVIDER AND EMPLOYER

19-256

Hawai'i environmental review submittal form : Entry # 560

Action name

Nakahili

Type of document/determination

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

HRS §343-5(a) trigger(s)

- (9)(A) Propose any wastewater treatment unit, except an individual wastewater system or a wastewater treatment unit serving fewer than fifty single-family dwellings or the equivalent

Judicial district

South Kohala, Hawai'i

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

(3) 6-8-002:005, 006, 028, 029, 030

Proponent type

Applicant

Permit(s)/approval(s)

- Chapter 201H-38 Affordable Housing Exemption
- SLUD Boundary Amendment
- Other

Approving agency

Office of Housing and Community Development, County of Hawai'i

Agency contact name

Neil Gyotoku

Agency contact email

Neil.Gyotoku@hawaiicounty.gov

Agency contact phone

(808) 961-8379

Agency address

Hawai'i environmental review submittal form : Entry # 560

50 Wailuku Drive
Hilo, HI 96720-2456
United States
Map It

Applicant

Work Force Developers, LLC

Applicant contact name

Greg Brown

Applicant contact email

gregbrown@bdmaui.com

Applicant contact phone

(808) 662-3879

Applicant address

P.O. Box 1060
Lahaina, HI 96767
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

PBR HAWAII & Associates, Inc

Consultant contact name

Tom Schnell

Consultant contact email

tschnell@pbrhawaii.com

Consultant contact phone

(808) 521-5631

Consultant address

1001 Bishop St., Suite 650
Honolulu, HI 96813
United States
Map It

Hawai'i environmental review submittal form : Entry # 560

Action summary

Nakahili will be a family agricultural community in the Waikoloa area of South Kohala on the Island of Hawaii. The community will be on approximately 1,559 acres near the intersection of Mamalahoa Highway with Waikoloa Road. When fully built out Nakahili will include approximately 1,158 apartments and farm dwellings.

As a family agricultural community Nakahili will: include farm dwellings on agricultural lots; allow for agricultural operations; and include a small neighborhood commercial "village" area with apartments, limited retail and light industrial uses, and a small wastewater treatment facility. Two parks are proposed: 1) a community green for community activities and events adjacent to the village area; and 2) an a large regional park. Community infrastructure will be provided on-site, including water wells, water tanks, a waste wastewater treatment facility to serve the village area, and several detention basins. Approvals for Nakahili are proposed to be processed under Ch

Reasons supporting determination

Refer to DEA Section 7.

Attached Documents (agency letter & EA/EIS)

- 2019-Nakahili-DEA-digital.pdf
- 2019-Nakahili-DEA-digital1.pdf
- 2019-Nakahili-DEA-digital2.pdf
- 2019-Nakahili-DEA-digital3.pdf
- 2.11.19-Nakahili-Ltr-to-OEQC.pdf

Shapefile upload

- Nakahili_Project_Boundary.zip

Authorized individual

Selena Pang/PBR HAWAII & Associates, Inc.

Proponent

Work Force Developers, LLC

Authorization

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



- NAKAHILI -

A WORKFORCE FAMILY AGRICULTURAL COMMUNITY

Draft Environmental Assessment
Anticipated Finding of No Significant Impact (HRS 343)

Prepared for:

WFD WORK FORCE DEVELOPERS
www.WFDHawaii.com

Prepared by:

PBR HAWAII & ASSOCIATES, INC.

FEBRUARY 2019

Nakahili
A Workforce Family Agricultural Community

Draft Environmental Assessment –
Anticipated Finding of No Significant Impact
(HRS 343)

Prepared for:
Work Force Developers, LLC

Prepared by:

PBR HAWAII
& ASSOCIATES, INC.

February 2019

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SUMMARY

Project Name:	Nakahili
Location:	Waikoloa Ahupua‘a, South Kohala District, Hawai‘i
Judicial District:	South Kohala
Tax Map Keys (TMK):	(3) 6-8-002:005, 006, 028, 029, 030 Throughout this document, collectively, the five TMK parcels are referred to as the “Property.”
Area	TMK (3) 6-8-002:005: 249.548 acres TMK (3) 6-8-002:006: 668.749 acres TMK (3) 6-8-002:028: 332.556 acres TMK (3) 6-8-002:029: 153.871 acres TMK (3) 6-8-002:030: 154.815 acres Total Area: 1,559.539 acres
Applicant:	Work Force Developers, LLC (Work Force Developers)
Accepting Authority:	County of Hawai‘i Office of Housing and Community Development (OHCD)
Recorded Fee Owners:	Waikoloa Investment Land Trust: TMKs (3) 6-8-002:005, 028, 029, 030 Globe Corporation: TMK (3) 6-8-002:006
Existing Use:	The Property is currently vacant and undeveloped.
Proposed Use:	Work Force Developers LLC is proposing to create “Nakahili,” a workforce family agricultural community on the Property. As a family agricultural community Nakahili will: include farm dwellings on agricultural lots; allow for agricultural operations; and include a small neighborhood commercial “village” area with apartments, limited retail and light industrial uses, and a small wastewater treatment facility. Two parks are proposed: 1) a community green for community activities and events adjacent to the village area; and 2) a large regional park. Community infrastructure will be provided on-site, including water wells, water tanks, a waste wastewater treatment facility to serve the village area, and several detention basins. Approvals for Nakahili are proposed to be processed under Chapter 201H, Hawai‘i Revised Statues (HRS), meaning that a majority of the dwelling units (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income.

Current Land Use Designations:	*State Land Use:* Agricultural *County of Hawai'i General Plan Land Use Pattern Allocation Guide:* Important Agricultural Lands *County of Hawai'i South Kohala Community Development Plan Area:* Unclassified *County Zoning:* A-20a (Agricultural District – minimum lot size of 20 acres) *Special Management Area:* Outside of SMA boundaries
Alternatives Considered:	No Action Non "201H" processing of approvals Higher density community
Anticipated Determination:	Finding of No Significant Impact (FONSI)

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LIST OF ACRONYMS AND ABBREVIATIONS

The following is a list of terms, abbreviations, and acronyms used in this document.

AAQS	Ambient Air Quality Standards
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawai‘i
BMPs	Best Management Practices
CDP	Community Development Plan
cfs	cubic feet per second
CO	Carbon Monoxide
CWB	Clean Water Branch, Department of Health (State of Hawai‘i)
CWRM	Commission on Water Resource Management, Department of Land and Natural Resources (State of Hawai’i)
CZM	Coastal Zone Management

DBEDT	Department of Business, Economic Development, and Tourism (State of Hawai‘i)
DEM	Department of Environmental Management (County of Hawai‘i)
DLNR	Department of Land and Natural Resources (State of Hawai‘i)
DoD	Department of Defense (State of Hawai‘i)
DOE	Department of Education (State of Hawai‘i)
DOH	Department of Health (State of Hawai‘i)
DOT	Department of Transportation (State of Hawai‘i)
DWS	Department of Water Supply (County of Hawai‘i)
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FUDS	Formerly Used Defense Sites
H_2S	Hydrogen Sulfide
HAR	Hawai‘i Administrative Rules
HEER	Hazard Evaluation and Emergency Response Office
HHPS	Hawai‘i Housing Planning Study
HRS	Hawai‘i Revised Statutes
LSB	Land Study Bureau
LUC	Land Use Commission (State of Hawai‘i)
LUPAG	Land Use Pattern Allocation Guide (County of Hawai‘i General Plan)
mgd	million gallons per day
MRS	Munitions Response Site
NAAQS	National Ambient Air Quality Standards
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
OHCD	Office of Housing and Community Development, County of Hawai‘i
$PM_{2.5}$	Particulate matter 2.5 microns or less in aerodynamic diameter (“fine” particles)
PM_{10}	Particulate matter 10 microns or less in aerodynamic diameter (“coarse” particles)
SHPD	State Historic Preservation Division, Department of Land and Natural Resources (State of Hawai‘i)
SMA	Special Management Area
SO_2	Sulfur Dioxide
TMDL	Total Maximum Daily Load
TMK	Tax Map Key
TPD	Tons per Day
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Military Ordnances
WMA	Waikoloa Maneuver Area

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1 INTRODUCTION

This Environmental Assessment (EA) is prepared in accordance with Chapter 343, Hawai‘i Revised Statutes (HRS) for Nakahili in South Kohala, Hawai‘i, State of Hawai‘i.

1.1 LANDOWNERS

Waikoloa Investment Land Trust owns TMKs (3) 6-8-002:005, 028, 029, 030.

Contact: Waikoloa Investment Land Trust
4886 Coronado Ave., Unit A
San Diego, California 92107

Globe Corporation owns TMK (3) 6-8-002:006.

Contact: Globe Corporation
6730 N. Scottsdale Road
Scottsdale, Arizona 92107
Phone: (480) 344-2903

1.2 APPLICANT

Work Force Developers is the Applicant. Work Force Developers is a development entity under contract to acquire the Property from the landowners.

Contact: Work Force Developers, LLC
ATTN: Greg Brown
P.O. Box 1060
Lahaina, Hawai‘i 96767
Phone: (808) 662-3879
Fax: (808) 662-3870

1.3 APPROVING AGENCY

The County of Hawai‘i Office of Housing and Community Development (OHCD)is the approving agency.

Contact: County of Hawai‘i Office of Housing and Community Development
ATTN: Neil S. Gyotoku, Housing Administrator
50 Wailuku Drive
Hilo, Hawai‘i 96720-2456
Phone: (808) 961-8379
Fax: (808) 961-8685

1.4 PLANNING CONSULTANT & AGENT

PBR HAWAII & Associates, Inc. is the Applicant's planning consultant and agent.

Contact:

PBR HAWAII & Associates, Inc.
ATTN: Tom Schnell, AICP
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813
Phone: (808) 521-5631
Fax: (808) 523-1402

1.5 COMPLIANCE WITH STATE OF HAWAI'I ENVIRONMENTAL LAWS

This EA has been prepared in accordance with the provisions of Chapter 343, HRS and Title 11, Chapter 200, Hawai'i Administrative Rules (HAR) pertaining to Environmental Impact Statements. Section 343-5, HRS established nine types of actions that "trigger" compliance. The "trigger" applicable to Nakahili, without limitation, is the proposal for a "Wastewater treatment unit, except an individual wastewater system or a wastewater treatment unit serving fewer than fifty single-family dwellings or the equivalent." Nakahili will include a small wastewater treatment facility to serve the neighborhood commercial village area and any dwellings within 1,000 feet of a well site. The majority of the agricultural lots with farm dwellings will be serviced by individual wastewater treatment units on each lot.

In addition, creation of Nakahili may involve or impact State and/or County lands or funds relating to infrastructure improvements for public facilities, roadways, water, sewer, utility, drainage, or other facilities. While the specific nature of each improvement is not known at this time, this EA is intended to address all current and future instances involving the use of State and/or County lands and funds relating to Nakahili.

1.6 STUDIES CONTRIBUTING TO THIS ENVIRONMENTAL ASSESSMENT

The information contained in this EA has been developed from site visits, generally available information regarding the characteristics of the Property and surrounding areas, and technical studies prepared specifically for Nakahili, including a:

- Biological survey
- Archeological inventory survey
- Cultural impact assessment
- Traffic impact assessment report
- Preliminary engineering report

2 NAKAHILI DESCRIPTION

2.1 BACKGROUND INFORMATION

Location and Property Description

The Nakahili Property is located in the South Kohala District of Hawai‘i near the intersection of Māmalahoa Highway with Waikoloa Road, south of Waimea and mauka (inland) of Waikoloa Village (see Figure 1). The Property totals 1,559.539 acres identified by TMK parcels (3) 6-8-002:005, 006, 028, 029, 030 (Figure 2) and is accessible from Māmalahoa Highway (Hawai‘i State Route 190).

The Property is centrally located with South Kohala with Waikoloa Village a short drive to the south and major job centers such as the South Kohala resorts along the coastline to the west and Waimea to the north. Further south are a myriad public and private sector employment opportunities in the adjacent North Kona District.

The Property is undeveloped and vacant with sparse vegetation mainly consisting of non-native grasses and shrubs with intermittent trees. Limited cattle grazing occurs on the Property. The Property has no paved roads or connections to County public services such as water and sewer, etc. Several unpaved access roads cross through the Property with gated entrances where the Property is accessible from Māmalahoa Highway. Barbed wire boundary and cross fencing, often with gates, divides the Property in to large sections.

Property elevations range from 2,680 feet at the southeastern most corner to 1,880 feet at the most western side and the terrain slopes steadily downward from southeast to northwest at an average slope of approximately eight to 12 percent. Four tributary gulches traverse through the Property and form natural drainage ways. Most of the soils underlying the Property (approximately 95 percent) are Waikaloa-Puu Pa complex, which is formed in basic volcanic ash. These soil types indicate moderate to high permeability with medium runoff and are commonly found at intermediate elevations on the leeward side of Mauna Kea.

The region of the Property on the western flank of Mauna Kea is one of the driest on the Big Island, with an average annual rainfall of about 18 to 20 inches.

Figure 3 shows photographs of the Property.

Existing Land Use Designations

The land use designations of the Property are:

- *State Land Use:* Agricultural (see Figure 4)
- *County of Hawai‘i General Plan Land Use Pattern Allocation Guide:* Important Agricultural Lands (see Figure 5)

- *County of Hawai'i South Kohala Community Development Plan Area:* Unclassified (see Figure 6)
- *County Zoning:* A-20a (Agricultural District – minimum lot size of 20 acres), see Figure 7
- *Special Management Area:* Outside of SMA boundaries

Surrounding Land Uses

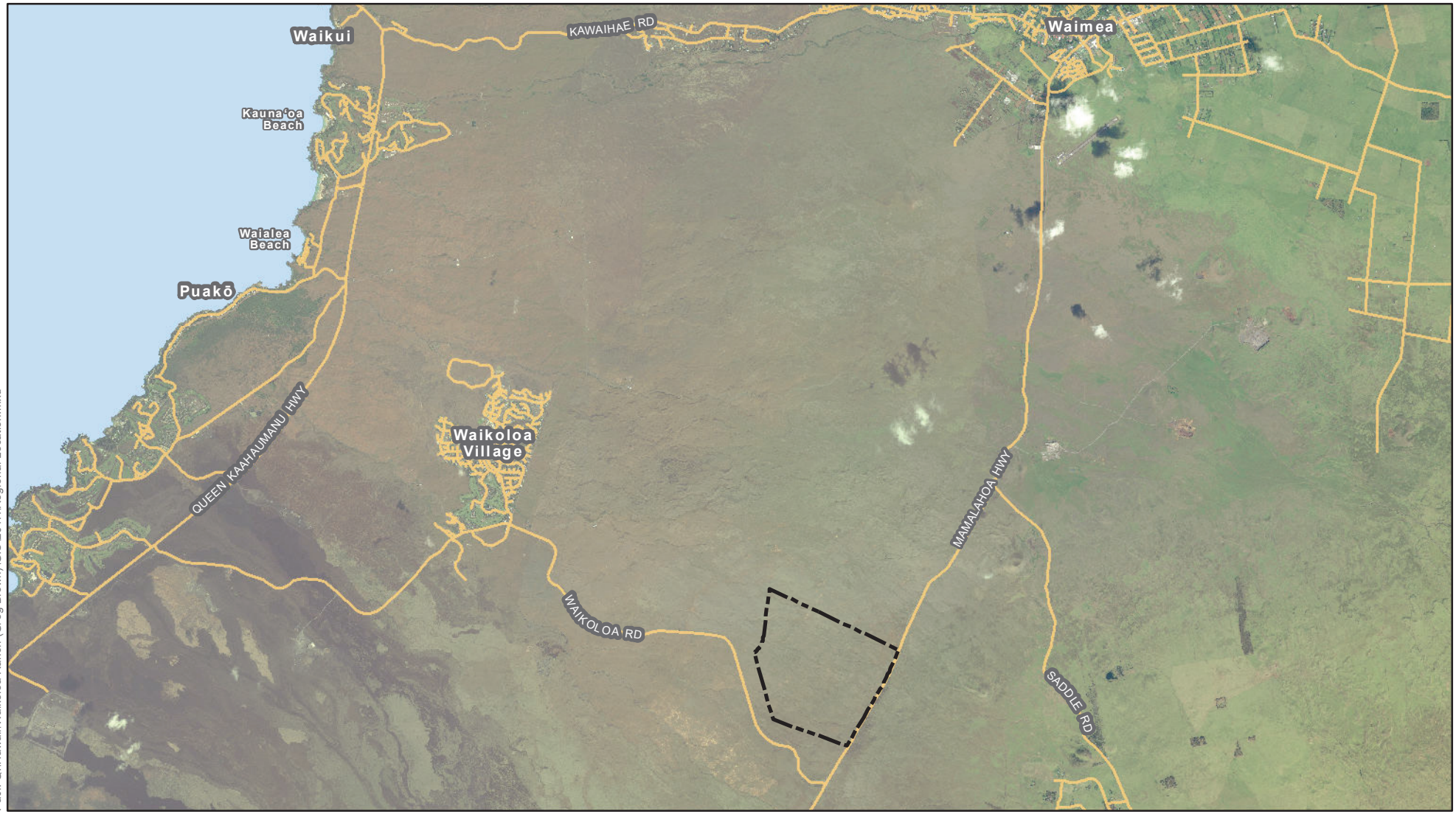
The existing settlement pattern in the South Kohala District is agricultural, residential, and resort, with more densely populated areas closest to the ocean or in the uplands of Waimea. The Property is bound on the east by Māmalahoa Highway (Route 190) and vacant land surrounds the Property.

The Property is situated between two major population centers within the South Kohala District: Waikoloa Village and Waimea. Waikoloa Village, makai (toward the ocean) of the Property, is an urbanized, residential community originally planned as a retirement community in 1971 until the expansion of commercial developments along the South Kohala coast provided greater opportunity for a family-oriented suburban community (Hawai'i County, 2008). Several large resorts such as the Mauna Kea Resort, Mauna Lani Resort, and the Waikoloa Beach Resort are located in close proximity, makai of Waikoloa Village. These resorts account for 40 percent of all hotel rooms within the County and are also among the County's largest employers (Hawai'i County, 2008).

In contrast, Waimea, north of the Property, is a rural community with a long history of agriculture and ranching operations. Parker Ranch, one of the largest privately-owned ranches in the world, has its headquarters in Waimea with approximately 230,000 acres of grazing land that supports 45,000 to 50,000 head of cattle (Hawai'i County, 2008).

Regional Land Use History

South Kohala has a long history of agricultural uses in its upland regions, beginning as early as the arrival of the first settlers to the island of Hawai'i, around 1000 A.D. Agriculturally productive land, especially in upland Waimea, became a source of frequent conflict between Native Hawaiians and eventually foreign settlers, for control over the productive land. South Kohala, in particular Kawaihae and Waimea, was also an important political region on Hawai'i (Hawai'i County, 2008). When cattle were introduced to the area by foreigners in the late 18th century, their grazing area was relegated to land south of the more agriculturally productive areas in upland Waimea. Agricultural productivity to the north in Waimea and availability of marine resources near the shore greatly influenced the distribution of human settlements throughout the South Kohala region.



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Legend

Nakahili Boundary

Roads

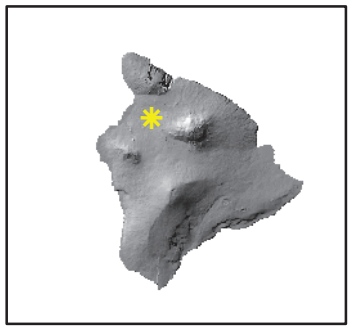


Figure 1

Regional Location

Nakahili

Work Force Developers LLC — Island of Hawai'i

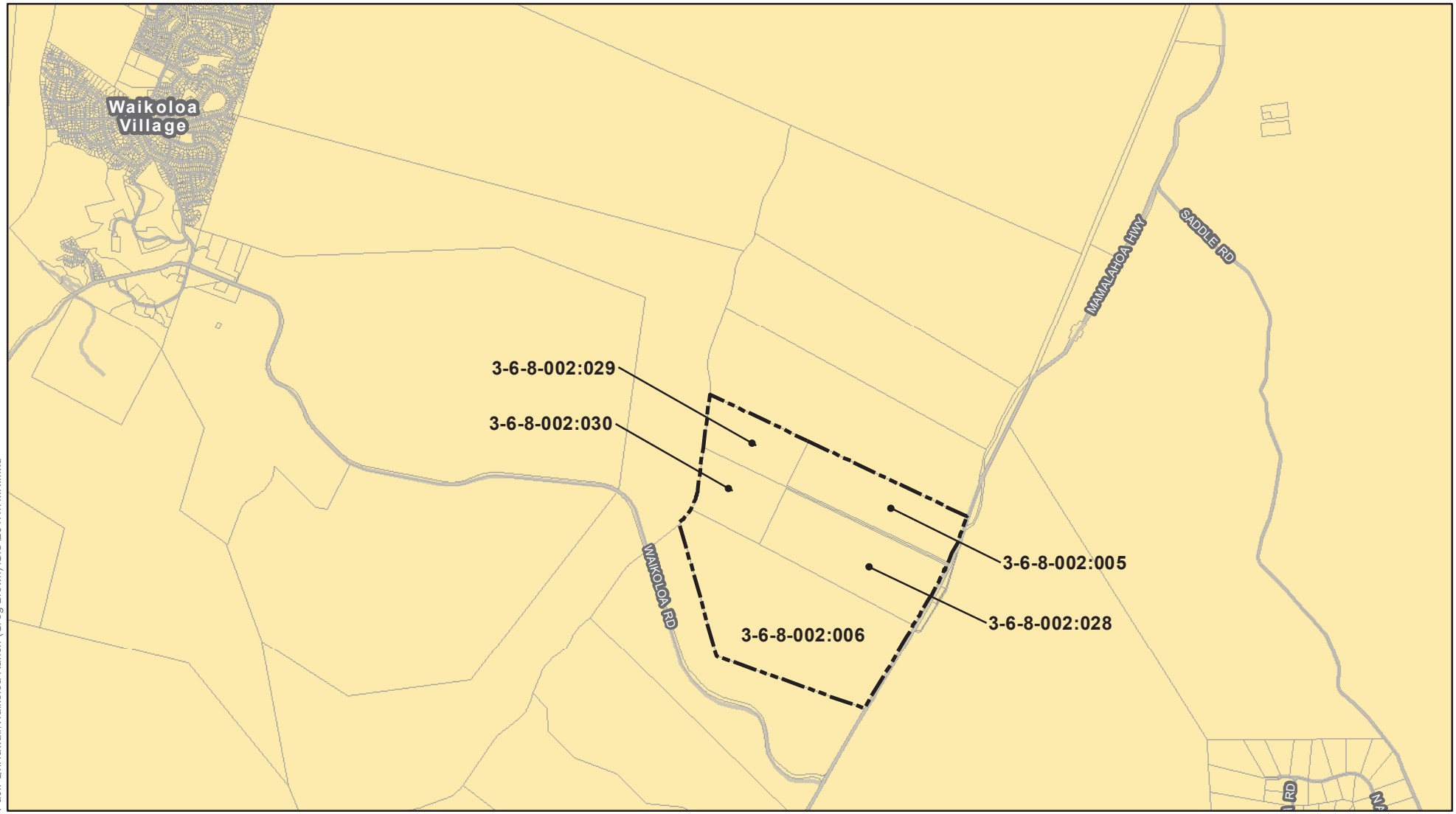
North

Linear Scale (miles)

0 0.5 1 2

PBR HAWAII & ASSOCIATES, INC.

Source: County of Hawai'i, 2018.



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Legend

Nakahili Boundary

TMK Parcels

Source: County of Hawai'i, 2018.

Figure 2

Tax Map Key Map

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.



1. View of the Property looking north with Mauna Kea in the distance.



2. Typical vegetation cover; view to the north.



3. An aerial view of the Property looking west.



4. An expansive relatively flat area of the Property with a grove of Eucalyptus trees in the distance.



5. A dense a'ali'i patch on the Property.

Figure 3: Property Photos

Nakahili

Work Force Developers LLC — Island of Hawai'i

PBR HAWAII & ASSOCIATES, INC.

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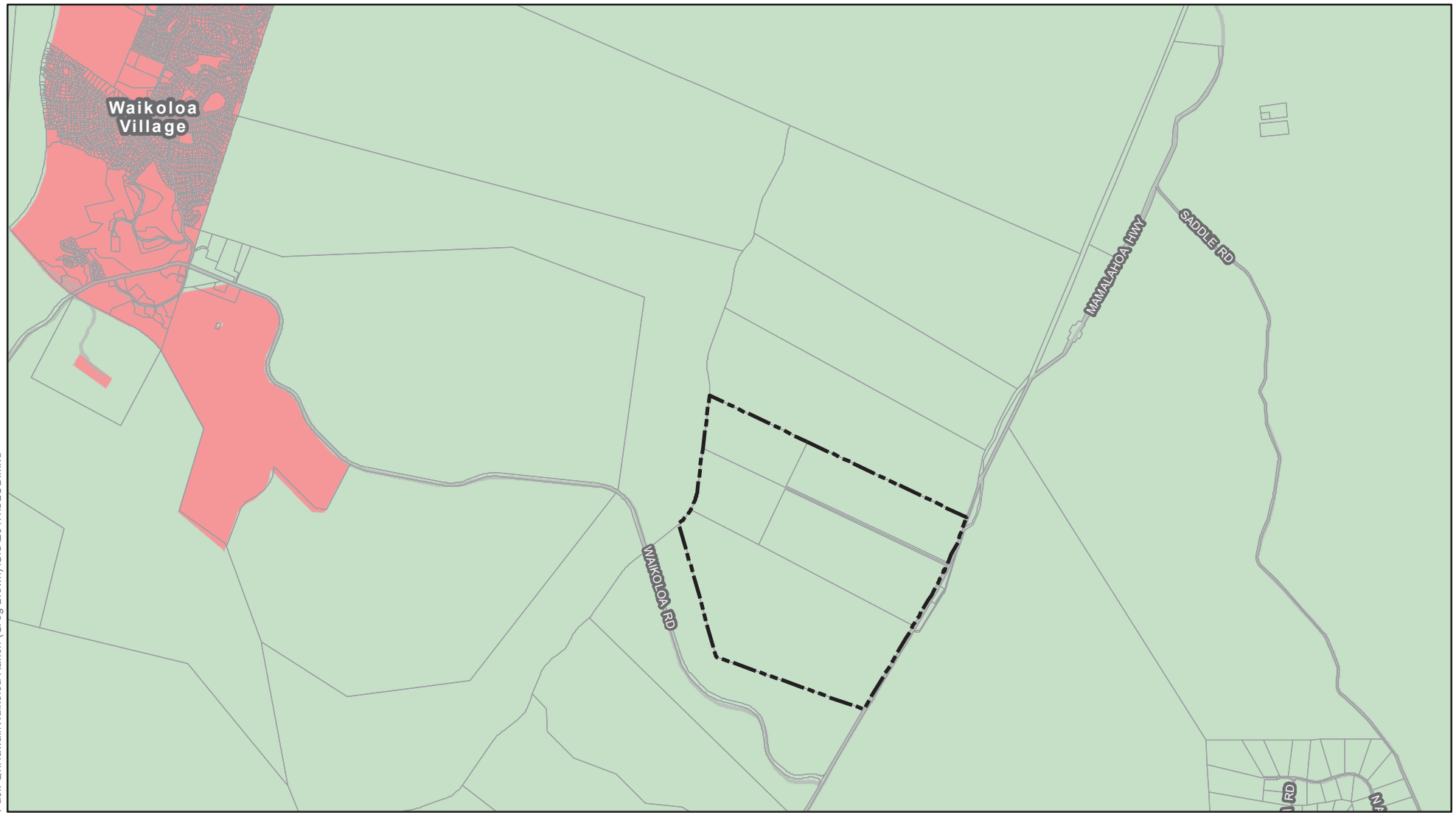

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Legend

Nakahili Boundary

TMK Parcels

State Land Use Districts

A - Agriculture

U - Urban

Source: County of Hawai'i, 2018. State of Hawai'i, Land Use Commission, 2016.

Figure 4

State Land Use Districts

Nakahili

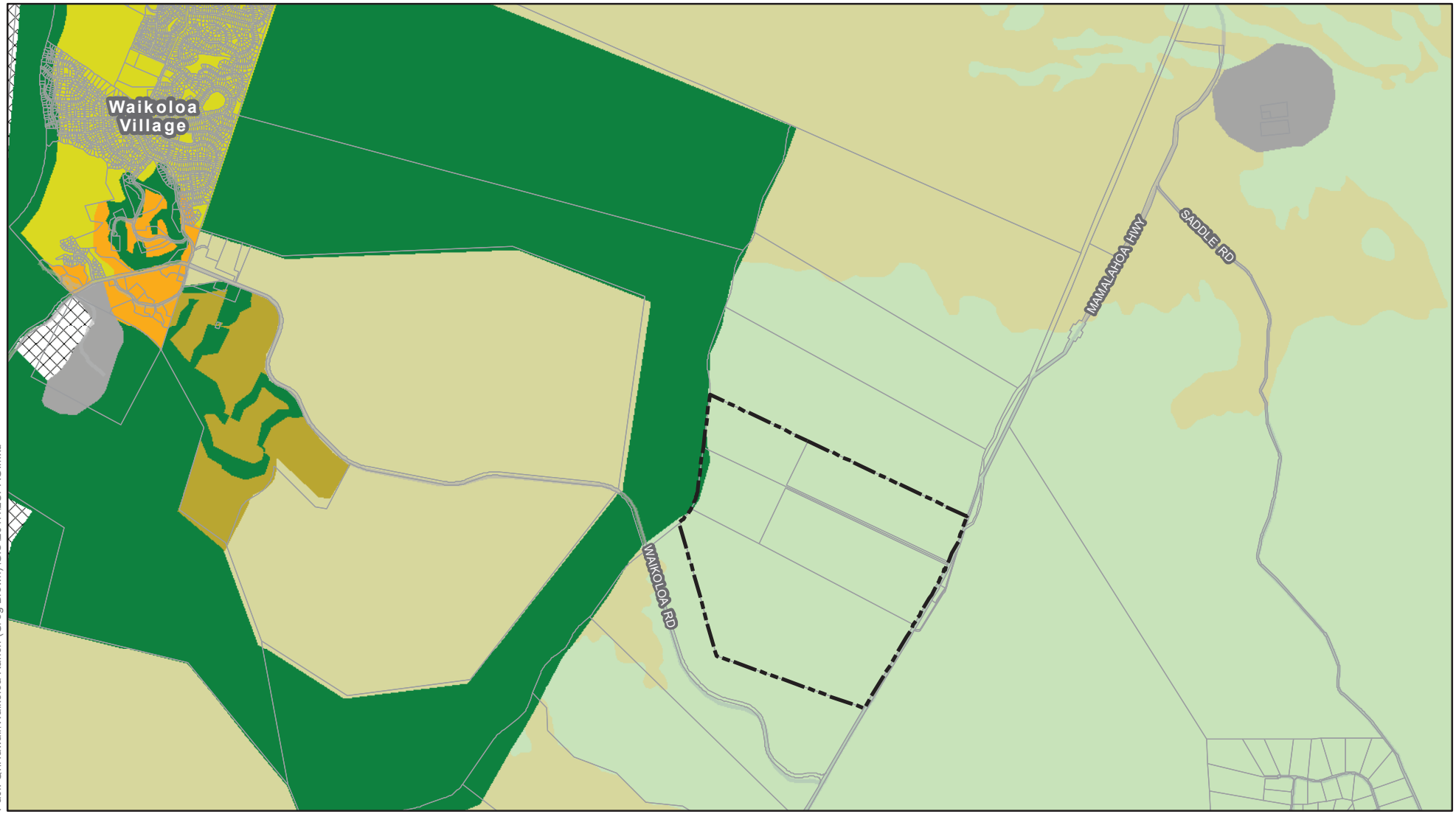
Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.



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Path: Q:\Hawaii\Waikoloa Ranch (Greg Brown)\GIS\2011\LUPAG.mxd

Legend

- Nakahili Boundary
- TMK Parcels

Land Use Pattern Allocation Guide (LUPAG)

- Extensive Agriculture
- Important Ag. Lands
- Industrial
- Low Density Urban
- Medium Density Urban
- Open Area
- Rural
- Urban Expansion

Source: County of Hawai'i, Land Use Pattern Allocation Guide (LUPAG) Map, 2015.

Figure 5

Hawai'i County General Plan LUPAG Map

Nakahili

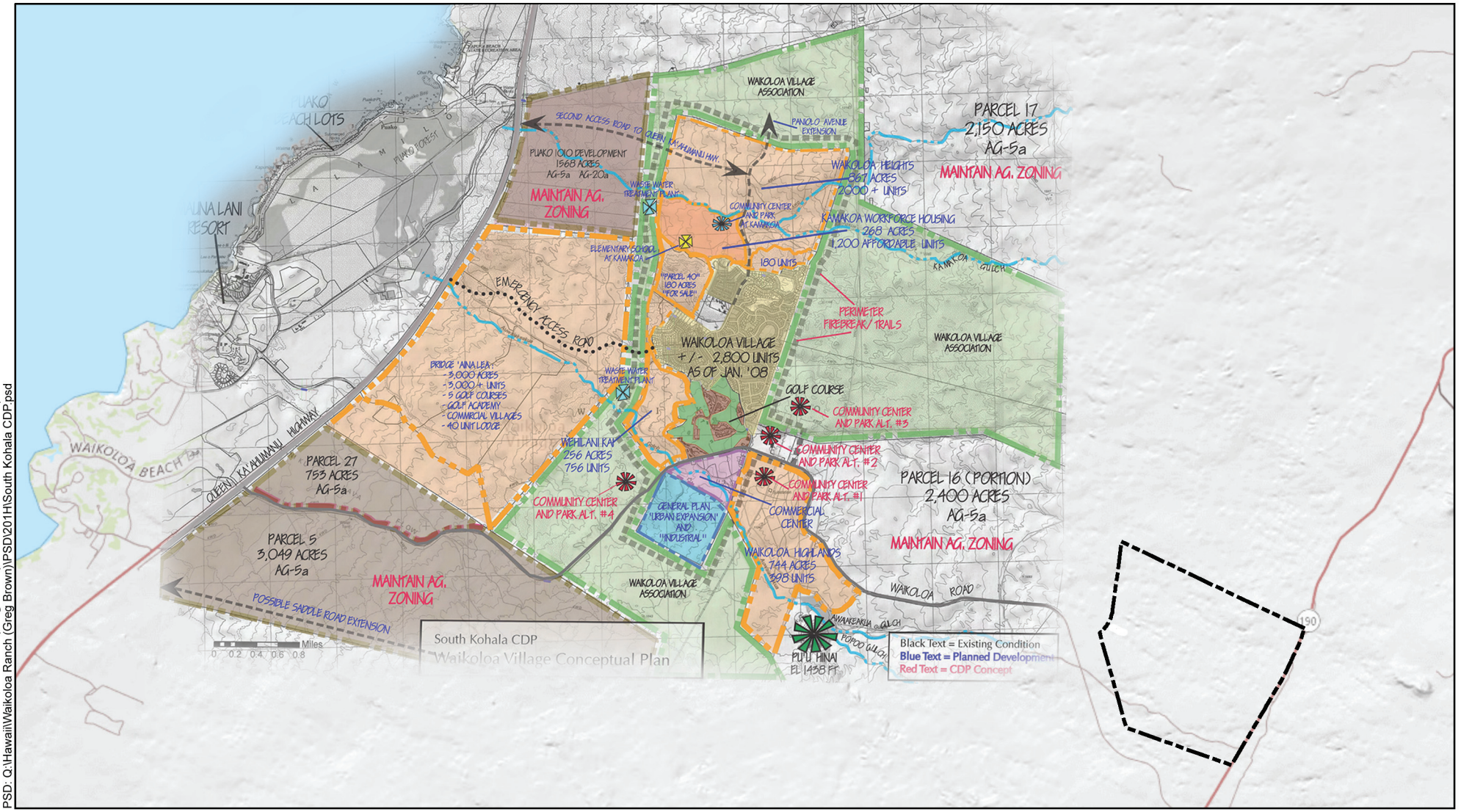
Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.



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Legend

Nakahili Boundary

Figure 6

South Kohala Community Development Plan

Nakahili

Work Force Developers LLC — Island of Hawai'i

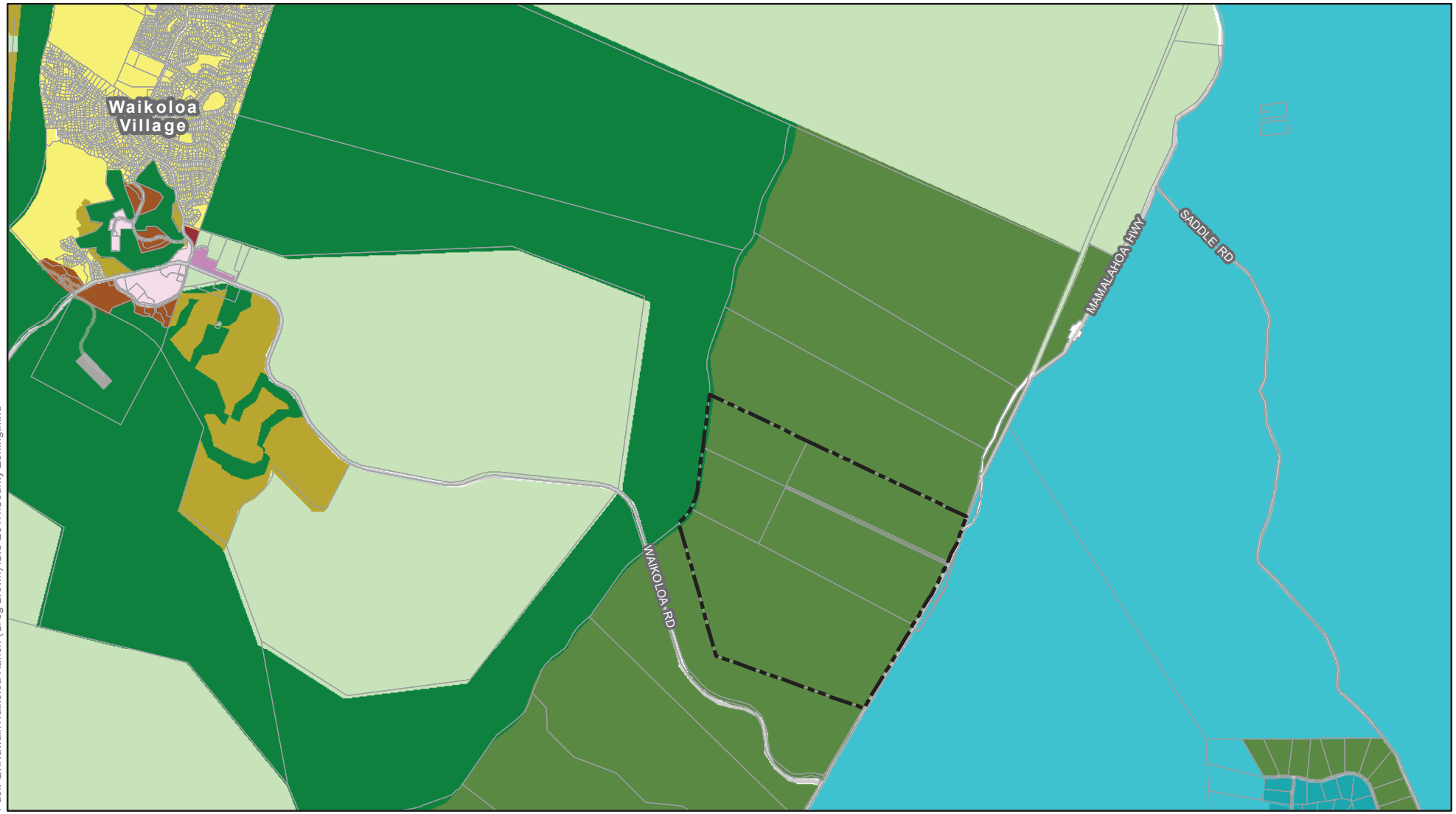
North

Linear Scale (feet)

0 1,750 3,500 7,000

PBR HAWAII & ASSOCIATES, INC.

Source: County of Hawai'i, 2018. Hawai'i County Planning Department, South Kohala Community Development Plan, 2008.



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Legend

Nakahili Boundary

TMK Parcels

County of Hawai'i Zoning

A-10a
A-20a
A-40a
A-5a
CV-10
CV-20
ML-1a
OPEN
RA-1a
RM-1.5
RM-2.5
RM-3
RS-10

Source: County of Hawai'i, 2018 (Hawai'i County Zoning Map, 2016).

Figure 7

County of Hawai'i Zoning

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.

From the mid-19th century and into the 20th century, the district was heavily influenced by the *paniolo* (or "Hawaiian Cowboy") way of life. The origins of the *paniolo* lifestyle can be traced back to the expansion of wild cattle populations in Waimea when Kamehameha I asked the Spanish-Mexican vaqueros from California to teach Native Hawaiians how to manage the wild cattle. Less than a decade later, Parker Ranch was founded in Waimea, which grew and expanded from many influential *paniolo* and today is one of the largest privately-owned ranches in the world. Toward the latter half of the 20th century, the development of three world class resorts in the district shifted the district's economic base from agriculture to tourism and influenced land use and development patterns over the last several decades (Hawai'i County, 2008).

From 1943 to 1953, the U.S. military used approximately 130,000 acres of land in South Kohala for training operations. This area is now called the "Former Waikoloa Maneuver Area." At least 40 percent of the area was used for training with live military munitions. While cleanup activities ensued shortly after the training grounds were deactivated, Unexploded Military Ordnances (UXO) were later discovered near homes and schools from Waimea to Waikoloa Village. The Property is among other areas in South Kohala within the Former Waikoloa Maneuver Area and is listed in the national Formerly Used Defense Sites (FUDS) Inventory. The U.S. Army Corps of Engineers (USACE) has completed the cleanup (munitions removal) at the north parcels of the Property (TMKs (3) 6-8-002:005, 028, 029, and 030) and these parcels are designated as a Cleared Area. USACE has not conducted its cleanup at TMK 3-6-8-002:006. See Section 4.4 for more information regarding the Waikoloa Maneuver Area, UXO, FUDS, and the Property.

2.2 PURPOSE AND NEED

Existing Home Supply and Affordability

Within Hawai'i County, the number of persons residing in the South Kohala District, in which the Property is located, has increased faster than the County as a whole. South Kohala's more rapid growth is attributed to its jobs base and accessibility to additional opportunities in the North Kona District immediately to its south. The effects of population growth in the region have put strain on the existing housing supply and affordability for residents. Observations of 2018 estimates for housing and demographics include the following:

- South Kohala currently houses about 20,300 persons, about 10% of County population, while North Hawai'i (South Kohala, North Kohala and Hāmākua districts) houses some 34,300, or 17 percent of County population.
- At 2.80 and 2.85, respectively, average household sizes appear to be somewhat higher in South Kohala and North Hawai'i than in the County as a whole, where they are estimated at 2.75. Average household sizes appear to have been increasing in all areas considered.
- Median household income in South Kohala, at about $80,000, is about 140 percent of the median estimated for the County by ESRI ($57,000). North Kohala's estimated

median income of about $70,000 is lower than for South Kohala alone, still higher than the County estimate.

- Median home values are notably higher in South Kohala (about $480,000) and North Hawai‘i (about $434,000) than for the County as a whole (about $335,000).

Home Demand

The need for additional primary residential housing in the County has been well documented and widely discussed for decades. The condition was worsened in 2018 as lava activity originating from Kīlauea Volcano's lower east rift zone destroyed more than 700 homes in the Puna District and cut off access to many others. The Hawai‘i Housing Planning Study (HHPS) reports 10,203 households in North Hawai‘i in 2016 (a majority of which are located in South Kohala), with 17 percent of those, or about 1,765, estimated to be crowded and/or doubled up. This is a potential indicator of current pent-up demand originating from the North Hawai‘i area. However, the 10,700 crowded and/or doubled up households estimated County-wide in the HHPS is also an important indicator, since those potential new households may choose to live outside of their current area of residence, and such choices are likely to be strongly influenced by the availability and affordability of housing options in any given area.

In addition to current demand, Hawai‘i County and its North Hawai‘i area will need substantial new housing development to accommodate household formation due to anticipated population growth. Adding the estimated pent-up demand and growth-based demand components together, the County could require up to 28,400 more primary resident homes delivered by 2035 (10,700 pent-up demand plus 18,700 future demand). Studies by the State of Hawai‘i Department of Business, Economic Development, and Tourism (DBEDT) suggest a need to add 1,600 to 2,000 new primary residential homes in an average year to meet needs. In contrast, private residential permitting for Hawai‘i County between 2015 and 2017 averaged only 784 units annually, or 752 when associated demolitions are deducted. Moreover, not all permitted units get built on a timely basis, or ever, and many are developed to target non-residential markets.

Proposed Home Supply

Nakahili could be an important component of a County plan to meet an anticipated future demand for some 28,400 resident-oriented housing units by 2035. The Property is located near to existing residential and commercial uses at Waikoloa Village, and within a short drive of major job centers in Waimea Town, South Kohala resorts, and myriad public and private sector opportunities in the adjacent North Kona District.

Unlike many other West Hawai‘i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households. Nakahili is seen to serve diverse market segments including new householders, first-time buyers, move-up buyers,

downsizing households, and seniors. Notably, it would produce a substantial inventory of rental housing opportunities, in alignment with the State's 2016 HHPS finding that more than half of intended County movers, including those currently living in North Hawai‘i, do not expect to purchase their next home. In addition, with its 300 apartments, of which at least 50% are planned to be made available for rent at affordable rates by 2023, Nakahili would also represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawai‘i.

2.3 NAKAHILI

Community

Nakahili will be a workforce housing and agricultural community in the Waikoloa area of South Kohala on the Island of Hawai‘i. The community will be on approximately 1,559.539 acres near the intersection of Māmalahoa Highway with Waikoloa Road. When fully built out, Nakahili will include approximately 1,158 farm dwellings and apartments with more than 50% affordable to households with incomes at or below 140% of the area median income.

As a family agricultural community, Nakahili will include farm dwellings and agricultural operations on agricultural lots and provide a small neighborhood commercial "village" area with apartments and limited retail uses to serve the community. These areas within Nakahili will generally conform to the development standards set forth under Hawai‘i County Code (HHC) Chapter 25 (Zoning) for: 1) Family Agricultural Districts, which provide for a blend of small-scale agricultural operations associated with small acreage farms, farm estates, and subsistence lots within the State Land Use Agricultural District; and 2) Neighborhood Commercial Districts, which apply to strategically located commercial centers that supply goods and services to a residential or working population on a frequent need or convenience basis.

Nakahili is designed with approximately 700 one-acre agricultural lots surrounded by approximately 150 larger agricultural lots ranging from two to five areas (and slightly larger) located around the perimeter of Nakahili to serve as a buffer to the adjacent, larger agricultural properties. The design also provides for a 150-foot wide firebreak around the entire Nakahili perimeter created from including "no build" open space easements on the large perimeter agricultural lots.

The village area will be in the northern mauka portion of the Property, near the primary entrance off Māmalahoa Highway, and contained within approximately 15 acres or less. In addition to neighborhood commercial uses (such as a neighborhood grocery store, shops, and restaurants targeted to the community), the village area will include approximately 300 apartments, with a majority being affordable rentals specifically envisioned for those who work in the region and need an affordable place to live within a short drive from their workplaces, e.g. employees of

nearby resorts. The village area will also provide space for: some limited light industrial uses, such as a self-storage facility or contractor or supplier warehouses or offices; and a small wastewater treatment facility.

Nakahili will also include two parks: 1) an approximately six-acre "community green" neighborhood park will be located adjacent to the village area; and 2) an approximately 29-acre regional park will be in the lower (makai) central area.

At some point in the future, the regional park within Nakahili could eventually connect to an even larger regional park area (for a total of up to approximately 150 acres) on adjacent property to the west (makai) owned by the Waikoloa Village Association. Another regional amenity under consideration is a greenway/fire break pedestrian and equestrian trail extending more than four miles from Nakahili to Waikoloa Village over land owned by the Waikoloa Village Association. Work Force Developers LLC has discussed these mutually beneficial regional amenities with the Waikoloa Village Association and could pursue the development of these recreation features in connection with the development of Nakahili, subject to terms to be mutually agreed upon by Waikoloa Village Association and Work Force Developers.

Community infrastructure will be provided on-site. The Nakahili plan includes areas for new water wells, water tanks, a small wastewater treatment facility serving the village area, and several large detention basins. Wastewater service the majority of the agricultural lots and homes will be provided by individual wastewater systems located on each lot. See Section 4.8 for more information regarding infrastructure.

Figure 8 shows the Nakahili Conceptual Master Plan. Table 2-1 provides a land use summary.

Table 2-1. Land Use Summary

LAND USES	**North Parcels** (TMKs (3) 6-8-002:005, 028, 029, 030)			**South Parcel** (TMK (3) 6-8-002:006)			
	Approx. Acres	Dwelling Density	Dwelling Units	Approx. Acres	Dwelling Density	Dwelling Units	Subtotal
Neighborhood Commercial							
Multifamily (Apartment) and Retail	10	30	300	0		0	300
Light Industrial/WWTP	5			0		0	
Subtotal:	**15**		**300**	**0**		**0**	**300**
Family Agricultural							
1+ acre Lot	463	0.76	350	445	0.80	355	705
2 to 4 acres Lot	252	0.34	86	123	0.34	42	128
5+ acres Lot	69	0.2	13	70	0.2	12	25
Subtotal:	**784**		**449**	**638**		**409**	**858**

LAND USES	North Parcels (TMKs (3) 6-8-002:005, 028, 029, 030)			South Parcel (TMK (3) 6-8-002:006)			
	Approx. Acres	Dwelling Density	Dwelling Units	Approx. Acres	Dwelling Density	Dwelling Units	Subtotal
Parks/Open Space							
Regional Park	29			0			
Community Park	6			0			
Subtotal:	**35**		**-**	**0**		**-**	
Infrastructure							
Detention Basins*	(38)			(4)			
Water Tank Sites	10			0			
Roadways (ave. 50'ROW)	46			31			
Subtotal:	**56**		**-**	**31**		**-**	
TOTAL:	**890 (acres)**			**669 (acres)**			**1,559 (acres)**
*NOTE: The areas of the proposed detention basins are assumed within the Family Agricultural approx. areas, and thus the areas of the retention basins on the north parcels and south parcel are not included in the Approx. Areas totals.							**1,158 (units)**

Affordability

Approvals for Nakahili are proposed be processed under Section 201H-38, HRS which was enacted to encourage the development of affordable housing. Section 201H-38, HRS (titled "Housing development; exemption from statutes, ordinances, charter provisions, and rules"), provides that the various County Council's shall authorize the development of housing projects that "shall be exempt from all statutes, ordinances, charter provisions, and rules of any government agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of dwelling units thereon" as long as: the project meets minimum requirements of health and safety; the project does not contravene any safety standards, tariffs, or rates and fees approved by the Public Utilities Commission for public utilities or of the Board of Water Supply; and the County Council approves the project by resolution.

In Hawai'i County, OHCD is the 201H coordinating agency for projects that are primarily designed for affordable housing, meaning that a majority of the housing units (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. In addition, OHCD requires the following additional affordability criteria under Chapter 11, HHC:

- A minimum of 4% of the total units must be affordable to households with incomes at or below 80% of the median income.
- A minimum of 8% or more of the total units must be affordable to households with incomes at or below 100% of the median income.
- A minimum of 12% or more of the total units must be affordable to households with incomes at or below 120% of the median income.
- A minimum of 20% or more of the total units must be affordable to households with incomes at or below 140% of the median income.

To develop Nakahili as a workforce family agricultural community, Work Force Developers proposes request exemptions from certain provisions of Hawai‘i Revised Statutes, the Hawai‘i County Code and County Charter, and County rules and regulations. Exemptions are needed to achieve and maintain Nakahili’s financial feasibility as a workforce family agricultural community. At this stage, Work Force Developers’ exemptions are conceptual but are expected to include exemptions to:

- The County of Hawai‘i General Plan Land Use Pattern Allocation Guide map
- The County of Hawai‘i South Kohala Community Development Plan
- The County of Hawai‘i Zoning Code
- The County of Hawai‘i Subdivision Code
- Other State and County statutes, ordinances codes, rules, and regulations, rules, and fees as may be determined

Although it is premature to identify specific exemptions that will be requested for Nakahili, it is expected that Work Force Developers will consult with applicable agencies and gather related information during the Environmental Assessment process. Section 5.3, Approvals and Permits, contains additional information regarding the scope of, and rational for, the exemptions that may be requested. After completion of the Environmental Assessment process, Work Force Developers will prepare a 201H Application that will include a list of requested exemptions and submit it to OHCD for review.

It is not expected that Nakahili, as a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, would be required to comply with Chapter 11, HHC, related to the development of affordable housing. Chapter 11, HCC is triggered upon certain types of rezoning and generally requires 20% of the total number of proposed units to qualify as affordable housing. Nakahili will not seek a formal rezoning. Moreover, Work Force Developers proposes to provide more than 50% of dwellings and lots at Nakahili at affordable prices, thereby far exceeding the affordability requirements under Chapter 11, HHC. Work Force Developers also expects to propose additional affordability provisions intended to further the County’s goal of providing affordable housing that would exceed the requirements of Chapter 11, HCC.

Agricultural Feasibility

Nakahili’s agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. The agricultural lots will provide ample space for small farms and diversified agriculture, including small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community.

Land Use Summary

2/5/2019

Land Uses	North Parcels TMKs (3)6-8-002:005,028,029,030 Approx. Acres	Dwelling Density	Dwelling Units	South Parcel TMK (3)6-8-002:006 Approx. Acres	Dwelling Density	Dwelling Units	Subtotal
Neighborhood Commercial							
Multi-family (Apartment) and Retail	10	30	300	0		0	300
Light Industrial/WWTP	5			0		0	
Subtotal :	**15**		**300**	**0**		**0**	**300**
Family Agricultural							
1+ acre Lot	463	0.76	350	445	0.80	355	705
2 to 4 acre Lot	252	0.34	86	123	0.34	42	128
5+ acre Lot	69	0.2	13	70	0.2	12	25
Subtotal :	**784**		**449**	**638**		**409**	**858**
Parks/ Open Space							
Regional Park	29			0			
Community Park	6			0			
Subtotal :	**35**		-	**0**		-	
Infrastructure							
Detention Basins*	(38)			(4)			
Water Tank Sites	10			0			
Roadway (ave. 50' ROW)	46			31			
Subtotal :	**56**		-	**31**		-	
TOTAL :	**890** (Acres)			**669** (Acres)		**1,559** (Acres)	

*NOTE: The areas of the proposed detention basins are assumed within the Family Agricultural approx. areas, and thus the areas of the retention basins on the north parcels and south parcel are not included in the Approx. Areas totals.

1,158 (Dwelling Units)

Figure 8

DRAFT 02/05/2019

Conceptual Master Plan

Nakahili

Brown Development

Island of Hawai'i

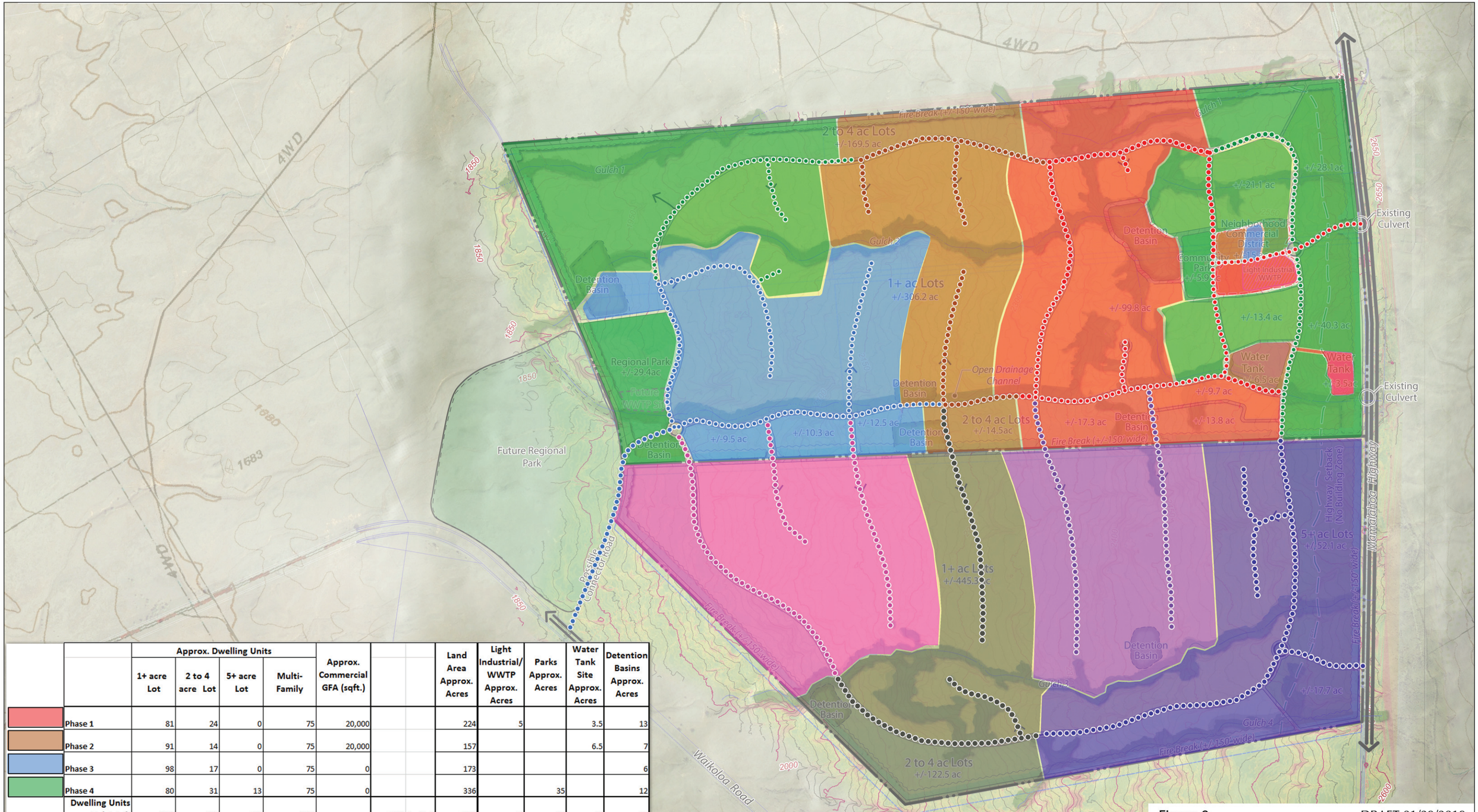
North

Linear Scale (feet) 0 500 1,000

PBR HAWAII & ASSOCIATES, INC.

WFD WORK FORCE DEVELOPMENT

Q:\Hawaii\Waikoloa Ranch (Greg Brown)\PSD\conceptual master plan 12_2018.psd



		Approx. Dwelling Units				Approx. Commercial GFA (sqft.)		Land Area Approx. Acres	Light Industrial/ WWTP Approx. Acres	Parks Approx. Acres	Water Tank Site Approx. Acres	Detention Basins Approx. Acres
		1+ acre Lot	2 to 4 acre Lot	5+ acre Lot	Multi-Family							
	Phase 1	81	24	0	75	20,000		224	5		3.5	13
	Phase 2	91	14	0	75	20,000		157			6.5	7
	Phase 3	98	17	0	75	0		173				6
	Phase 4	80	31	13	75	0		336		35		12
	Dwelling Units Subtotal:	**350**	**86**	**13**	**300**		**749 (units)**	**890**	5	35	10	38
	Phase 5	101	0	0	0	0		197				2
	Phase 6	66	12	12	0	0		139				
	Phase 7	87	13	0	0	0		154				2
	Phase 8	101	17	0	0	0		178				
	Dwelling Units Subtotal:	**355**	**42**	**12**	**0**	**0**	**409 (units)**	**669**				4
	TOTAL:	**705**	**128**	**25**	**300**		**1,158 (units)**	**1,559**	5	35	10	42

Figure 9 DRAFT 01/29/2019

Preliminary Phasing Plan
Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet) 0 500 1,000

PBR HAWAII & ASSOCIATES, INC.

WFD WORK FORCE DEVELOPERS www.WFDHawaii.com

Q:\Hawaii\Waikoloa Ranch (Greg Brown)\PSD\draft phasing plan.psd

As the State of Hawai‘i and County of Hawai‘i continue transitioning from large-scale monocrop planation agriculture and ranching operations, increasingly small-scale farms to enable self-sufficiency and promote sustainability may become the new norm for marginal agricultural lands. Compared to existing conditions, where limited cattle grazing is taking place on the Property, and given that it is likely that large-scale agricultural production or ranching operations may never be viable on the Property, Nakahili's lower intensity, small-scale family farms will increase agricultural use of the Property.

Small-scale family farms contribute toward the growing trend and popularity in which people choose to have a more active role in food production and the ability to know and control the quality of food they chose to consume. Developing local food systems have gained momentum as national and statewide trends toward sustainable food production have gained in popularity. Local food systems provide access to healthy choices in typically underserved communities and small-scale farms also contribute to reducing the environmental strain of conventional, energy-intensive food production. It is likely that such small-scale and self-sufficient agricultural uses will also be more diversified (and therefore more resilient). In addition to the production of self-sufficient and sustainable food crops, viable agricultural activities on Nakahili's agricultural lots may include growing herbs (for consumption, sale, medicinal purposes, and cultural practices) and small-scale raising of livestock, such as cows, chickens, goats, and horses.

The value of diversified agriculture has been increasing dramatically since the early 1970s and the diversified agriculture sector was worth over $420 million in 2017. Although a great many crops can be grown in Hawai‘i's year-round subtropical climate, only a few crops have proven profitable, and appropriate crops vary based on climatic and regional conditions.

The climate in the area of the Property is slightly cooler than the nearby coastal areas due to the higher elevation with moderately low rainfall and above average solar radiation. Therefore, feasible crop choices on Nakahili's agricultural lots should include drought-tolerant plants and those that do well in milder temperatures. Existing conditions could provide favorable agricultural use given: 1) the soils of the Property (the U.S. Department of Agriculture Natural Resource Conservation Services (NRCS) Soil Survey shows that 95 percent of the Property has well-drained soils (see Section 3.3 for more information on soils) and 2) the availability of water to the Property with the development of Nakahili.

Potential crops that could be grown in the Waikoloa area for both subsistence and small-scale commercial sales to local farmers markets include a variety of crops that would be appropriate and profitable for small agricultural lots. These include those that could be grown at cooler, moderately higher elevations and especially well-suited for drier climates such as: Chinese cabbage, green (head) cabbage, carrots, head lettuce, Romaine lettuce, radishes and Italian squash (zucchini). Crops that are especially well-suited for drier climates, similar to the Property, include: eggplant,

tomatoes, beans, kale, sweet potatoes, and persimmon. In addition, cultivation of high-value fresh herbs and medicinal plants may be particularly well-suited for Nakahili's agricultural lots and could include drought-resistant varieties that thrive in well-drained soil with full sun such as: aloe vera, basil, chives, fennel, ginger root, lavender, oregano, rosemary, sage and thyme.

Among the potential crops best suited for the climatic and regional conditions, Table 2-2 offers the most productive crop types based on yield per acre and value of sales, providing the most viable agricultural uses on small agricultural lots. Statistics are based on the most recent data available from the USDA National Agriculture Statistics Service and the State of Hawai'i Department of Agriculture. Potential value estimates for selected agricultural commodities are based on cultivation on a half-acre per lot.

Table 2-2. Potential Productive Crops

Commodity	Annual Yield per Acre (pounds)	Farm Price (cents per lb.)	Annual Value of Sales (per acre)
Cucumber	20,870	100.0	$20,870
Daikon Radish	9,533	118.2	$11,268
Eggplant	15,636	108.1	$16,903
Ginger Root	20,857	233.0	$48,597
Fresh Herbs (Total)	13,924	202.7	$28,223
Kale	7,222	224.6	$16,221
Persimmon	4,100	162.0	$6,642
Snap Beans	2,967	184.8	$5,483
Squash, Oriental	3,667	86.4	$3,168
Sweet Potatoes	17,138	50.6	$8,672
Tomatoes	36,960	46.4	$17,149

Source: Statistics of Hawai'i Agriculture 2019

Compared to limited agricultural use of the Property for cattle grazing, Nakahili's agricultural lots, are expected to make the Property productive with diversified crop cultivation and other agricultural uses that align with statewide and national trends toward subsistence farming.

Considering the scale of production on Nakahili's agricultural lots, potential commercial crop sales could be feasible by taking advantage of the abundant number of farmers markets across the County. Likely markets in the vicinity of Nakahili include: Waikoloa Village Farmers Market, Waimea Town Market, Farmers' Market at Hāmākua Harvest, Waimea Midweek Farmers Market, Hawaiian Homestead Farmers Market, Kamuela Farmers Market, Kings' Shops Farmers Market, Kona Sunset Farmers Market, Kona Village Farmers Market, Ho'oulu Farmers Market, Keauhou Farmers Market, South Kona Fruit Stand, and Pure Kona Green Market.

Nakahili's agricultural lots could have greater agricultural value when managed by multiple owners who are knowledgeable and capable of cultivating the land for agricultural pursuits. Most

notably, creation an association or cooperative among multiple lot owners could increase the profitably of agricultural production through shared knowledge and support. A collective effort by multiple owners could also increase the viability of selling produce at local farmers markets through a developed association of farmers. Under this type of structure, an association or cooperative for agricultural uses within Nakahili could facilitate a network of support for owners with multiple benefits to increase agricultural production and profitability.

2.4 SUSTAINABLE PLANNING DESIGN AND FEATURES

Sustainable planning design and features of Nakahili include:

- A small neighborhood commercial "village" area with stores and services (such as a neighborhood grocery store, shops, and restaurants) targeted to the community to provide frequently needed items and convenience, thus potentially reducing car trips outside of Nakahili for all needs.
- Affordable rentals specifically envisioned for those who work in the region and need an affordable place to live within a short drive from their workplaces (as compared to other areas of the island from which some people may commute), for example, employees of nearby resorts, thus potentially reducing long-distance commuting and energy consumption.
- Agricultural lots to enable self-sufficiency, promote sustainability, and encourage sustainable food production, thus:
    - Reducing the environmental strain of conventional, energy-intensive food production
    - Providing for more diversified (and therefore more resilient) agricultural uses
    - Providing the opportunity for people who choose to have a more active role in their food production with the ability to know and control the quality of food they chose to consume
- Mitigating risks posed by wild-land fires by designating a 150-foot wide firebreak around the Property perimeter and an additional 150-foot wide firebreak through the middle of the Property (see Figure 8)
- Providing roadways with wide gravel shoulders and drainage swales on both sides to minimize runoff from excessive impervious services and allow runoff to infiltrate into the ground
- Preserving the existing drainage patterns, by minimizing grading.
- Conserving water by including low-flow and water-efficient plumbing fixtures and devices pursuant to the Hawai‘i County Water Use and Development Plan reference to the Plumbing Code Regulation for new developments
- Reducing energy consumption by including solar water heater systems for all single-family farm dwellings sold by Work Force Developers, as required under Section 196-6.5, HRS; or alternatively including energy-efficient gas water heating systems, as may be permitted under the variance provisions of Section 196-6.5, HRS

Additional sustainable planning and design features that may be considered (as practicable and feasible) as more detailed design progresses include:

- Planting climate-adaptive native plants (and other species considered low-risk of becoming invasive) for roadway landscaping, parks, and other common areas
- Incorporating Low Impact Development (LID) drainage features such as vegetated buffers/filter strips, grass swales, and infiltration basins.
- Use of energy-saving technologies and features, such as:
    - ENERGY STAR qualified appliances in dwellings sold or rented by Work Force Developers
    - Maximum use of day lighting.
    - High efficiency lighting.
    - Roof and wall insulation, radiant barriers, and energy efficient windows
    - Installation of light-colored roofing.
    - Use of landscaping for shading of buildings.
    - Use of landscaping for dust control and to minimize heat gain.
    - Use of solar parking lot lighting.

2.5 PHASING, TIMING, AND COSTS

At this preliminary time, Work Force Developers anticipates developing Nakahili in approximately eight phases, as summarized below and shown on Figure 9, Preliminary Phasing Plan. The phases relate to the expected construction of dwellings, commercial spaces, light industrial uses, parks, and the provision of adequate infrastructure (including assumed and recommended regional and Nakahili-specific roadway improvements) to support each phase.

Phase 1:

- Approximately 224 acres
- Includes: approximately 75 multi-family rental apartments; approximately 105 single-family farm dwelling units; approximately 20,000 square feet of commercial space; 5 areas for light industrial uses and a small wastewater treatment plant to serve the Neighborhood Commercial "village" area; roadways; detention basin(s); well(s); and a water tank.

Phase 2:

- Approximately 157 acres
- Includes: approximately 75 multi-family rental apartments; approximately 105 single-family farm dwellings; approximately 20,000 square feet of commercial space; roadways; detention basins; well(s); and a water tank.

Phase 3:

- Approximately 173 acres
- Includes: approximately 75 multi-family rental apartments; approximately 115 single-family farm dwellings; roadways; and detention basins.

Phase 4:

- Approximately 336 acres
- Includes: approximately 75 multi-family rental apartments; approximately 124 single-family farm dwellings; an approximately 6-acre community green; an approximately 29-acre regional park; roadways; and detention basins.

Phases 1 to 4 above are assumed on the north Property parcels (TMKs (3) 6-8-002:005, 028, 029, 030) with a projected build-out by 2023.

Phase 5:

- Approximately 197 acres
- Includes: 101 single-family farm dwellings; roadways; and detention basins.

Phase 6:

- Approximately 139 acres
- Includes: 90 single-family farm dwellings; and roadways.

Phase 7:

- Approximately 154 acres
- Includes: 100 single-family farm dwellings; roadways; and a detention basin.

Phase 8:

- Approximately 178 acres
- Includes: 118 single-family farm dwellings; roadways; and a detention basin.

Phases 5 to 8 above are assumed on the south Property parcel (TMK (3) 6-8-002:006) with a projected build out of Phases 5 to 7 by 2028 and a projected build-out of Phase 8 by 2038.

Phases and timing of phases are preliminary and subject to timely approvals, market absorption, and other factors as may be determined or encountered.

Construction is expected to commence once approvals are obtained. Preliminarily, total order of magnitude costs are as follows:

- Infrastructure costs (total of all phases) are estimated to range from approximately $40 to $150 million.
- Dwelling, commercial, and light industrial construction costs (total of all phases) are estimated to range from approximately $8 to $60 million.

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3 DESCRIPTION OF THE NATURAL ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This section describes existing conditions of the natural environment, potential impacts of Nakahili, and mitigation measures to minimize impacts.

3.1 CLIMATE

The climate on Hawai‘i, as well as within the State of Hawai‘i, can be characterized as mild and subtropical, with relatively low day-to-day and month-to-month variability. Differences in the climates of various areas are generally attributable to the island's geologic formation and topography creating distinct ecosystems and microclimates ranging from tropical rain forests to dryer plains, along with corresponding differences in temperature, humidity, wind, and rainfall over short distances (Department of Geography, University of Hawai‘i at Hilo, 1998). According to the Köppen climate classification system, Hawai‘i features four out of five of the world's major climate zones, and eight out of thirteen of the sub-zones (Miller, 1978).

The entire State of Hawai‘i lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east of the islands. Areas along the eastern coasts of the islands are particularly affected by the trade winds and are usually well-ventilated nearly year-round. The dominant winds on Hawai‘i include trade winds, Kona winds, and winds associated with hurricanes and tropical storms. Northeast trade winds prevail most (70 percent) of the year and generally blow 10-20 mph (Fletcher III, Grossman, Richmond, & Gibbs, 2002).

The Kohala Mountains in North Hawai‘i greatly influence the physical environment of South Kohala. The gentle slope on the leeward side of the Kohala Mountains create the rolling hills and pasture land of upland Waimea, which are kept green by constant rains or mist carried over the mountains. As rainfall decreases makai of the mountains, the environment transitions to a distinctly different setting of dry grasslands mixed with black lava fields to create a desert-like setting (Hawai‘i County, 2008). Arid and dry conditions characterize the area surrounding Waikoloa Village, including the Property to the east, and the resort areas along the shoreline.

The area of the Property is one of the driest on Hawai‘i, with an average annual rainfall of about 18 to 20 inches (Giambelluca, et al., 2013). Temperatures in the vicinity of the Property range from a low of 66 degrees Fahrenheit during winter to a high of 82 degrees in the summer. The Property is exposed to prevailing trade winds from the northeast and Kona winds from the southwest.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No significant impact to regional climate conditions are anticipated. Modification of the Property's specific microclimate may occur from the planting of trees and other landscape elements. Construction of homes and buildings may somewhat channel air flows on a micro level.

3.2 GEOLOGY AND TOPOGRAPHY

Hawai‘i lies over or just north of the Hawaiian hot spot and is composed of five volcanoes and one active seamount: Kohala, Hualālai, Mauna Loa, Kīlauea, Mauna Kea, and Lō‘ihi located offshore. Of these, only Mauna Loa, Kīlauea, and Lō‘ihi are considered active, while Hualālai is dormant with its most recent eruption ending sometime between 1800 and1801. From the western banks of the shallow coastal lagoon at Kīholo Bay, the coast formed by Hualālai extends southwest, around the western tip of the island at Keāhole Point, and south beyond Kailua-Kona to Kuamo‘o Point. This shoreline is characterized by low rocky headlands fronted by fringing reef, small rocky remnants offshore, and tidepools and beaches (both black and white) along the shore (University of Hawai‘i at Mānoa, School of Ocean and Earth Science and Technology, 2013).

The terrain of the Property slopes steadily downward from southeast to northwest across at an average slope of approximately eight to 12 percent. Elevations across the Property range from 2,680 feet at the southeastern most corner to 1,880 feet at the most western side. Four gulches, all tributaries, traverse through the Property and drain to ‘Auwaiakeakua Gulch.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Creation of Nakahili will involve grading, including excavation and embankment for roadways, building pad areas, and drainage facilities. However adverse impacts to the overall topography of the Property from grading are not anticipated to be significant. Overall grading: 1) will maintain existing drainage patterns on the Property; 2) will be avoided within gulches; and 3) plans will be designed to balance excavation and embankment quantities to the extent practicable.

Due to the shallow depth to rock, grading will be minimized; however, grading will be necessary to provide consistent slopes for roadways and level pads for buildings and infrastructure facilities such as water tanks and drainage basins. Building pads will be created within the neighborhood commercial "village area" area; however, pads for the single-family farm dwellings will not be created as part of the initial site work. Grading will be phased, as appropriate, per development phase (see Section 2.5, Phasing, Timing, and Costs and Figure 9, Preliminary Phasing Plan).

Appropriate engineering, design, and construction measures will be undertaken to minimize potential erosion of soils during grading. All grading will be done in compliance with all applicable Federal, State, and County regulations and rules for erosion control, including Chapter 10 of the Hawai‘i County Code, relating to erosion and sedimentation control.

3.3 SOILS

Three soil suitability studies prepared for lands in the State of Hawai‘i describe the physical attributes of land and the relative productivity of different land types for agricultural production; these are: 1) the U.S. Department of Agriculture Natural Resource Conservation Services (NRCS) Soil Survey; 2) the University of Hawai‘i Land Study Bureau (LSB) Detailed Land Classification; and 3) the State Department of Agriculture’s Agricultural Lands of Importance to the State of Hawai‘i (ALISH) system. The three soil suitability studies as they relate to the Property are discussed below.

Natural Resource Conservation Service Soil Survey

NRCS Soil Survey for the Island of Hawai‘i classifies the soils of the Property as Waikaloa-Puu Pa complex 2 to 10 percent slopes, Waikaloa-Puu Pa complex 10 to 20 percent slopes, Waikaloa medial very fine sandy loam 2 to 10 percent slopes, Waikaloa medial very fine sandy loam 10 to 20 percent slopes, and Hāpuna-Waikui-Lālāmilo complex 0 to 20 percent slopes (see Figure 10).

Approximately 95 percent of the soils within the Property are Waikaloa-Puu Pa complex, which is comprised of two sub-soils, Waikaloa (70 percent) and Puu Pa (28 percent). Both sub-soils are formed in basic volcanic ash and are found on the mid-elevation leeward slopes of Mauna Kea. Waikaloa soils have moderate permeability and are considered well-drained soils with a range of low to high runoff. Puu Pa soils range from high permeability at the surface to low permeability at the underlying rock and are very well-drained soils.

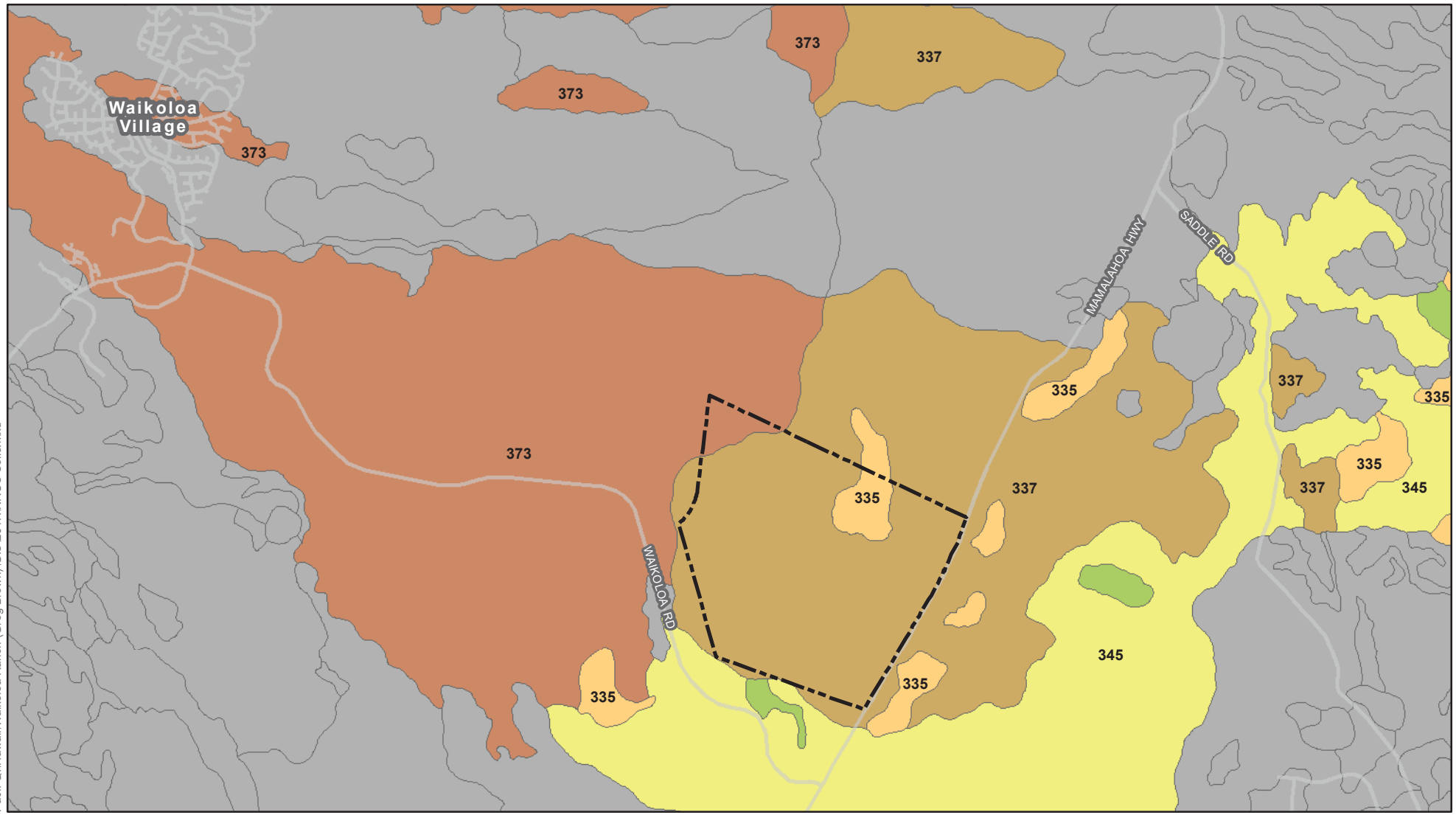
Hāpuna-Waikui-Lālāmilo complex soils make up approximately 4 percent of soils underlying the Property, located within the northwest corner. The remaining soils (approximately one percent) are comprised of Waikaloa medial very fine sandy loam, located along the southern boundary of the Property.

LSB Detailed Land Classification

The University of Hawai‘i LSB Detailed Land Classification, Island of Hawai‘i classifies soils based on a productivity rating. Letters indicate class of productivity, with “A” representing the highest class and “E” the lowest. The LSB classifies the soils of the Property soils as “D” (Poor) (Figure 11).

ALISH

The State Department of Agriculture’s ALISH system rates agricultural land as “Prime,” “Unique,” or “Other.” Land not rated under the ALISH system is not classified. Under the ALISH system the entire Property is classified as “Other” (see Figure 12).



Legend

- Nakahili Boundary
- 335: Waikaloa-Puu Pa complex, 10 to 20 percent slopes
- 337: Waikaloa-Puu Pa complex, 2 to 10 percent slopes
- 345: Waikaloa medial very fine sandy loam, 2 to 10 percent slopes
- 346: Waikaloa medial very fine sandy loam, 10 to 20 percent slopes
- 373: Hapuna-Waikui-Lalamilo complex, 0 to 20 percent slopes
- Others

Source: U.S. Department of Agriculture, Natural Resources Conservation Service, 2018.

Figure 10

NRCS Soil Classifications

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

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Legend

- Nakahili Boundary
- TMK Parcels

LSB Productivity Ratings

- A - Very Good
- B - Good
- C - Fair
- D - Poor
- E - Very Poor

Source: County of Hawai'i, 2018. Land Study Bureau's Detailed Agricultural Land Productivity Ratings, 1965.

Figure 11

Land Study Bureau (LSB) Productivity Ratings

Nakahili

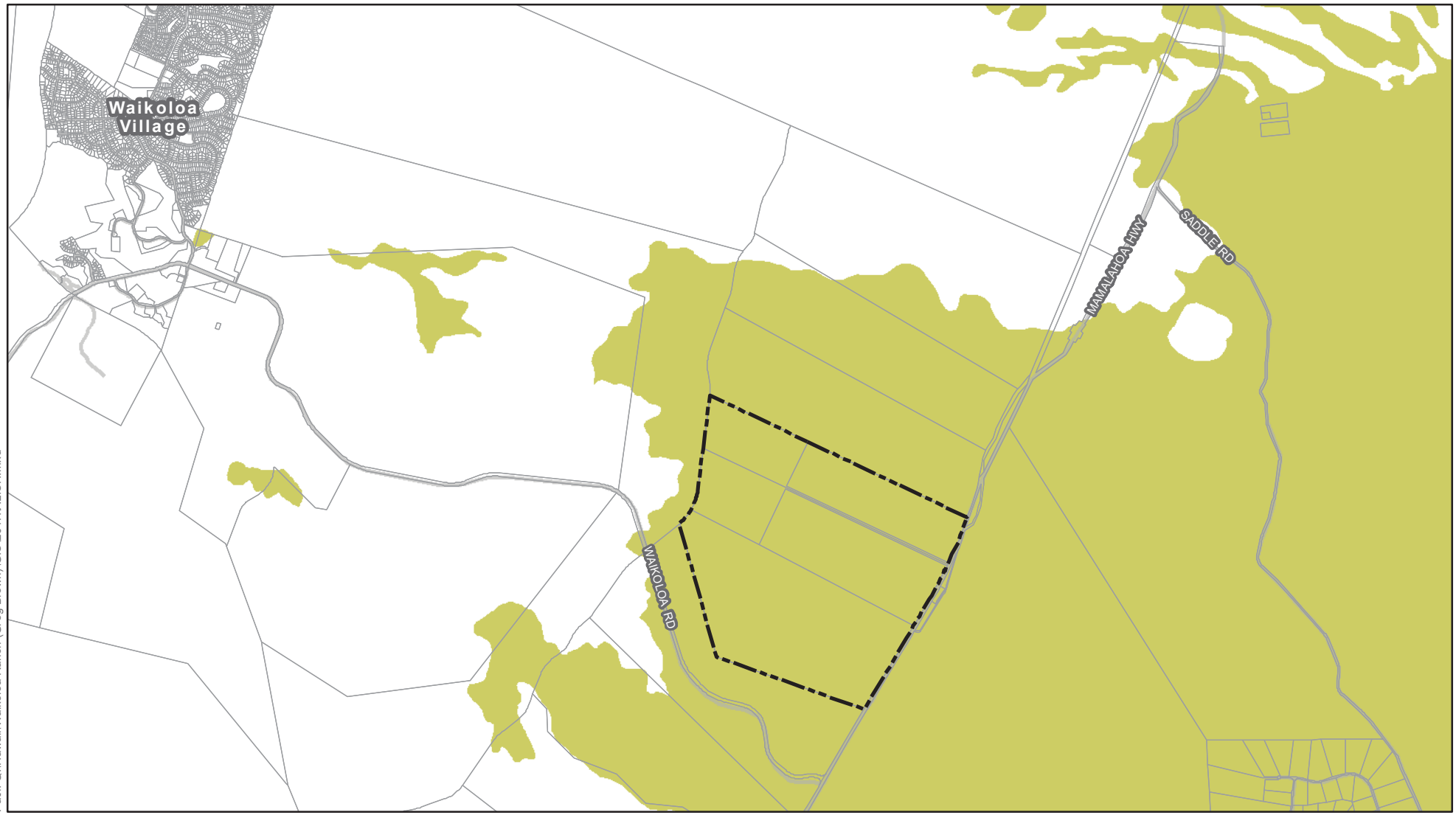
Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.



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Legend

Nakahili Boundary

TMK Parcels

ALISH Classification

Prime ALISH

Unique ALISH

Other ALISH

Source: County of Hawai'i, 2018. State Department of Agriculture, 1977.

Figure 12

Agricultural Lands of Importance to the State of Hawai'i (ALISH)

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.

According to the ALISH system, land classified as "Other" is land other than Prime or Unique that is of state-wide or local importance for the production of food, feed, fiber, and forage crops. The land is important to agriculture in Hawai‘i and yet it exhibits properties, such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, or droughtiness, that exclude the land from Prime or Unique agricultural land use classifications. Two examples are:1) lands which do not have an adequate moisture supply to be qualified as Prime; and 2) lands which have similar characteristics and properties as Unique, except that the land is not currently in use for the production of a "unique" crop. These Other lands can be farmed sufficiently by applying greater amounts of fertilizer and other soil amendments, drainage improvement, erosion control practices, and flood protection. Land classified as "Other" can produce fair to good crop yields when managed properly.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili is not anticipated result in long-term impacts to the Property soils and is expected to increase the agricultural productivity of the Property (see Section 2.3.3, Agricultural Feasibility).

The creation of Nakahili will require clearing, grubbing, and grading. Impacts to soils include the potential for soil erosion and the generation of dust during construction. To minimize potential impacts grading will be done in compliance with all applicable Federal, State, and County regulations and rules for erosion control, including Chapter 10 of the Hawai‘i County Code, relating to erosion and sedimentation control. In addition, a National Pollutant Discharge Elimination System (NPDES) permit will be required before grading areas greater than one acre. Further, in compliance with the Clean Water Act, a Section 401 Water Quality Certification from the State Department of Health, Clean Water Branch (CWB) will be obtained if it is determined that may grading and related activities may result in any discharge into navigable waters or as otherwise triggered.

During grading and all other construction activities, Best Management Practices (BMPs), which may include use of silt fences, sediment traps, and diversion swales, will be implemented to minimize erosion and the discharge of pollutants, associated with construction. After construction, landscaping will provide long-term erosion control.

Nakahili's agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that occurs on the Property. The agricultural lots will provide ample space for small farms and diversified agriculture, including small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community.

As the State of Hawai‘i and County of Hawai‘i continue transitioning from large-scale monocrop planation agriculture and ranching operations, increasingly small-scale farms to enable self-sufficiency and promote sustainability, may become the new norm for marginal agricultural lands. Compared to existing conditions, where limited cattle grazing is taking place on the Property, and

given that it is not likely that large-scale agricultural production or ranching operations may never be viable on the Property, Nakahili's lower intensity, small-scale family farms will increase agricultural use of the Property.

Small-scale family farms contribute toward the growing trend and popularity in which people choose to have a more active role in food production and the ability to know and control the quality of food they chose to consume. Developing local food systems have gained momentum as national and statewide trends toward sustainable food production have gained in popularity. Local food systems provide access to healthy choices in typically underserved communities and small-scale farms also contribute to reducing the environmental strain of conventional, energy-intensive food production. It is likely that such small-scale and self-sufficient agricultural uses will also be more diversified (and therefore more resilient). In addition to the production of self-sufficient and sustainable food crops, viable agricultural activities on Nakahili's agricultural lots may include growing herbs (for consumption, sale, medicinal purposes, and cultural practices) and small-scale raising of livestock, such as cows, chickens, goats, and horses. For more information on the agricultural feasibility of Nakahili see Section 2.3.3, Agricultural Feasibility.

3.4 HYDROLOGY

Surface Water

There are no perennial streams, ponds, or lakes, on or near the Property. Four gulches, all tributaries, traverse through the Property and form natural surface water drainage ways that drain to ʻAuwaiakeakua Gulch. The National Wetlands Inventory classifies two of these tributary gulches, located along the northern and southern boundaries of the Property (Figure 13), as "R4SBC," which signifies System Riverine (R), as a Subsystem Intermittent (4) Class Streambed (SB) Water Regime Seasonally Flooded (C) (USFWS, 2018). This classification indicates that these are intermittent riverine systems in which water only flows seasonally but are otherwise dry or may at times contain isolated pools. Recent, on-site inspection of these two of these tributary gulches during the course of a biological survey of the Property (see Section 3.6 and Appendix A) indicated that these are highly intermittent drainage ways that have no aquatic or distinctly riparian vegetation, although weedy vegetation is greener, and some non-native plants are more common, than elsewhere on the Property.

Ground Water

On Hawaiʻi, groundwater is the primary source of drinking water. In South Kohala, groundwater occurs as both basal groundwater and high-level (dike-impounded perched) groundwater. The Property is located within the West Mauna Kea Sector, Waimea Aquifer System (80301). Groundwater from this aquifer system is primarily pumped from the basal zone (where fresh groundwater is suspended over seawater). However, the aquifer also includes high-level (or "dike-impounded") groundwater, which is impounded between dense, almost impermeable rock, or dikes, and is typically of excellent quality due to its inland location that prevents salt water

intrusion. According to the Hawai‘i Water Plan Water Resource Protection Plan (WRPP) (CWRM, 2008), the aquifer sector has a sustainable yield of approximately 24 million gallons per day (mgd) and use of 9.173 mgd (as of 2005), or approximately 38 percent of the sustainable yield.

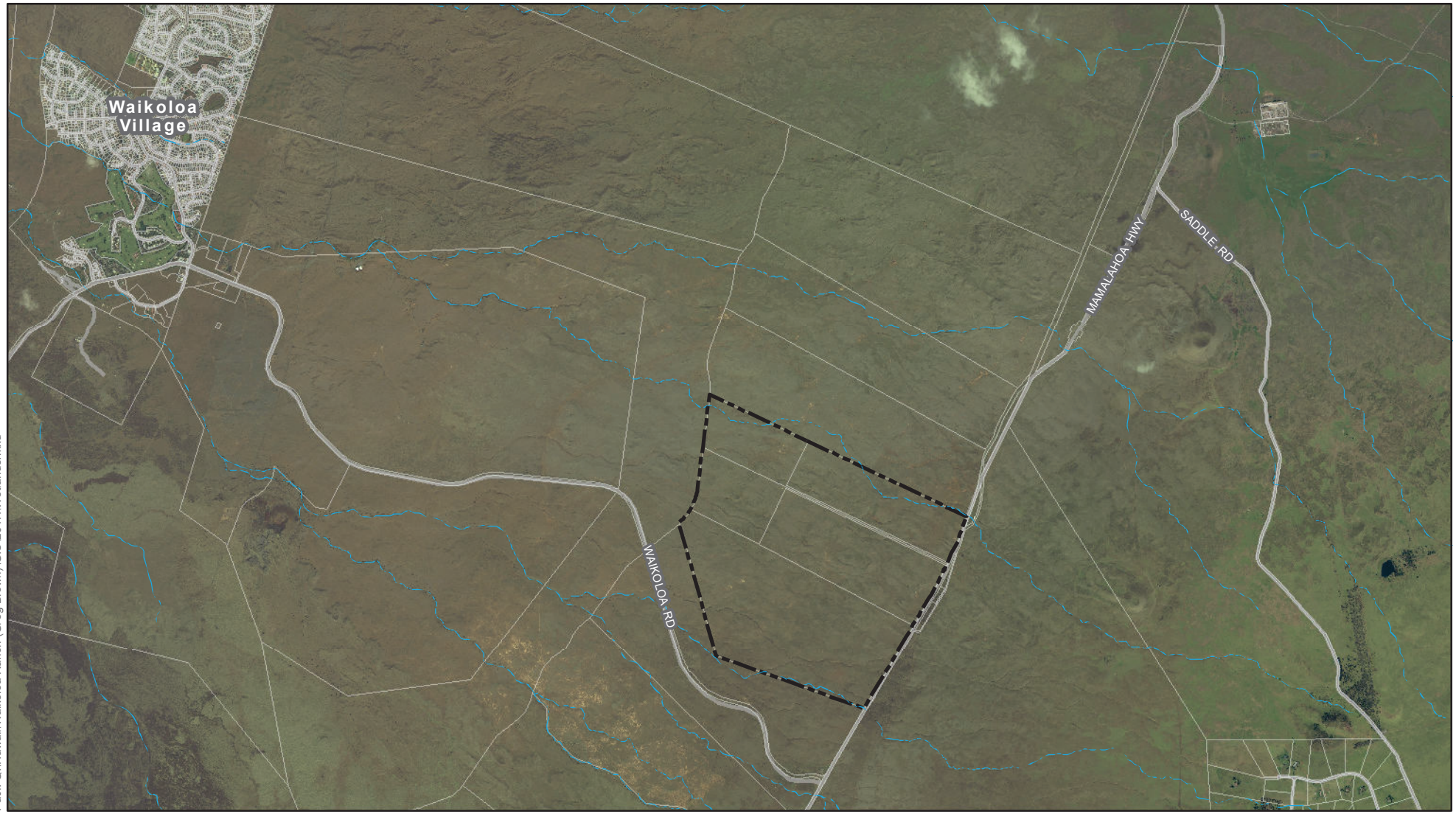
The State Department of Land Natural Resources (DLNR) is in the process of updating the WRPP and CRWM staff released the WRPP 2019 Update Public Review Draft in October 2018. The 2019 Update Public Review Draft estimates the sustainable yield of West Mauna Kea Sector, Waimea Aquifer System (80301) at approximately 16 mgd and quantifies that current use has reached 13.83 mgd, or approximately 86.4 percent of the sustainable yield.

Public hearings on the 2019 Update Public Review Draft are scheduled in February of 2019. Barring any significant and substantive revisions, DLNR staff plan to submit the WRPP 2019 Update to the CWRM for adoption in April or May of 2019. If significant and substantive revisions are required, CWRM staff will hold additional public hearings statewide. In that case, adoption of WRPP 2019 Update may occur in the fall of 2019. Should the final WRPP 2019 Update maintain the same sustainable yield estimates as in the 2019 Update Public Review Draft, the full build out of Nakahili may not be realized and alternative plans may be pursued.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili is not anticipated to negatively impact: 1) surface water drainageways through the Property, including the two intermittent riverine systems classified in the National Wetlands Inventory; and 2) groundwater resources.

Grading within gulches will be avoided and existing drainage patterns on the Property will be maintained. A NPDES permit will be required before grading of areas one acre or greater. The NPDES permit requires erosion control measures and covers storm water runoff discharges associated with construction activities, including clearing, grading, excavation and construction support activities (see HAR Chapter 11-55). In accordance with the Department of Health regulations and the requirements of the standard permit conditions, Work Force Developers or its contractors will design, install, and maintain erosion and sediment controls that minimize (i.e., reduce and/or eliminate to the extent achievable) the discharge of pollutants from earth-disturbing activities (see HAR Chapter 11-55). All storm water controls must be installed prior to earth-disturbance, and pollution prevention procedures must be identified and followed. Further, in compliance with the Clean Water Act, a Section 401 Water Quality Certification from the State Department of Health (DOH), Clean Water Branch (CWB) will be obtained if it is determined that may grading and related activities may result in any discharge into navigable waters or is otherwise triggered.



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Legend

Nakahili Boundary

Riverine Systems (as classified by the National Wetlands Inventory)

Figure 13

Riverine Systems

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI basemap, 2016. County of Hawai'i, 2018. U.S. Fish and Wildlife Service, 2017.

Water for Nakahili will be provided by ground water wells and infrastructure to be developed on-site by Work Force Developers. At full-build out, the daily water demand for Nakahili is expected to average 1.39 mgd (see Section 4.8.1 for more information on Nakahili's water system). The West Mauna Kea Sector, Waimea Aquifer System, with a sustainable yield of approximately 24 million gallons per day (mgd) and use of 9.173 mgd (as of 2005), has adequate capacity to accommodate this demand without impacting the aquifer's sustainable yield. However, due to the pending WRPP 2019 Update and proposed estimates regarding sustainable yield, Work Force Developers will monitor the update process.

Nakahili's wastewater systems will be in compliance with all DOH requirements as provided under HAR Title 11, Chapter 62, Wastewater Systems (Wastewater System Rules). The purpose of these rules is, in part, to ensure that the disposal of wastewater from wastewater systems does not: "…contaminate or pollute any drinking water or potential drinking water supply, or the waters of any beaches, shores, ponds, lakes, streams, groundwater, or shellfish growing waters…" (see Section 11-62-02, HAR). In addition, the Wastewater System Rules state, in part: "The department of health seeks to ensure that the use and disposal of wastewater and wastewater sludge does not contaminate or pollute any valuable water resource…" and "Individual wastewater systems may be utilized in remote areas and in areas of low population density." (see Section 11-62-01, HAR). See Section 4.8.2 for more information on Nakahili's wastewater systems.

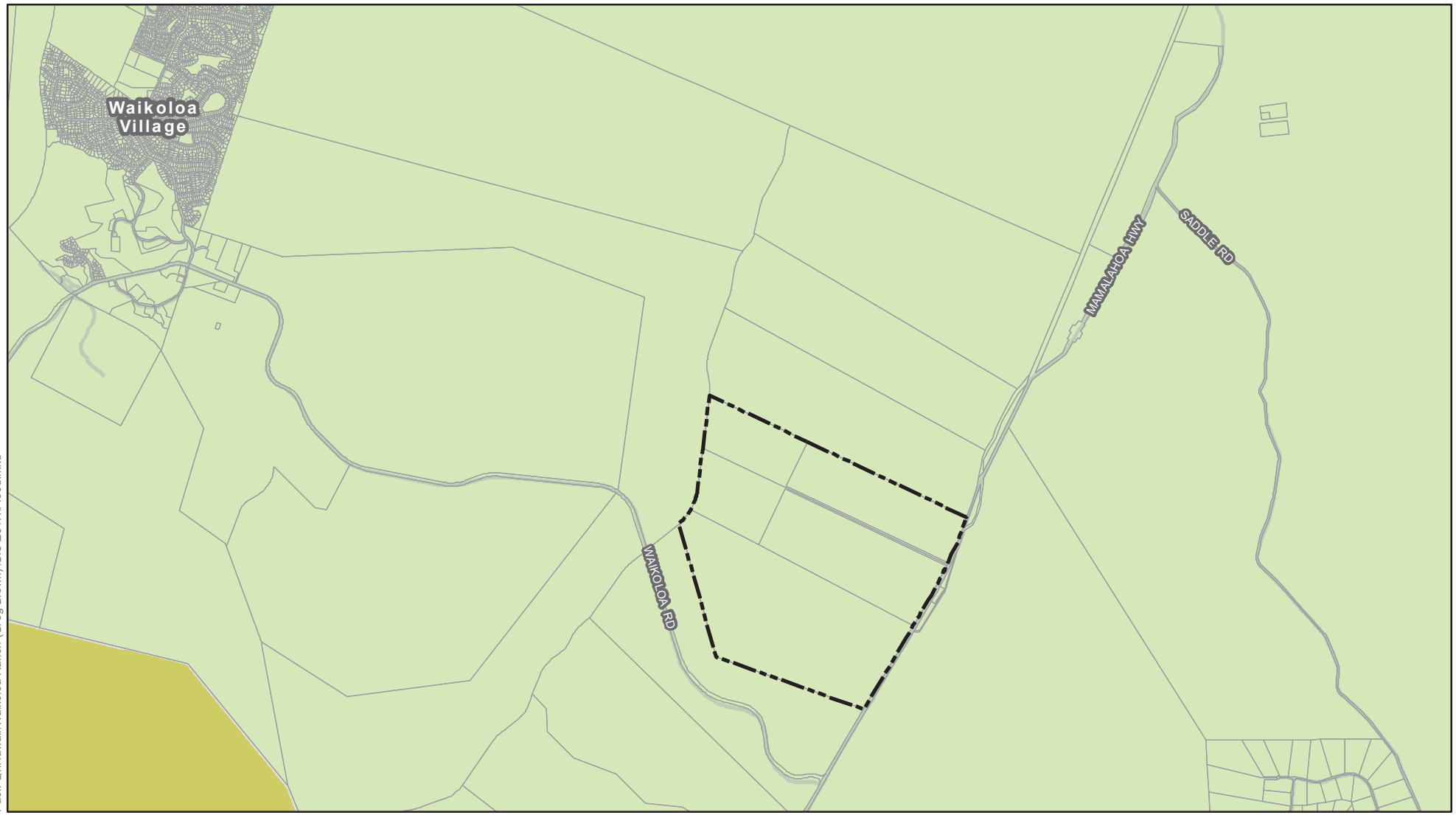
3.5 NATURAL HAZARDS

Hawai‘i is susceptible to potential natural hazards, such as flooding, tsunami inundation, hurricanes, earthquakes, lava flows, and wildfires. This section provides an analysis of the Property's vulnerability to such hazards.

The State of Hawai‘i Department of Defense (DOD), Hawai‘i Emergency Management Agency operates a system of civil defense sirens throughout the State to alert the public of emergencies and natural hazards, particularly tsunamis and hurricanes. The siren closest to the Property (Waikoloa Community Park siren HA408) is approximately 3.9 miles to the west. This siren is audible from an approximately 0.64-mile (or 3,400-foot) radius and, therefore is not audible from the Property. The emergency shelters nearest to the Property are Waikoloa Elementary School (approximately 4.3 miles west of the Property) and Waimea Elementary and Intermediate School (approximately 8.3 miles north of the Property).

Floods

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) for Hawai‘i County designates the Property as within Zone X, outside the 500-year floodplain (Figure 14). Four gulches, all tributaries, traverse through the Property and form natural surface water drainage ways that drain to ‘Auwaiakeakua Gulch. The amount of runoff that flows through the Property from offsite mauka areas is significant.



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Legend

- Nakahili Boundary
- TMK Parcels

Flood Zone

- X: Minimal flood areas
- D: Unstudied areas

Source: County of Hawai'i, 2018. Federal Emergency Management Agency, 2017.

Figure 14

FEMA Flood Zones

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.

Tsunamis

Since the early 1800's, approximately 50 tsunamis have inundated the State of Hawai'i's shores. Seven historical events have caused major damage. The Property is not located in a Tsunami Evacuation Zone and is well inland and uphill of areas which would be impacted by coastal flooding from a tsunami.

Hurricanes

Hurricanes are classified into one of five categories according to the Saffir-Simpson Hurricane Scale. This scale provides some indication of the potential damage and flooding a hurricane will cause upon landfall. Since 1980, two hurricanes have had a devastating effect on Hawai'i. They were Hurricane 'Iwa in 1982 (Category 1- sustained winds between 75–95 mph) and Hurricane 'Iniki in 1992 (Category 4- sustained winds between 131–155 mph). In both instances, damage was sustained primarily on Kaua'i and O'ahu. While it is difficult to predict such natural occurrences, it is reasonable to assume that future hurricanes are likely, given historical events.

The three major elements that make a hurricane hazardous are: 1) strong winds and gusts, 2) large waves and storm surge, and 3) heavy rainfall (Federal Emergency Management Agency, 1993). Of these three, only strong winds and heavy rainfall could affect Nakahili. The Property is not located along the shoreline and is at an elevation over 1,000 feet above mean sea level. As a result, this location makes impacts from large waves and storm surge highly improbable.

Earthquakes

In Hawai'i, most earthquakes are linked to volcanic activity, unlike other areas where a shift in tectonic plates is the cause of an earthquake. Each year, thousands of earthquakes occur in the islands, particularly on Hawai'i, the vast majority of which are detectable only with highly sensitive instruments. However, moderate and disastrous earthquakes have occurred in the islands in the past.

On Hawai'i, earthquakes may occur before or during a volcanic eruption, or may result from the underground movement of magma that comes close to the surface. The majority of the island's seismicity is related to the movement of magma within Kīlauea or Mauna Loa. A few of the island's earthquakes are less directly related to volcanism. These originate in the zones of structural weakness at the base of volcanoes or deep within the earth beneath the island due to the gravitational adjustment of the volcanic edifice.

Non-volcanic Hawaiian earthquakes reflect the long-term accumulation and release of lithospheric stresses, rather than short-term processes associated with the motion of magma before or during an eruption. The long-term stresses consist in part of stresses generated in the crust and mantle by the weight of the volcanic rock that composes the islands. In that sense, most Hawaiian earthquakes that are not directly associated with eruptions are nonetheless broadly related to volcanic activity.

The seismic risk classification of Hawai‘i is Zone 4 Seismic Probability Rating, which indicates a 10 percent chance of severe shaking in a 50-year interval. Seismic tremors on the island have caused ground cracks, landslides, ground settlement, damaging tsunami, and mudflows. Buildings, bridges, and water tanks have been destroyed or damaged, and utility, sewer, and water lines have been disrupted (Fletcher III, Grossman, Richmond, & Gibbs, 2002). New construction could be impacted by seismic activity resulting in destruction and possible injury or loss of life.

The seismic hazard is highest along the southeast coast of Hawai‘i, followed by the Kona coast. The largest earthquake in the State (magnitude 7.9) occurred on the southeast coast of Hawai‘i in 1868 and triggered a tsunami along the Ka‘ū-Puna coast that drowned 46 people and spawned numerous landslides that resulted in 31 deaths. Damaging earthquakes of magnitude 6 or greater on Hawai‘i since 1868 have generally occurred on the southern half of the island, primarily on the eastern end. A magnitude 6.9 tremor on August 21, 1951, damaged homes on the Kona coast and triggered numerous damaging landslides. In 2006, a magnitude 6.7 earthquake occurred about one mile off the west coast of Hawai‘i (approximately 13 miles south west of the Property), causing damage to the Mauna Kea Resort, makai of the Property. The largest earthquake in recent history (magnitude 6.9) occurred over 80 miles from the Property, near Kalapana, on May 4, 2018, related to volcanic activity of Kīlauea.

Volcanic Hazards

Hawaiian volcanoes erupt either at their summits where lava collects and may overflow from craters called calderas, or along their flanks where lava issues through fractures called rift zones. The volcanic hazard is associated with lava flows, explosive eruptions, airborne lava fragments, poisonous and corrosive volcanic gases, and ground cracks and settling. Airborne ash, cinders, and other lava fragments are usually only hazardous in the immediate vicinity of an eruption (Fletcher III, Grossman, Richmond, & Gibbs, 2002).

The U.S. Geological Survey lava-flow hazard zones map for Hawaii divides the island into zones ranked from 1 through 9 based on the probability of coverage by lava flows, with Zone 1 having the most repeatedly active vents in historic time, and Zone 9 being least active. Lava-flow risks are defined according to geology, seismic and volcanic activity history, and recent scientific predictions. Lava-Flow Hazard Zones are based mainly on the location and frequency of both historic and prehistoric eruptions. Lava-Flow Hazard Zones also consider larger topographic features of the volcanoes that affect the distribution of lava flows.

The most recent, significant lava flow occurred in 2018 in Puna, on the east side of the Big Island just south of Hilo, from a rift zone eruption of Kīlauea, one of the world’s most active volcanoes (USGS, 2018). Puna is located within Lava-Flow Hazard Zones 1 and 2, where eruptive activity along the Kīlauea east rift zone has been continuous since 1983, approximately 60 miles to the south east of the Property. The 2018 lava flows destroyed hundreds of homes and caused thousands of people to evacuate from the Leilani Estates, Kapoho, and Vacationland areas, in addition to

releasing toxic gases and producing dangerous explosions from lava contacting the ocean. Although the lava flows and associated hazards from this eruption significantly diminished toward the end of 2018, hazards are still present as a result of the volcanic activity and the Hawai‘i County Civil Defense and the National Parks Service recommend that residents living near recently active rift zones and lava flows stay informed in the event that another evacuation is necessary (National Parks Service, 2018).

The Property is within Lava-Flow Hazard Zone 8 (Figure 15), where only a small percentage of the area has been covered with lava in the past 10,000 years.

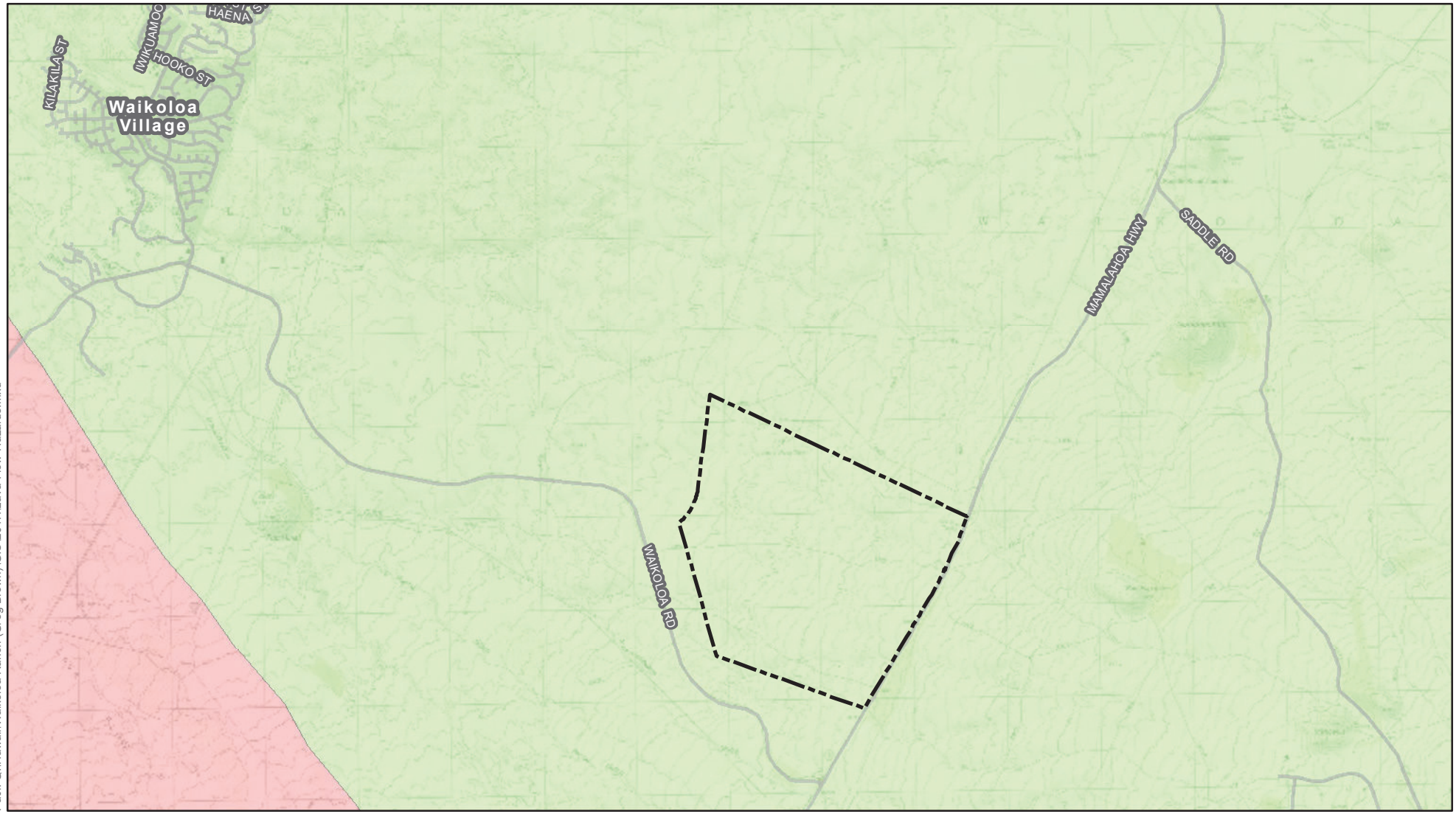
Property loss and economic devastation are the most frequent consequences of lava-flows. Based on the low probability of lava flows in Zone 8, there is a low concern for developing structures in the Property area.

Wild-land Fires

The greatest danger of fire is where wild-land (trees and brush) borders urban areas. Although all the Hawaiian Islands are vulnerable to wild-land fires (especially during the summer months, prolonged drought and/or high winds), the great majority of wildfires are human-caused (intentionally caused or by negligence) and start along roadsides. The numbers of such fires are increasing. Wildfires can and do also occur naturally.

In the history of wildfires in the State of Hawai‘i, the Waikoloa area had two of the largest fires ever, beginning on: 1) August 1, 2005, when 25,000 acres burned; and 2) August 1, 2018, when 18,000 acres burned. Fortunately, there was no loss of life or structures during either fire. Charred branches and trunks of numerous trees within the Property indicate that the Property has experienced periodic wildfires.

The Hawai‘i County Fire Prevention Bureau works to prevent fires before they can cause injuries and property damage. In addition, the DLNR, Division of Forestry and Wildlife has authority under Chapter 185, HRS, Land Fire Protection Law, for the prevention, pre-suppression, and suppression of wildfires for forest reserves. It also has the authority to cooperate with established fire control agencies for the protection of lands not within the DNLR’s protection areas. Further, the Hawai‘i Wildfire Management Organization is a nonprofit organization dedicated to outreach, education and technical assistance, project implementation, and research focused on proactive and collaborative wildfire prevention, mitigation and post-fire recovery in Hawai‘i and the Pacific.



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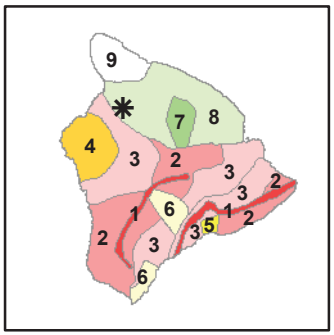
Legend

Nakahili Boundary

Lava-Flow Hazard Zones

Zone 3 - Areas less hazardous than zone 2 because of greater distance from recently active vents and (or) because of topography. One to five percent of zone 3 has been covered since 1800, and 15 to 75 percent has been covered within the past 750 years.

Zone 8 - Remaining part of Mauna Kea. Only a few percent of this area has been covered by lava in the past 10,000 years.



Source: County of Hawai'i, 2018. U.S. Department of the Interior, U.S. Geological Survey (USGS), 1992. ESRI USGS basemap, 2013.

Figure 15

U.S. Geological Survey Lava-Flow Hazard Zones

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.

Climate Change and Sea Level Rise

Sea level rise is one of many growing concerns associated with global climate change and can be especially taxing on the limited resources of island ecosystems. Coastal areas are extremely vulnerable to sea level rise, which poses a threat to the long-term safety and operation of drinking water, wastewater, and storm water infrastructure for cities and communities located in coastal regions. In addition, changing climate patterns, extreme weather events, and sea level rise can affect the climate patterns, magnitude of wind, flood, and rain impacts, and storm surges in coastal regions (EPA, 2016). The greatest immediate threats to the Property include potential increases in extreme weather events including rain and resulting flash-flooding, as well as longer periods of drought, increasing likelihood of wild-land fires.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili is not anticipated to increase the Property's exposure to any natural hazard. Mitigation of hazards associated with earthquakes and hurricanes include adherence to Hawai‘i County building codes and standards to minimize potential damage to structures. All homes and structures will be designed and constructed in compliance with applicable building codes and standards.

The Property is outside of the Tsunami Evacuation Zone at an elevation that is very unlikely to be impacted by a tsunami. The Property is not susceptible flooding as indicated by the FIRM.

To mitigate risks posed by wild-land fires the Nakahili plan designates a 150-foot wide firebreak around the Property perimeter and an additional 150-foot wide firebreak through the middle of the Property (see Figure 8).

Since the closest DOD Hawai‘i Emergency Management Agency siren in the region (Waikoloa Community Park siren HA408) is not auditable from the Property, should the DOD Hawai‘i Emergency Management Agency desire to install a siren on the Nakahili Property, Work Force Developers will work with the DOD Emergency Management Agency to determine a suitable location and provide access easements.

3.6 BIOLOGICAL RESOURCES

Geometrician Associates, LLC conducted a biological survey of the Property in June of 2018. The biological survey included surveys of botanical and wildlife resources. The results of the botanical and wildlife surveys are summarized below. Appendix A contains the complete biological survey report, including photos of the vegetation.

Botanical Resources

No listed, proposed threatened, or endangered plant species were detected during the survey. In addition, the U.S. Fish and Wildlife Service (USFWS), has not designated critical habitat for endangered plant species on or near the Property (see Figure 16).

The geologic substrate in the surveyed areas is Pleistocene-era lavas from Mauna Kea (Wolfe and Morris 1996). The area is one of the driest on Hawai‘i, with an average annual rainfall of about 18 to 20 inches (Giambelluca, et al., 2013). The introduction of certain grasses, grazing animals, and fire have changed the soil and microclimate of the area significantly from pre-human period.

The vegetation of the Property and the surrounding area is a grassland/shrubland comprised primarily of the alien fountain grass (*Cenchrus setaceus*) and the native ‘a‘ali‘i (*Dodonaea viscosa*). Over most of the Property, these two plants are estimated to account for more than 90 percent of biomass. Scattered individuals of eucalyptus (*Eucalyptus spp*.) are present in certain locations, especially on the mauka third of the Property. Nearly all of the eucalyptus trees appear to have been intentionally planted as groves and windrows, with very little natural recruitment. Two other natives, ‘ākia (*Wikstroemia pulcherrima*) and ‘uhaloa (*Waltheria indica*), are locally abundant, especially on rocky outcrops and hardpan surfaces.

The grassland/shrubland has numerous other minor constituent species, primarily alien grasses and herbs, that vary in abundance from place to place. The low diversity was created and is maintained by the combination of low average annual rainfall, periodic severe droughts, overgrazing by cattle and feral goats, and fire.

Along Māmalahoa Highway the extra water supplied by road runoff encourages weed diversity and shrubs that are otherwise uncommon on the Property, including koa haole (*Leucaena leucocephala*).

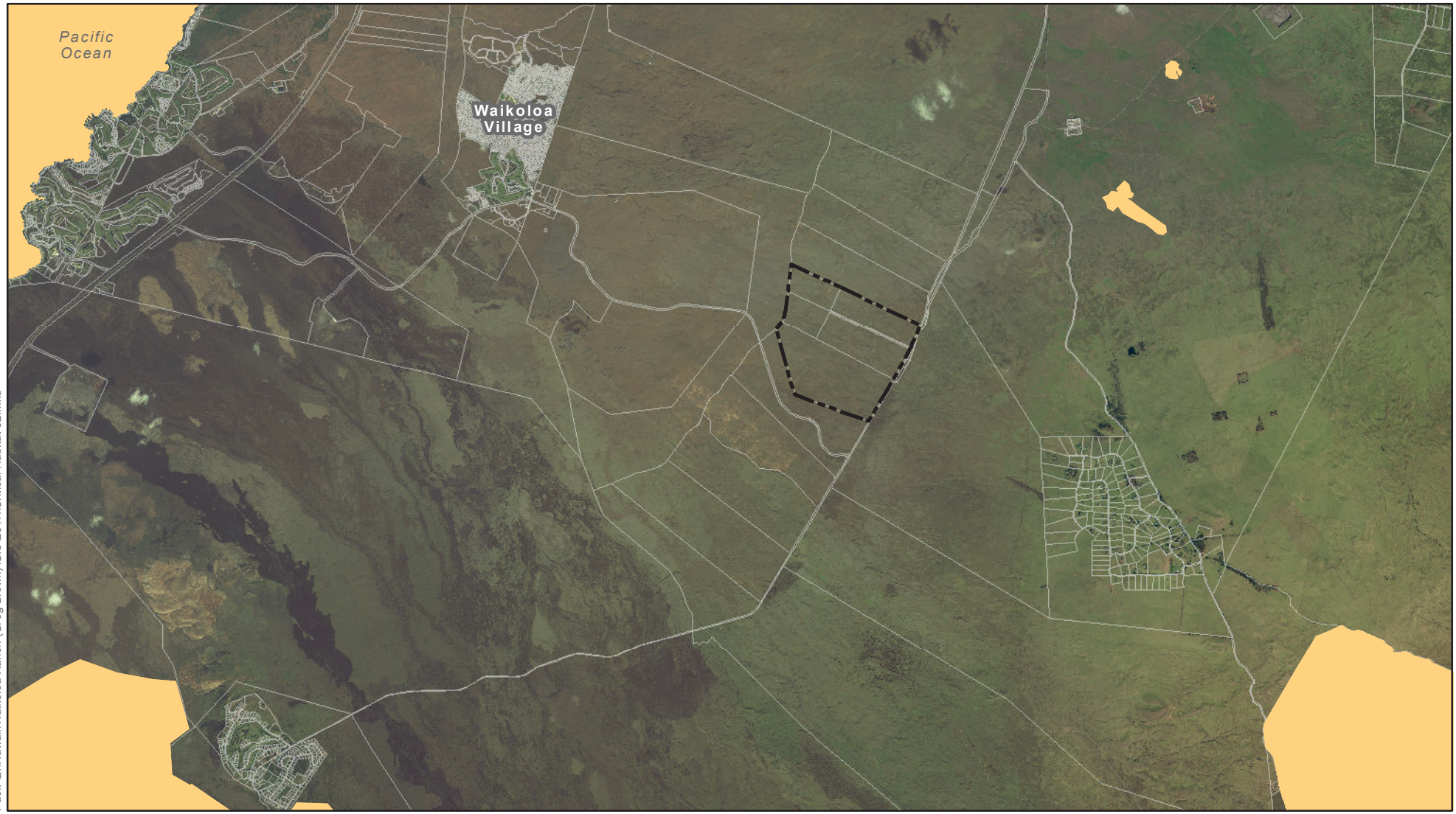
Only eight of the more than four dozen plant species found on the Property are natives, seven of which are indigenous (found in Hawai‘i as well as elsewhere) and one endemic (found in Hawai‘i and nowhere else). All are very common in various locations on the leeward side of Hawai‘i. Aside from ‘a‘ali‘i, which is abundant on the Property, and ‘ākia, which is sparingly present, the other natives are generally not common on the Property. Appendix B contains a full list of plant species identified during the botanical survey.

Wildlife Resources

No listed, proposed threatened, or endangered wildlife species were detected resting, foraging, or nesting on the Property. In addition, the USFWS, has not designated critical habitat for wildlife species on or near the Property (see Figure 16).

Mammal Species

No mammal species, aside from domestic cattle (*Bos taurus*) and feral goats (*Capra h. hircus*), were detected during the course of the survey. It is likely that feral cats (*Felis catus*), small Indian mongooses (*Herpestes a.auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.), domestic dogs, (*Canis f. familiaris*) and perhaps wild donkeys (*Equus a. asinus*) are or have been occasionally present on the Property. None of these alien mammals have conservation value and all pose threats to native flora and fauna.



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Legend

Nakahili Boundary

Critical Habitat

Figure 16

Critical Habitat

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (miles)

0 0.5 1 2

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI basemap, 2016. County of Hawai'i, 2018. U.S. Fish and Wildlife Service, 2018.

Although not detected as part of the survey, which took place in daylight, the only native Hawaiian land mammal that may be present in the general area is the Hawaiian hoary bat (*Lasiurus cinereus semotus*), as it is present in many areas on Hawai‘i and has been observed in eucalyptus trees. Bats may forage for flying insects over portions of the Property on a seasonal basis, though the xeric nature of the habitat and the lack of dense vegetation provides little in the way of attractive food resources for a bat. Hawaiian hoary bats are vulnerable to disturbance during the summer pupping season.

Bird Species

Bird species detected during the survey are typical of those found in similar lowland highly disturbed habitat and include the Common Myna (*Acridotheres tristis*), the House Finch (*Carpodacus mexicanus*), the Black Francolin (*Francolinus francolinus*), the Zebra Dove (*Geopelia striata*), and the Warbling Silverbill (*Lonchura malabarica*).

No native land birds were detected during the survey and it would be unlikely to find any except *Asio flammeus sandwichensis*, the Hawaiian endemic sub-species of the short-eared owl. Also called pueo, this diurnal bird of prey is regularly seen within the grasslands of North and South Kohala but was not noticed during the survey. This species is currently widespread in Kohala and does not have special protective status under either the State or federal endangered species statutes.

The endangered Hawaiian hawk (*Buteo solitarius*) is a wide-ranging raptor that nests in large trees and forages in forests, farms and even residential neighborhoods. It is seen throughout forested areas of the island. It is vulnerable to disturbance during the nesting season from March through September, however, hawk sightings have not been documented in the vicinity of the Property, and in particular, no hawk nests, in this area of South Kohala dominated by grasslands. The context of the Property coupled with the lack of truly suitable trees indicates that the likelihood of hawks nesting on the Property is exceedingly small.

The Hawaiian petrel (*Pterodroma sandwichensis*), the Hawaiian sub-species of Newell’s shearwater (*Puffinus auricularis newelli*), and the band-rumped storm-petrel (*Oceanodroma castro*) have been recorded over-flying various areas of Hawai‘i between late April and the middle of December each year. The Hawaiian petrel and the band-rumped storm petrel are known to nest at elevations well above 5,000 feet on Hawai‘i, which is well above the elevation of the Property. Although once abundant on all the main Hawaiian islands, most Newell’s shearwater birds today are found on Kaua‘i.

Invertebrate Species

The only endangered invertebrate that has some potential to be present on the Property is Blackburn’s sphinx moth (*Manduca blackburnii*). It is found at various locations throughout West Hawai‘i including Māmalahoa Highway frontage just south of the Daniel K. Inouye Highway. The adult moth feeds on nectar from native plants including beach morning glory (*Ipomoea pes-caprae*), ‘ilie‘e (*Plumbago zeylanica*), and maiapilo (*Capparis sandwichiana*), none of which are

present or likely to be present on the Property. However, moth larvae that naturally feed upon the native ʻaiea (*Nothocestrum* spp.) have adapted to feeding on non-native tree tobacco (*Nicotiana glauca*), which occupies disturbed areas such as open fields and roadway margins. No ʻaiea or tree tobacco are present on the Property and there is no ʻaiea nearby, but tree tobacco is common in Waikoloa Village, on Māmalahoa Highway, and in many other areas. Tree tobacco can be particularly abundant in very dry areas on ʻaʻā flows that have been disturbed by bulldozing.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The biological survey concludes that clearing portions of the Property for the creation of Nakahili will not adversely affect native vegetation or sensitive flora or fauna, as the Property is dominated by non-native species and no rare, threatened or endangered species are present. To minimize potential impacts to species that may be present in the area, or may seasonally forage or fly over the Property, the biological survey provides the recommendations below.

To minimize potential impacts to the endangered Hawaiian hoary bat, woody plants taller than 15 feet should not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Relatively few such trees are present, most in planted groves or directly along with highway.

To avoid potential impacts to listed seabirds, no construction or unshielded equipment maintenance lighting should be permitted after dark between the months of April and October. All permanent lighting will be shielded in conformance with HCC Chapter 9, Article 14, which requires shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting.

To avoid attracting the Blackburn's sphinx moth to the Property, during construction graded areas should be monitored for the growth of tree tobacco. If tree tobacco sprouts, it should be removed before it reaches a height of one meter and offers a suitable a habitat for Blackburn's sphinx moth larva.

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4 DESCRIPTION OF THE HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This section describes the existing conditions of the human environment, potential impacts of the Nakahili, and preliminary mitigation measures to minimize any impacts.

4.1 ARCHAEOLOGICAL AND HISTORIC RESOURCES

ASM Affiliates (ASM) conducted an Archaeological Inventory Survey (AIS) of the Property. The survey was conducted in support of this EA and expected permitting applications in anticipation of the Department of Land and Natural Resources-State Historic Preservation Division's (DLNR-SHPD) HRS Chapter 6E review of Nakahili. The AIS report contains: 1) background information describing the location and environment of Property; 2) a summary of previous archaeological work conducted in the vicinity of the Property; 3) a detailed presentation of a culture-historical context of the Property region; 4) an explanation of the survey methods; 5) detailed descriptions of all of the identified archaeological sites; 6) interpretation and evaluation of the significance if the identified sites; and 7) treatment recommendations for all of the identified sites. The results of the survey are summarized below. Appendix B contains the complete AIS report.

Background

The Property is situated mauka of the northwestern coast of Hawai‘i Island, within the District of South Kohala, in what is today referred to as the ahupua‘a of Waikoloa. Archaeological studies in Waikoloa and the neighboring ahupua‘a of Lālālmilo have largely concentrated on the coastal areas in the vicinity of the large resort developments makai of Queen Ka‘ahumanu Highway. Collectively, the archaeological investigations conducted in the coastal areas have identified a wide range of Precontact and Historic archaeological site types including caves (lava tubes), petroglyphs, cairns, trails, rock and cave shelters, refuge caves, burials, a hōlua slide, and a large number of features associated with both temporary and permanent habitation.

Fewer studies have been conducted mauka of Queen Ka‘ahumanu Highway in the arid, intermediate inland area in which the Property is situated. The studies near the highway that have been conducted and near present-day Waikoloa Village have generally included large land areas but have documented none or few archaeological sites. The most common feature types recorded mauka of the highway have been C-shaped shelters and cairns, along with Historic military and ranching features. The findings of the previous studies agree that the dry, intermediate inland areas of Waikoloa Ahupua‘a were not extensively utilized during Precontact times, but were an area where small scale resource procurement was conducted on a limited basis.

No previous archeological surveys of the Property are known to have been conducted.

AIS Findings

Fieldwork for the AIS was conducted between June and July of 2018. As a result of the fieldwork, seven sites (one Precontact and six Historic) were identified and recorded within the Property. The identified sites are described below.

Site 30919 is a C-shape enclosure dating to the Precontact Period, interpreted as a windbreak shelter based upon formal characteristics, construction method, and location. This site is constructed of small to large dry-stacked, subangular pāhoehoe cobbles. The northern interior and exterior wall retain some stacking and overall the site is in relatively good condition, however the interior portion of the site and exterior eastern wall are somewhat collapsed. No cultural material was observed.

Site 30920 is a modified outcrop likely dating to the late nineteenth/early twentieth century that appears to have been an informal hunting blind used during historic times, based upon its location, construction, and evidence of past activity. It is constructed of 10 medium to large subangular pāhoehoe cobbles placed atop an exposed bedrock outcrop. Aquamarine glass bottle fragments were identified near the site and are likely parts of an early nineteenth-century broken bottle used for an alcoholic beverage.

Site 30921 is a rectangular enclosure assumed to be Historic in age that likely functioned as a hunting blind during historic or modern times based upon its construction method and optimal location overlooking a drainage channel and level grasslands downslope. It is constructed of 10 medium to large sized subangular pāhoehoe cobbles. No cultural material was observed.

Site 30922 is a linear wall, likely Historic in age. Its function is indeterminable, but it possibly functioned as a hunting blind as it is situated at the top of ridgeline which affords excellent views in all directions. It is constructed of medium to large subangular pāhoehoe cobbles and measures approximately 18.7 meters in length, averages 0.7 meters in width, and ranges in height between 0.2 to 0.6 meters. No cultural material was observed.

Site 30923 is a concrete water tank foundation and associated concrete trough dating to the early to mid-twentieth century. The foundation is constructed from six laterally-spaced segmented precast concrete beams. The trough is rectangular concrete structure located on a level area below the water tank foundation. A 1954 aerial photograph and the 1956 USGS quadrangle map indicates a water tank on the foundation and depict the trough.

Site 30924 is a modified depression dating to the early part of the twentieth century and is likely related to the former or current alignment of the Kona-Waimea Belt Road. While the precise function of Site 30924 is indeterminate, there are two possibilities for its existence, the first being

that the depression is the result of rock blasting and subsequent quarrying activities conducted to supply construction material for either the former or current roadway. The second possibility is that the alignment for the Kona-Waimea Belt Road was originally slated to extend farther to the south than where it currently is located, and that Site 30924 represents a remnant of an alignment which was never further developed or utilized.

Site 30925 is a modified outcrop likely dating to the late nineteenth/early twentieth century and is interpreted as a Historic windbreak shelter based upon informal construction, location, and evidence of past activity. It is crudely constructed of medium to large subangular cobbles forming a rough U-shaped enclosure with the northern exterior portion being highly collapsed. Two fragments of Historic glass from a Coca-Cola® bottle were identified near the site.

In addition to the identified sites, the AIS report notes that no evidence of Precontact mauka-makai trail systems or later Historic trails were identified within the Property during the fieldwork, although both Precontact coastal and inland and Historic Period trail networks have been documented throughout the South Kohala District.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The AIS assessed the identified archaeological sites for their significance based on criteria established in Section 13-284-6, HAR. Based on these criteria, the AIS recommends:

- No further work for the six sites related to Historic (nineteenth/early twentieth or mid-twentieth century) hunting and ranching practices (Sites 30920, 30921, 30922, 30923, 30924, and 30925) as:
    - The research conducted during the AIS is sufficient to exhaust the information potential of these sites; and
    - The documentation of these sites in the AIS has mitigated any potential future adverse effects to these sites; and
- A data recovery plan be prepared for site 30919 (the C-shape enclosure dating to the Precontact Period) in accordance with Section 13-278, HAR, as recovery of additional information from this site could potentially augment understanding of the site's age and function, as well as add to the body of knowledge about traditional land use in this portion Waikoloa Ahupua'a

In light of the AIS conclusions and recommendations the AIS "determination of effect" of Nakahili is "affect with agreed upon mitigation."

Work Force Development, LLC and its contractors will comply with all State and County laws and rules regarding the preservation of archaeological and historic sites. The permits and construction documents will include provisions that, in the event that historic resources, including human skeletal remains, cultural layers, cultural deposits, features, artifacts, sinkholes, lava tubes or lava blisters/bubbles are identified during grading and grubbing activities, work will cease

immediately and the State Historic Preservation Division will be contacted to assess the significance of the find and recommend appropriate mitigation measures, as necessary.

4.2 CULTURAL RESOURCES

ASM Affiliates (ASM) conducted a Cultural Impact Assessment (CIA) to identify traditional customary practices associated with the Property. The cultural impact assessment includes a description of the Property, detailed culture-historical background, historical testimonies pertaining to the area, and a presentation of prior studies of the area; all of which combine to provide the physical and cultural setting and context of the Property. The CIA also includes archival research and an interview with a person knowledgeable of the area to obtain information relating to practices and beliefs of indigenous Hawaiians within and surrounding the area. Such practices may include access-driven subsistence, agricultural, recreational, healing and burial practices, and religious or spiritual traditions. The results of the CIA are summarized below. Appendix B contains the complete CIA report.

Hawaiian Settlement, Land Use, and Resource Management Practices

The first permanent settlements in South Kohala occurred not long after initial settlements to the Hawaiian Islands and were split primarily between the coast and upland regions where food and fresh water were available. The topography of the Kohala Mountains and rainfall patterns heavily influenced the distribution of settlements, which in the uplands were established at sheltered bays with access to fresh water in the windward valleys and gulches. The wetter upland region, now the present-day town of Waimea, was used for agricultural fields to supply produce for inhabitants of the uplands and the coastal areas as well. Waimea's high elevation, fertile landscape, and sufficient rainfall facilitated the creation and development of the Waimea Field System during the 16th century. Coastal residents in South Kohala, however, relied primarily on the ocean for sustenance, and they augmented their diet with produce procured through trade with the upland areas. As such, a network of coastal and inland trails was developed for the exchange of goods as well as to provide a connection between the coastal and upland population centers and resource areas.

In South Kohala and in many regions throughout the islands, an increasing dependency on agricultural resources led to the expansion of the *mauka-makai* connections to accommodate the exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupua'a* system sometime during the 13th century. *Ahupua'a* are land divisions that typically incorporated all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base. The *ahupua'a* became the equivalent of a local community, with its own social, economic, and political significance, which added another component to a then well-stratified society. The *ahupua'a* systems fell within larger districts or *moku* and were controlled by a hierarchy of *ali'i* (chiefs). By the 17th century, large areas of Hawai'i Island were controlled by a few powerful *ali'i 'ai moku* (chief who claimed the abundance of the entire district). There is island-wide evidence to suggest

that growing conflicts between independent chiefdoms were resolved through warfare, culminating in a unified political structure at the district level.

The Environmental Setting of the Waikoloa Ahupua‘a

The Property is located within Waikoloa Ahupua‘a, in the traditional *moku* of South Kohala, a portion of which comprises the traditional *moku-o-loko* (sub-district) of Kohala. Kohala is comprised of some seventy *ahupua‘a* on the leeward shores of Hawai‘i. While Waikoloa is referred to today as an *ahupua‘a*, traditionally it was an *‘ili* of the *kalana* (or *‘okana*) of Waimea, and in ancient times was referred to as Waikoloa Nui and the neighboring area of Lālāmilo was referred to as Waikoloa Iki.

The long ridge of the Kohala Mountains extends perpendicular to the predominant northeasterly trade winds, creating an orographic rainfall pattern that separates the district into two distinct environmental zones; a wetter windward zone on the eastern (Hāmākua) side, and a drier leeward zone on the western (Kona) side. Most of the *kalo* (taro) and *‘uala* (sweet potato) fields of this part of the island were located in the rainier uplands near the present-day town of Waimea, where there was a sizable permanent population as well. The traditional cultivating places in the upland field systems were planted in sweet potato, irrigated *kalo, wauke, māmaki*, plantains, bananas, sugarcane, coconuts, and *hala*. Marine resources were brought ashore in the small bays with sandy shores found in the coastal section of Waimea (now called South Kohala), where fishermen lived and probably cultivated potatoes in small patches. The earliest inhabitants of the region emphasized the use of natural caves and overhangs, along with the construction of small, simple surface features for habitation purposes, but as populations increased and expanded, so did the occurrence of more permanent habitation structures in both the coastal and upland areas.

Native Traditions and Historical Accounts of Waikoloa and the Region

The oral tradition of Hawai‘i is perhaps best preserved in *‘ōlelo no‘eau*, which have been passed down throughout the generations. Many *‘ōlelo no‘eau* speak of South Kohala, and most mention the famed winds of the region.

Traditional *mo‘olelo* (stories, tales, and myths) associated with Waikoloa are limited, and those recorded focus primarily on the famous winds of the Kohala region including the intense Mumuku, ‘Āpa‘apa‘a, and namesake Waikoloa winds. A traditional *mo‘olelo*, “The Heart Stirring Story of Ka-Miki” (*Ka‘ao Ho‘oniua Pu‘uwai no Ka-Miki*), originally appeared in the Hawaiian language newspaper *Ka Hōkū o Hawai‘i* between 1914 and 1917. This tale tells of the two supernatural brothers, Ka-Miki and Maka-‘iole, who were skilled *‘ōlohe* (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 *‘ōlohe*. A portion of this tale describes the naming of South Kohala’s land divisions, and focuses explicitly on the Waimea region and three associated *‘ili*, including Lālāmilo, Puakō, and Waikoloa. Another portion of the legend was set in Waikoloa, where the brothers collected a native sedge to strain *‘awa* to mix with the sacred waters from Mauna Kea.

Upon transporting the bowl of *ʻawa* from Holoholokū in Waimea, a gust of wind identified in the story as the Waikoloa wind blew a bit of the sacred water out of the bowl, thereby forming a spring called Waikiʻi.

The winds of Kohala are also enumerated in a traditional *moʻolelo* featuring the famous wind-gourd Laʻamaomao, which was said to contain all the winds of Hawaiʻi. Originally published by Moses Kuaea Nakuina, the legend relates the story of Pākaʻa, son of Laʻamaomao and Kūanuʻuanu and the highly trusted, personal attendant and favorite of the *aliʻi ʻai moku* Keawenui a ʻUmi. Pākaʻa succeeded his father as *kahu* (personal attendant) of Keawenui a ʻUmi, but Pākaʻa's greatest and most cherished responsibility was the keeping of a highly treasured personal possession: a very special and sacred *ipu* (gourd) passed down to him from his mother. Originally, the *ipu*, known as the wind-gourd of Laʻamaomao, belonged to Pākaʻa's grandmother. Pākaʻa uses the *ipu* to escape to Molokaʻi when his reputation is slandered by other men who served Keawenui a ʻUmi. While on Molokaʻi, Pākaʻa fathered a son, Kūapākaʻa whom he groomed the way his own father had groomed him, to one day serve the man who would one day become his *haku* and avenge Pākaʻa's enemies. With his knowledge of the *ipu*, Kūapākaʻa is able to help Pākaʻa return to his position as *kahu* of Keawenui a ʻUmi with all of his previous rights restored to him.

Furthermore, there is the *moʻolelo* of Lonoikamakahiki and the Battle of Hōkūʻula. Lonoikamakahiki was a celebrated ruling chief of Hawaiʻi Island, whose lineage was from the ancient Pili dynasty with heritage rooted on Hawaiʻi Island, and likely Waipiʻo Valley, since roughly A.D. 1300. He was also the son of Keawenui a ʻUmi. He integrates prominently into the history and significance of Waikoloa as a *wahi pana* (celebrated place) to the people of old. With respect to Waikoloa, Lonoikamakahiki figures into this notable *moʻolelo* regarding his triumph over the invading Maui chief Kamalālāwalu. During the time of Lonoikamakahiki's rule, there were several battles that transpired in the coastal portion of South Kohala and also in the general vicinity of the study area. One such battle was fought between Lonoikamakahiki and his older brother, Kanaloakuaʻana, who rebelled against him. A series of subsequent attacks were instigated and waged by Kamalālāwalu, the *aliʻi nui* of Maui, against Lonoikamakahiki, which occurred along the South Kohala coastline.

Land Tenure in Waikoloa and Vicinity

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 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. After much consideration, it was decided that three classes of people each had one-third vested rights to the lands of Hawaiʻi: the King, the chiefs and *konohiki*, and their tenants (the *makaʻāinana* or common people).

The King and some 245 chiefs 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. 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. 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.

During the Māhele, native tenants of the lands that were divided up among the Crown, Konohiki, and Government could claim, 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. As a result of the Māhele, Waikoloa Nui (originally an *‘ili* of Waimea kalana) was awarded to George Davis Hū‘eu as an ahupua‘a based on Kamehameha I’s gift of the land to Hū‘eu’s father Isaac Davis. There were nine small residential *kuleana* awarded in the uplands of Waikoloa near the town of Waimea, however no *kuleana* were awarded within or near the Property.

In 1859, Hū‘eu and John Palmer Parker began a dispute over the boundary between Hū‘eu’s ahupua‘a of Waikoloa and Parker’s holdings in Pā‘auhau, which included lands in the Hāmākua District located southeast of the subject parcels. The boundary issue was quickly resolved, but disputes over the boundaries of Waikoloa and the neighboring Crown lands of Waimea also soon arose. In August of 1865 the boundaries for Waikoloa Nui were brought before the Boundary Commission and certified a day later. From the testimonies, we learn that the coastal areas of Waikoloa Nui were considered more valuable than its interior portions, and as such were not given to Isaac Davis by Kamehameha I. The lands of Waikoloa Nui were known as being *pili* lands and a place for bird catching. Several of the informants revealed that the lands along and adjacent to the South Kohala/North Kona boundary were hunting grounds for ‘uwa‘u and nēnē birds. Numerous localities in Waikoloa in the general vicinity of the study area are mentioned in the testimonies, including several named caves (Hānaiali‘i, Kapukaiki, Wawaekea), resting places (He‘ewai Gulch, Kikiha, Palioka‘aka‘a), a burial ground (Kanakaola), sacrificial grounds (Huikaula), roads (Kiikii, Liuliu, Palioka‘aka‘a, Puuokowai), and prominent gulches (‘Auwaiakeakua, He‘ewai, Palihai, Poopoo, Waiki‘i)

By the mid-1860s the Waimea Grazing and Agricultural Company (WGAC), founded by Robert C. Janion and William H. Green in 1861, had acquired considerable strategic assets around Waimea in an attempt to monopolize the livestock industry in the region. From the outset, Parker Ranch had become a competing entity and conflict ensued between the two involving cattle harvesting and multiple land disputes. In 1868, the WGAC became the largest ranching operation on the island, although it is estimated that in 1867 the population of Waimea was only four hundred people. By the late-1870s, largely due to persistent drought conditions within its grazing lands, the

WGAC went out of business, and its herd was purchased by Parker Ranch (Parker Ranch would also eventually acquire the lease of Waikoloa Ahupua‘a).

Parker Ranch continued to operate into the 20th century, during which time a significant amount of newly acquired land in Waikoloa was transitioned to cattle ranching. Much of these grazed lands were divided into paddocks, and transportation and water conveyance infrastructure projects were undertaken to increase the productivity of the Waikoloa rangelands. The expansion of Parker Ranch’s land- and lease holdings throughout the late 19th and early 20th centuries allowed the ranch to raise cattle and sheep in paddocks around the island. Once ready for the market, these animals would be brought back to Waimea for sorting, then driven down to Kawaihae to be shipped. During these drives the cowboys followed a well-used network of trails that connected the distant stations at Waiki‘i, Kalai‘ehā, and Ke‘āmuku with the town of Waimea and shipping harbors on the Kohala coast. One segment of this network, the Ke‘āmuku trail, is located in close proximity to the Property.

In 1933, the new belt road (Highway 190) was finished and extends along the eastern boundary of the Property. The construction of a main thoroughfare connecting Waimea to Kona was not only beneficial for mere transportation purposes, but also facilitated urbanization in Waikoloa. In 1969, just a year before major development activities began across Waikoloa Road, which resulted in the creation of a resort and residential subdivision, approximately 8,309 acres of land situated on the west side of Highway 190 was subdivided into ten lots ranging in size from 350 to over 1,300 acres for the proposed Waikoloa Ranch Lots subdivision. The Property is identified as Lots 7 and 8 of this subdivision, which was originally slated for agricultural land use and construction of a single-family dwelling and additional farm building development. Despite the formal subdivision of these lands, the entirety of the Waikoloa Ranch Lots subdivision has remained undeveloped.

Oral History Interview

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. In the process conducing the CIA, ASM contacted three individuals thought to be knowledgeable about traditional cultural practices and/or uses associated with the Property. One individual did not respond to repeated attempts to contact him; another individual declined to be interviewed; the third individual, Godfrey Kainoa, a retired Kahua Ranch Cowboy Supervisor and Livestock Manager, was willing to provide his knowledge of the Property and the surrounding lands. The following summarizes the interview with Godfrey Kainoa.

Godfrey Kainoa was born in Kohala and now currently resides on Hawaiian Home Lands in Honokoa, Kawaihae. Mr. Kainoa worked for Kahua Ranch for fifteen years and also worked for Parker Ranch for thirty years as a Cowboy, Foreman and a Division Livestock Superintendent for the Ke‘āmuku, Kohala and Humu‘ula Divisions beginning in the mid-1970s. Mr. Kainoa shared that the lands within the Property, which he refers to as “Boise 1” were owned by Parker Ranch in

the late 1960's and later sold to Boise Cascade/Waikoloa Land Company. Mr. Kainoa helped steward the lands for Parker Ranch, while running a cow-calf operation for six years. During the time that he worked there, he described the lands as dry and a desert-like environment with strong winds with some rain during the winter. Most of the open range he worked on was mostly covered in *ʻaʻaliʻi* and fountain grass (*Pennisetum seraceum*), which he described to be a nuisance, and recalls the presence of several types of birds including pheasants and francolins. Mr. Kainoa shared that Parker Ranch sourced water for the area from Waikiʻi Ranch. However, since the lands were sold, ranchers had to haul their own water for their cattle. He recalled the entire area being a fire hazard and because water was limited, he saw many fires ravage the land.

Mr. Kainoa believes that the large pit with a stacked wall on the western side of the Māmalahoa Highway (Site 30924) is the remnants of the old road that extended from Waimea to Kona. He also shared that he was never told any *moʻolelo* of the area and shared that the stewards of "Boise 1" (comprising a portion of the Property), have all since passed. During his time working there he did not recall seeing any cultural sites and believes there will not be any direct impact to the area. However, he does feel strongly that the area should be properly cared for and nurtured in the right way. Mr. Kainoa's final thoughts were to encourage the new land owners that they "may they do the right thing for the people and this place."

Additional Consultation

In an effort to identify other individuals knowledgeable about traditional cultural practices and/or uses associated with the Property, ASM submitted a public notice to the Office of Hawaiian Affairs (OHA) for publication in their newspaper, Ka Wai Ola. The notice appeared in the Kekemapa (December) 2018 issue of the publication. As of the February 2019, no responses have been received from the public notice.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili is not anticipated to have a negative impact on the cultural resources of the Property. ASM concludes that that given the consultation and assessment documented in the CIA, "it is our conclusion that the proposed development of the Nakahili Community on TMKs: (3) 6-8-002:005, 006, 028, 029, and 030 will not result in impacts to any traditionally valued cultural or historical resources nor will it impact any traditional cultural practices or beliefs."

4.3 VISUAL RESOURCES

The Hawaiʻi County General Plan (2005) identifies the backdrop of the rolling Kohala Mountains as a predominant visual attribute in South Kohala, as well as the dramatic view of Mauna Kea in the distance. Green pastures and puʻu contribute to exceptional natural beauty in the uplands of Waimea. In contrast, the coastline of South Kohala exhibits natural beauty in pockets of white sand beaches, stretches of lava flows along the coastline, and bright coastal waters.

The South Kohala Community Development Plan (CDP) also notes the same visual attributes of South Kohala, with the following excerpt further describing visual attributes in the vicinity of the Property:

> *Waikoloa is home to many beautiful sunsets and sunrises. Mauna Kea Mountain is clearly viewed from the dry slopes of Waikoloa, which provides many displays of cloud formations made from strong winds that are unique to the mountain. The view of the island of Maui from Waikoloa will allow a clear vision of Haleakalā and the many pali to Hana. Waikoloa has as many puʻu if not more, than its sister town of Waimea, many of which have names that convey traditional stories of this ahupuaʻa. The puʻu named Hinaʻi in the vicinity of Waikoloa and several other puʻu in the district are being mined. Mining and also the encroachment of development have degraded the condition of several puʻu in the district. These puʻu should be protected and preserved in their natural state.*

Furthermore, a General Policy the South Kohala CDP is to: "Preserve visually and environmentally important open space grasslands, ocean views, views of the puʻu, and South Kohala's unique 'Five Mountain Views' of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā."

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili will not substantially affect scenic vistas or view planes identified in the County General Plan or the South Kohala CDP. Neither the backdrop of the rolling Kohala Mountains nor dramatic view of Mauna Kea in the distance will be substantially affected.

Some impact to the visual character of open space grasslands may occur due to the creation of Nakahili, and the view of the Property will change from open space to a family agricultural community with farm dwellings and agricultural uses. However, with the descending elevation from Māmalahoa Highway, Nakahili will not impact clear views of the coastline and bright coastal waters from the highway. In addition, Nakahili will not impede views of South Kohala's unique "Five Mountain Views" of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā.

No named puʻu, geologic, or natural features were identified on the Property as a result of examining historical maps, documentation, and testimonies in the course of research conducted as part of the Cultural Impact Assessment (see Section 4.2). Therefore, Nakahili will not impact any known or traditionally valued puʻu on the Property, as none have been identified.

To minimize visual impacts, all Nakahili farm dwellings will be in compliance with the development standards set forth under Chapter 25, HCC (Zoning) for Family Agricultural

Districts. Lot sizes will be a minimum of one acre to maintain the agricultural character of the area and provide space for agricultural uses.

All outdoor lighting will be in compliance with Chapter 14, Article 9, HHC, which provides standards to limit degradation of the night visual environment by minimizing light glare, pollution, and trespass through regulation of the type and use of outdoor lighting.

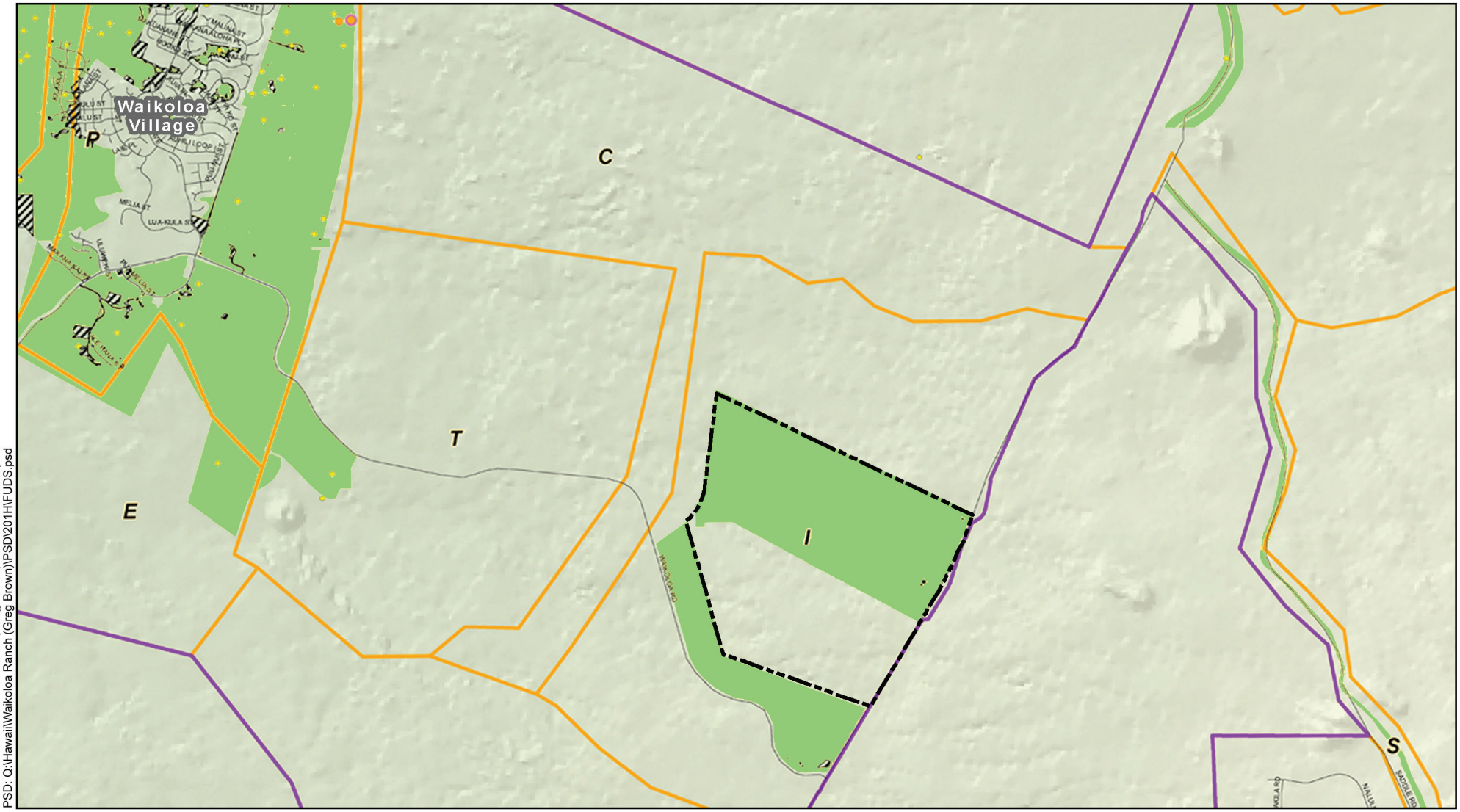
4.4 WAIKOLOA MANEUVER AREA FORMERLY USED DEFENSE SITES

Like many parts of South Kohala, the Property is within the Waikoloa Maneuver Area (WMA) listed in the national Formerly Used Defense Sites (FUDS) Inventory. From 1943 to 1953 U.S. military activities occupied approximately 130,000 acres of land in South Kohala, at least 40 percent of which were used for training with live military munitions. While cleanup activities ensued shortly after the training grounds were deactivated, unexploded ordnance (UXO) was later discovered near homes and schools from Waimea to Waikoloa Village.

The identification and cleanup process for FUDS sites is regulated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund. The FUDS Program uses the CERCLA process to address potential risks on lands formerly owned or controlled by the Department of Defense prior to 1986. The U.S. Army Corps of Engineers (USACE) identifies eligible properties, investigates their condition, and manages required cleanup efforts (USACE, n.d.). A FUDS cleanup can include cleaning up hazardous, toxic and radioactive waste sites; removing munitions, explosives, and munitions constituents; and/or building demolition and debris removal (USACE, n.d.).

The Property is within the Area I Munitions Response Site of the WMA FUDS. The Area I Munitions Response Site is in the Investigation phase of the CERCLA process which consists of three phases: Inventory, Investigation, and Cleanup. Once the Cleanup phase is finished, the CERCLA process is complete and the land can move into Long Term Management. Informal consultation with USACE and the Hawai‘i Department of Health (DOH) confirmed that completion of the CERCLA process will first require completion of the Investigation and Cleanup phases, including a Remedial Investigation/Feasibility Study and Remedial Design/Remedial Action. A process by which DOH can formally assess risk on FUDS lands, based on information provided by the USACE, is in development. Currently the DOH does not formally assess risk on FUDS lands.

USACE has completed the cleanup (munitions removal) at the north parcels of the Property (TMKs (3) 6-8-002:005, 028, 029, and 030) and these parcels are designated as a Cleared Area. USACE has not conducted its cleanup at TMK 3-6-8-002:006. There is the possibility of encountering UXO within the WMA, even in areas that were previously cleared.



PDF: Q:\Hawaii\Waikoloa Ranch (Greg Brown)\PDF\201HIFUDS.pdf
PSD: Q:\Hawaii\Waikoloa Ranch (Greg Brown)\PSD\201HIFUDS.psd

Legend

Project Boundary

Munitions and Explosives of Concern (MEC) (1,802)

- 1
- 2 - 4
- 10 - 13
- 81
- 278

Background

- Exception Area (2,079 acres)
- Cleared Area (22,604 acres)
- Work Sector
- Former Waikoloa Maneuver Area (100,262 acres)

Source: County of Hawai'i, 2018. U.S. Army Corps of Engineers, 2013.

Figure 17

Formerly Used Defense Sites (FUDS)

Nakahili

Work Force Developers LLC — Island of Hawai'i

North

Linear Scale (feet)

0 1,250 2,500 5,000

PBR HAWAII & ASSOCIATES, INC.

The Cleared Area is one portion of the larger Area I Munitions Response Site, which is in the Investigation phase of the CERCLA process. Clearing of the north parcels was conducted in 2012 on behalf of USACE by Alu Like-Environet Joint Venture (ALE-Environet JV, LLC, 2012). The work included removal and disposal of all munitions and explosives of concern and munitions debris within approximately 903.39 acres of undeveloped land (slightly more than the area of the north parcels of the Property). The report concluded that no munitions and explosives of concern were found in the work area (which included areas of TMKs (3) 6-8-002:005, 028, 029, and 030), and any munitions debris found during the investigation was removed. A USACE map of the former Waikoloa Maneuver Area indicates the 2012 report resulted in the USACE designating the north parcels as a Cleared Area (see Figure 17).

The south parcel (TMK (3) 6-8-002:006) is also located within Area I Munitions Response Site. Unlike the north parcels, USACE has not conducted its cleanup at the south parcel.

POTENTIAL IMPACTS AND MITIGATION MEASURES

USACE has completed the cleanup (munitions removal) at the north parcels of the Property (TMKs (3) 6-8-002:005, 028, 029, and 030) and these parcels are designated as a Cleared Area. While the USACE has not conducted its cleanup at the south parcel (TMK (3) 6-8-002:006), Work Force Developers will continue to consult the USACE and the DOH regarding the WMA FUDS throughout the creation of Nakahili.

To mitigate potential impacts associated with the WMA FUDS, Work Force Developers will follow all applicable State and County laws to ensure that health and safety remain a priority throughout planning, construction, and long-term use of Nakahili. In a letter dated January 23, 2019, USACE said:

> *If you discover an item that you think might be an UXO, remember the 3R's of Explosives Safety;* ***Recognize*** *when you may have come across a munition and that munitions are dangerous* ***Retreat*** *by carefully leaving the area-DO NOT touch, move, or disturb the item; and* ***Report*** *what you saw and where you saw it to the County of Hawai'i Police Department at 911 or 935-3311. They will contact the appropriate agency to identify and dispose of the item if necessary. USACE would be happy to provide a 3R's safety briefing to anyone associate< with your project (landowners, stakeholders, construction personnel, etc.).*

In accordance with a Site-Specific Environmental Hazard Management Plan approved by the DOH, Work Force Developers will ensure that an expert specializing in UXO is present to support and monitor construction activities. If any munitions-related material is discovered, the appropriate authorities will be contacted, and the materials will be properly disposed of. Up-to-date information regarding FUDS and safety will be made available to residents in the form of educational materials, signs, and/or training opportunities. Work Force Developers will provide

information regarding WMA FUDS CERCLA, and safety measures to prospective property owners and residents.

Work Force Developers will cooperate with the USACE regarding any future investigation and remediation activities. Work Force Developers will contract an environmental consultant to ensure the clearance of FUDS-related hazards on the south parcel (TMK (3) 6-8-002:006) prior to construction.

4.5 NOISE

Current sources of noise in the vicinity of the Property include noises associated with intermittent vehicular traffic along Māmalahoa Highway and natural sources, such as wind, rain, birds and cattle.

The Pōhakuloa Training Area (PTA) is located over 30 miles south east of the Property and provides firing ranges and training areas for U.S. Army, Marine, Air Force and Navy units. PTA firing ranges accommodate small-arms training as well as artillery and mortar live fire. PTA also includes a small military airstrip known as Bradshaw Army Airfield (MilitaryBases.us, n.d.).

POTENTIAL IMPACTS AND MITIGATION MEASURES

Potential impacts to ambient quality of the Property and surrounding area due to the creation of Nakahili are primarily limited to short-term construction activity and, in the long-term, potential increases in traffic noise and sounds from human activity within the neighborhood, which are not anticipated to be significant. During the construction phase, temporary noise impacts may be associated with the operation of construction machinery, paving equipment, and material transport vehicles. However, any impact from construction activity will be short term.

Proper mitigation measures will be employed to minimize construction-related noise impacts and comply with all Federal and State noise control regulations. Increased noise activity due to construction, will be limited to daytime hours and occur only during the construction period. Noise from construction activities will comply with State DOH noise regulations (HAR, Chapter 11-46, Community Noise Control). Should construction noise exceed, or is expected to exceed, the DOH's allowable limits, a permit must be obtained from the DOH. Specific permit restrictions for construction activities are:

- No permit shall allow any construction activities that emit noise in excess of the maximum permissible sound levels before 7:00 AM and after 6:00 PM of the same day, Monday through Friday;
- No permit shall allow any construction activities that emit noise in excess of the maximum permissible sound levels before 9:00 AM and after 6:00 PM on Saturday; and
- No permit shall allow any construction activities that would emit noise in excess of the maximum permissible sound levels on Sundays and holidays.

Potential noise associated with PTA activities will be disclosed to potential Nakahili buyers and renters.

4.6 AIR QUALITY

Ambient air quality standards (AAQS) have been established by both Federal and State governments that limit ambient concentrations of six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead, ozone, and particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) or less than 2.5 microns ($PM_{2.5}$). In addition, a State standard has been established for hydrogen sulfide (H_2S). State AAQS are more stringent than the comparable national limits (NAAQS) except for the standards for sulfur dioxide, particulate matter, and lead, which are set at the same levels.

Hawai‘i’s standards are not divided into primary and secondary standards as are the National standards. Primary standards are intended to protect public health with an adequate margin of safety while secondary standards are intended to protect public welfare through the prevention of damage to soils, water, vegetation, man-made materials, animals, wildlife, visibility, climate, and economic values.

Air quality in Hawai‘i is generally characterized as relatively clean and low in pollution. Northeast trade winds that are predominant throughout the year typically carry emissions and other air pollutants from inland areas out toward the ocean. Air quality in the Project area is believed to be relatively good, except for occasional impacts from upwind sulfur dioxide volcanic emissions that convert to a particulate-sulfate volcanic haze (“vog”) and minimal impacts from localized traffic congestion north and makai of the Property between Waikoloa Village and Waimea. Air flow from this southeast direction carrying vog can result in an increase in pollution and a decrease in visibility, and can impair the health of sensitive receptors.

Kīlauea Volcano is recognized as the largest point source of SO_2 gas in the United States. Gaseous emissions increased dramatically in 2008 when a new vent opened at the volcano’s summit. Emission estimates increased to 3,000 – 5,000 tons per day (TPD) of SO_2, in contrast to previous average emission of 1,700 TPD.

The State Department of Health (DOH) has monitoring stations on Hawai‘i, which mainly measure air quality impacts from the volcano and geothermal energy production. The closest air monitoring station to the Property is the Waikoloa air monitoring station located north west of the Property, approximately 4.34 miles from the Property. Based upon the DOH 2014 air quality data for the Waikoloa air monitoring station, there were no occurrences of $PM_{2.5}$ greater than the National and State standards (State of Hawai‘i, Department of Health, 2015). The Waikoloa air monitoring station does not monitor levels of PM_{10}, ozone, SO_2, CO, or H_2S.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Air quality impacts anticipated during construction of Nakahili are not anticipated to have long-term adverse impacts to regional air quality. No state or federal air quality standards will be violated during or after construction of Nakahili.

In the short-term emissions from construction vehicles and equipment may temporarily affect ambient air quality in the immediate vicinity of the Property. Temporary adverse air quality impacts may also occur during site preparation. Impacts will be mitigated through development and implementation of a dust control plan, as well as proper maintenance of construction equipment and vehicles, as necessary. Dust control measures may include watering loose soils, erecting dust screens, phasing land disturbing activities to minimize open soils, or establishing temporary ground cover. Other appropriate BMPs will be implemented to ensure fugitive dust from the Property is minimized. Additional BMPs related to construction operations may include, providing an adequate water source at the Property, planning the implementation of rapid landscaping to cover bare areas starting from the initial grading phase, planning for daily operations that may carry dust and debris to and from the site, and ensuring dust control measures are in place after hours and on weekends.

A combination of these and other measures to mitigate potential air quality impacts will be implemented as appropriate. Exhaust emissions from construction equipment and increased vehicular traffic are not expected to violate State or Federal air quality standards based on the moderate level of existing traffic volumes in the region. All construction activities will comply with the provisions of Chapter 11-60.1-33, HAR regarding fugitive dust.

In the long-term, after construction and during occupancy, significant impacts to air quality are not anticipated due the relatively good air quality in the region and the predominant trade winds that typically carry emissions and other air pollutants from inland areas out toward the ocean.

4.7 TRAFFIC

Austin, Tsutsumi & Associates, Inc. (ATA) prepared a Traffic Impact Analysis Report (TIAR) for Nakahili. The TIAR: 1) assesses existing traffic conditions; and 2) analyzes future traffic conditions in the surrounding area, both with and without Nakahili, for future Year 2023, Year 2028, and Year 2038 in compliance with the Hawai‘i County concurrency requirements (Section 25-2-46, HCC); and 3) makes recommendations to mitigate traffic impacts from Nakahili. Key conclusions of the TIAR are summarized below. Appendix D contains the complete TIAR.

Area Roadway System

Māmalahoa Highway (Highway 190) –runs along the east side of the Property and is generally a north-south, two-way, two-lane, undivided State roadway. Māmalahoa Highway begins in Waimea as a continuation of Hawai‘i Belt Road at its intersection with Kawaihae Road and travels

southwest before turning into Palani Road at its intersection with Queen Kaʻahumanu Highway in Kailua-Kona. Māmalahoa Highway is one of the two main thoroughfares between the Kohala and Kona regions. In the vicinity of the Property, Māmalahoa Highway has a posted speed limit of 55 miles per hour (mph).

Daniel K. Inouye Highway (Route 200) – is generally an east-west, two-way, three-lane, undivided State roadway in the vicinity of the Property. Daniel K. Inouye Highway begins at the outskirts of Hilo and travels west before terminating at its intersection with Māmalahoa Highway. The highway provides direct access between the east and west sides of the island. Daniel K. Inouye Highway is a realignment of the previous Saddle Road and was completed in 2017. In the vicinity of the Property, the Daniel K. Inouye Highway has a posted speed limit of 45 mph.

Saddle Road (Old Route 200) – is generally a north-south, two-way, two-lane, undivided State roadway in the vicinity of the Property. The majority of Saddle Road has been realigned and reconstructed as the new Daniel K. Inouye Highway. The remainder of the old Saddle Road begins just west of Lava Road at Daniel K. Inouye Highway and travels north to Māmalahoa Highway. In the vicinity of the Project, Saddle Road has a posted speed limit of 45 mph.

Waikoloa Road – is generally an east-west, two-way, two-lane, undivided County roadway in the vicinity of the Property. Waikoloa Road begins to the east at its intersection with Māmalahoa Highway (near the Property) and terminates to the west at its intersection with Queen Kaʻahumanu Highway where it transitions into Waikoloa Beach Drive. Waikoloa Road has a posted speed limit of 35 mph near Waikoloa Village but the posted limit increases to 45 mph near Queen Kaʻahumanu Highway and 55 mph near Māmalahoa Highway.

Paniolo Avenue – is generally a north-south, two-way, four-lane, undivided County roadway in the vicinity of the Property providing access to Waikoloa Village. Paniolo Avenue begins to the south at its intersection with Waikoloa Road and Pua Melia Street and travels north through Waikoloa Village before terminating at the Kamakoa Nui subdivision park. Paniolo Avenue has a posted speed limit of 25 mph.

Pua Melia Street – is generally a two-way, two-lane, undivided County roadway in the vicinity of the Property. Pua Melia Street forms a loop along the southern side of Waikoloa Road with entrances across from Paniolo Avenue and the Paniolo Greens Resort. Pua Melia Street has no posted speed limit.

Queen Kaʻahumanu Highway (Route 19) – is generally a north-south, two-way, two-lane, undivided State roadway in the vicinity of the Property. Queen Kaʻahumanu Highway begins in Kawaihae at its intersection with Akoni Pule Highway and Kawaihae Road and travels south to Kailua-Kona before terminating at its intersection with Palani Road and Māmalahoa Highway. Queen Kaʻahumanu Highway continues further south of the intersection as Route 11 before turning into Māmalahoa Highway at its intersection with Hualālai Road. In the vicinity of the Property, the roadway has a posted speed limit of 45 mph.

Property Access

The Property has four unimproved dirt access points off Māmalahoa Highway and one unimproved existing access road through a neighboring parcel to the southwest (TMK) (3) 6-8-002:008) off Waikoloa Road. All the access ways are gated and have a rough surface condition.

Public Transit

The County of Hawai‘i Mass Transit Agency operates the Hele-On Bus, which serves the most populated areas of the island. In the immediate vicinity of the Property, bus service is provided by the North Kohala-Waimea-Kailua-Kona route which passes by the Property along Māmalahoa Highway, however, buses do not stop at or near the Project as there is no nearby bus stop. The bus stop nearest to the Property is in Waikoloa Village.

Pedestrian Facilities

There are no pedestrian facilities in the vicinity of the Property as the area is largely undeveloped and the nearby roadways are generally high-speed highways.

The TIAR notes that pedestrians were generally not observed along roadways in the vicinity of the Property, likely as a result of the limited destinations within a reasonable walking distance. Pedestrians were observed to use facilities within both Waikoloa Village and the Waikoloa Beach Resort area. Some pedestrians were observed crossing at the unsignalized crosswalks at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection.

Bicycle Accessibility

There are bike lanes along Waikoloa Road at the Queen Ka‘ahumanu Highway intersection. These bike lanes extend for approximately a quarter of a mile east (mauka) before terminating. In general, most roadways in the vicinity of the Property have wide, paved shoulders that can be used by cyclists. Although the paved shoulders provide some level of separation from vehicles, high vehicle speeds and winding roadways (notably Waikoloa Road) create less than ideal conditions for bicyclists. The TIAR notes that minimal bicycle activity was observed along roadways in the vicinity of the Property with most observed bicyclists traveling along Queen Ka‘ahumanu Highway.

The *Bike Plan Hawaii Master Plan* (DOT, 2003) identifies bicycle facilities proposed for future implementation. Proposed facilities are assigned a Priority Level ranging from I to III, with Priority Level I planned for near-term completion and Priority Level III planned for long-term completion. In the vicinity of the Property, the *Bike Plan Hawaii Master Plan* identifies the following bicycle facilities:

- Bike Path – Parallel to Queen Ka‘ahumanu Highway (Priority Level II)
- Signed Shared Roadway – Queen Ka‘ahumanu Highway (Priority Level I)
- Signed Shared Roadway – Māmalahoa Highway (Priority Level II)

- Bike Path – Old Māmalahoa Highway Remnants (Priority Level II)
- Signed Shared Roadway – Saddle Road (Priority Level III)
- Signed Shared Roadway – Waikoloa Road (Priority Level II)

Existing Traffic Conditions

The TIAR analyzed existing conditions the following intersections:

- Māmalahoa Highway/Daniel K. Inouye Highway (unsignalized)
- Māmalahoa Highway/Waikoloa Road (unsignalized)
- Māmalahoa Highway/Saddle Road (unsignalized)
- Waikoloa Road/Paniolo Avenue/Pua Melia Street (unsignalized)
- Waikoloa Road/Queen Ka‘ahumanu Highway (signalized)

Based on the count data, it was determined that the AM peak hour of traffic occurs between 7:30 AM and 8:30 AM and the PM peak hour of traffic occurs between 3:30 PM and 4:30 PM. Traffic in the area was generally observed to be light with minimal delays and queuing experienced. However, queues were observed to form at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection. Delays at this intersection resulted from Paniolo Avenue serving as the single access to the large Waikoloa Village residential area.

POTENTIAL IMPACTS AND MITIGATION MEASURES

In accordance with the Hawai‘i County concurrency requirements (Section 25-2-46, HCC), the TIAR projects future traffic growth in the area for Year 2023, Year 2028, and Year 2038 without and with Nakahili. Traffic projections were based on planned roadway improvements and developments anticipated to be completed in the area of Nakahili.

Future Traffic without Nakahili

Due to developments anticipated to be completed in the area, traffic is expected to increase over existing conditions by approximately 10-75% (depending on the roadway) by Year 2028 without Nakahili. Waikoloa Road is expected to see the largest growth as a result of the continued development in the Waikoloa Beach Resort area and in Waikoloa Village and adjacent areas. Improvements at various Waikoloa Road intersections are anticipated to provide adequate capacity in the mid-term for both regional through traffic and local traffic. By Year 2038, the Daniel K. Inouye Highway extension (previously known as the Saddle Road Extension), is expected to provide a long-term solution for regional traffic with construction of an extension from Māmalahoa Highway to Queen Ka‘ahumanu Highway parallel to Waikoloa Road. Table 4-1 summarizes the aggregate growth applied to the studied roadways for each of the forecast years. Table 4-2 summarizes the roadway improvements that are planned or are anticipated to be necessary by Year 2023, Year 2028, and Year 2038 without Nakahili.

Table 4-1. Regional Aggregate Traffic Growth

Roadway	2023	2028	2038
Queen Kaʻahumanu Highway	23%	31%	42%
Māmalahoa Highway	35%	47%	63%
Waikoloa Road	55%	73%	-16% [1]
Daniel K. Inouye Highway	10%	14%	19%
Saddle Road	9%	11%	16%

1. Negative growth rate is a result of traffic rerouted from Waikoloa Road to the planned Daniel K. Inouye Highway Extension from Māmalahoa Highway to Queen Kaʻahumanu Highway parallel to Waikoloa Road.

Table 4-2. Roadway Improvements for Year 2023, Year 2028, and Year 2038 without Nakahili

Year	Location	Roadway Improvement
Year 2023 (Without Nakahili)	Waikoloa Road/Paniolo Avenue/Pua Melia Street	- Install a traffic signal when warranted. - Improvements at this intersection were previously imposed on the Waikoloa Highlands Subdivision project by the State Land Use Commission (LUC). Although a roundabout was previously identified as the preferred mitigation, a traffic signal is recommended based on expected capacity and space requirements. If the Waikoloa Highlands Subdivision does not move forward, fair share contribution may be required by regional developers for this mitigation. See Table 4-4 for Nakahili pro-rata shares for the peak hours of traffic.
Year 2028 (Without Nakahili)	Māmalahoa Highway/Waikoloa Road	- Install a traffic signal when warranted. - A traffic signal is expected to warrant by Year 2023 but is not anticipated to be necessary to mitigate long delays until Year 2028. - Fair share contribution may be required by regional developers for this mitigation. See Table 4-4 for Nakahili pro-rata shares for the peak hours of traffic.
Year 2038 (Without Nakahili)	Daniel K. Inouye Highway Extension	- Extend Daniel K. Inouye Highway from its existing terminus at Māmalahoa Highway to Queen Kaʻahumanu Highway. - Construction of the extension is a State planned project.

Future Traffic with Nakahili

To project traffic impacts with Nakahili, for the purpose of the TIAR, built out of Nakahili was projected for Year 2023, Year 2028, and Year 2038. Table 4-3 shows the land use breakdown and vehicle trips generated by each of the three TIAR time periods. At full build-out, access to Nakahili is proposed be provided via: 1) two accesses along Māmalahoa Highway (compared to the four currently permitted access points); and 2) a third proposed access off Waikoloa Road

(improvement of an existing dirt road through the neighboring parcel to the southwest (TMK (3) 6-8-002:008).

Table 4-3. Nakahili Land Use and Build Out Projection

Year	Land Use	New Trips AM (PM)
Year 2023	- 449 Agricultural Lots with Single-Family Farm Dwellings - 300 Multi-Family Residential Units with Retail Component - Approximately 3 Acres Light Industrial - Approximately 6-acre "Community Green" Neighborhood Park	468 (572)
Year 2028	- 409 Agricultural Lots with Single-Family Farm Dwellings - Approximately 29-acre Regional Park	294 (406)
Year 2038	- 108 Accessory Dwellings Units[1] (farm dwellings)	52 (64)

Year 2023 – By 2023 Nakahili is assumed to include the Neighborhood Commercial component, agricultural lots with SF farm dwellings, and the approximately six-acre "community green" neighborhood park, all on the Property north parcels (TMKs (3) 6-8-002: 005, 028, 029, 030). The area projected to be built by 2023 will be accessible by a single access along Māmalahoa Highway.

Year 2028 – By 2028 Nakahili is assumed to include the remaining agricultural lots with SF farm dwellings located on the south parcel of the Property (TMK (3) 6-8-002: 006) as well as the regional park. The area projected to be built by 2028 will be accessible from the north portion of the community and by a second access along Māmalahoa Highway. In addition, new collector road (improvement of an existing dirt road through the neighboring parcel to the southwest) is proposed between Nakahili and Waikoloa Road to provide additional access to the community.

Year 2038 – By 2038 potential construction of 108 accessory dwelling units (ADUs) is assumed. Although the ADUs will not be part of the initial Nakahili development, future agricultural lot owners, at their own discretion and expense, may elect to build an ADU on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), Hawai'i County Code (HCC). While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, for the purpose of the TIAR 108 ADUs are assumed to be built out in 2038.

[1] Although Accessory Dwelling Units (ADUs) will not be part of the initial Nakahili development, future agricultural lot owners, at their own discretion and expense, may elect to build an ADU on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), Hawai'i County Code (HCC). While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, for the purpose of the TIAR 108 ADUs are assumed to be built out in 2038.

As summarized in Table 4-3 above, Nakahili is anticipated to generate 814 (1042) new external vehicular trips during the AM (PM) peak hours of traffic upon full build-out in 2038. Nakahili is expected to contribute to both local and regional traffic along the area roadways. Table 4-4 summarizes Nakahili's contribution to traffic for Year 2023, Year 2028 and Year 2038.

Table 4-4. Nakahili Traffic ContributionTable[1]

Roadway	**2023**	**2028**	**2038**
Queen Kaʻahumanu Highway	1%	4%	3%
Māmalahoa Highway	24%	28%	28%
Waikoloa Road	16%	23%	34%
Daniel K. Inouye Highway	10%	15%	14%
Intersection	2023	2028	2038
Māmalahoa Highway/Waikoloa Road	19%	25%	29%
Waikoloa Road/Paniolo Avenue/Pua Melia Street	10%	17%	18%

1. Traffic contribution determined based on percentage of Nakahili-generated traffic versus total future year traffic projections.

Based on the Property location, the majority of Nakahili traffic is anticipated to travel on Māmalahoa Highway and Waikoloa Road. Due to the high speeds along Māmalahoa Highway and Waikoloa Road, design elements such as acceleration lanes, deceleration lanes, and traffic signals, where applicable, should be considered at the Nakahili accesses. Table 4-5 shows a summary of recommended lane configurations and controls at the Nakahili accesses.

Table 4-5. Recommended Access Configuration and Controls for Nakahili

Location	**Roadway Improvement**
Māmalahoa Highway/North Nakahili Access	- Install a traffic signal when warranted. A traffic signal is expected to warrant by Future Year 2023. - Provide a southbound right-turn deceleration lane → Minimum 175 feet storage and 715 feet deceleration length anticipated. - Provide a northbound left-turn pocket → Minimum 175 feet storage and 715 feet deceleration length anticipated. - Provide an eastbound left-turn pocket → Minimum 175 feet storage anticipated.

Location	Roadway Improvement
Māmalahoa Highway/South Nakahili Access	- Provide stop-control along the South Project Access approach. - Provide a southbound right-turn deceleration lane → Minimum 50 feet storage and 715 feet deceleration length anticipated. - Provide a northbound left-turn pocket → Minimum 100 feet storage and 715 feet deceleration length anticipated. - Provide an eastbound left-turn pocket → Minimum 75 feet storage anticipated. - Provide an eastbound left-turn median acceleration lane → Minimum 1,310 feet acceleration length anticipated. - Provide an eastbound right-turn acceleration lane → Minimum 1,120 feet acceleration length anticipated.
Waikoloa Road/ Nakahili Connector Road	- Provide stop-control along the Project Connector Road approach. - Provide a westbound right-turn deceleration lane → Minimum 50 feet storage and 715 feet deceleration length anticipated. - Provide an eastbound left-turn pocket → Minimum 150 feet storage and 715 feet deceleration length anticipated. - Provide a southbound left-turn pocket → Minimum 100 feet storage anticipated. - Provide a southbound left-turn median acceleration lane → Minimum 1,310 feet acceleration length anticipated. - Provide a southbound right-turn acceleration lane → Minimum 770 feet acceleration length anticipated.

1. Acceleration and deceleration lane lengths based on design speeds of 65 miles per hour (mph) along Māmalahoa Highway and Waikoloa Road, 40 mph along the Project Connector Road and 30 mph along the North and South Project Accesses.

2. Acceleration and deceleration lane lengths based on guidance in the AASHTO Green Book. Need for additional taper length and acceleration/deceleration length should be verified upon design.

Table 4-6 summarizes the roadway improvements that are anticipated to be necessary by Year 2023, Year 2028 and Year 2038 with Nakahili.

Table 4-6. Roadway Improvements Summary for Years 2023, 2028 and 2038 with Nakahili

Year	Location	Roadway Improvement
Year 2023 (With Nakahili)	Waikoloa Road/Paniolo Avenue/Pua Melia Street	- Install a traffic signal when warranted if not completed as part of the Waikoloa Highlands Subdivision project. - Fair share contribution may be required by regional developers for this mitigation if the Waikoloa Highlands Subdivision does not proceed (See Table 4-4 for Nakahili contribution to traffic).

Year	Location	Roadway Improvement
	Māmalahoa Highway/Waikoloa Road	- Install a traffic signal when warranted. - A traffic signal is expected to warrant by Year 2023 but is not anticipated to be necessary until Year 2028. - Fair share contribution may be required by regional developers for this mitigation (See Table 4-4 for Nakahili contribution to traffic).
	Māmalahoa Highway/North Nakahili Access	- Install a traffic signal when warranted. - A traffic signal is expected to warrant by Future Year 2023. - Additional roadway improvements summarized in Table 4-5.
Year 2028 (With Nakahili)	Waikoloa Road/Paniolo Avenue/Pua Melia Street	- Construct an additional eastbound left-turn lane and an exclusive westbound right-turn lane. - Fair share contribution may be required by regional developers for this mitigation (See Table 4-4 for Nakahili contribution to traffic).
	Māmalahoa Highway/South Nakahili Access	- Provide stop-control along the South Nakahili Access approach. - Additional roadway improvements summarized in Table 4-5.
	Waikoloa Road/Nakahili Connector Road	- Provide stop-control along the Project Connector Road approach. - Additional roadway improvements summarized in Table 4-5.
Future Year 2038 (With Nakahili)		- No roadway improvements recommended.

The TIAR concludes: "With the assumed and recommended regional and Project-specific roadway improvements, traffic in the Project area is expected to operate adequately by 2038 with acceptable levels of service at all study intersections."

4.8 INFRASTRUCTURE AND UTILITIES

Austin, Tsutsumi, and Associates, Inc. (ATA) prepared a Preliminary Engineering Report (PER) for Nakahili. The PER addresses infrastructure related to internal roadways, water, wastewater, drainage, electrical power, and telecommunications necessary for Nakahili. Key information from the PER is summarized in the following sections. Appendix E contains the complete PER.

Internal Roadways

The Property has various internal dirt, gravel, and four-wheel drive roadways and has: 1) four unimproved access points off Māmalahoa Highway; and 2) one unimproved access through a neighboring parcel to the southwest (TMK) (3) 6-8-002:008) off Waikoloa Road. All the access ways are gated and have a rough surface condition.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili will include two access points along Māmalahoa Highway (compared to the four currently permitted access points). An existing access road through the neighboring parcel to the southwest (TMK (3) 6-8-002:008) is also proposed to be improved at a point in the future to provide a third access point from Waikoloa Road.

A hierarchy of internal roads is proposed within Nakahili. The two access points off Māmalahoa Highway will connect to major collector roads designed as two-lane undivided streets with a 50-foot right-of-way and wide gravel shoulders and drainage swales on both sides. The collector roads will generally circle the community and one collector road will run through the center of the community. The collector roads will provide access to minor streets (some with cul-de-sacs) that provide access to the agricultural lots. The minor streets are designed as two-lane undivided streets with a 40-foot right-of-way and wide gravel shoulders and grassed swales along both sides. Within the neighborhood commercial "village" area the spine road is designed as a two-lane undivided street with a 66-foot wide right-of-way with: parking on both sides, wide gravel shoulders that can be used as a multi-use path, and grassed swales. Appendix E, Exhibit 8 shows typical roadway sections.

Water

The Property does not have water service from the County of Hawai‘i DWS or any wells or water infrastructure.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Nakahili water system will be in compliance with Chapter 11-20, HAR, titled "Rules Relating to Public Water Systems."

Domestic Water

ATA projects the domestic water demand for Nakahili at full build out to average 1.39 million gallons per day (mgd) and the domestic water maximum demand will be 2.08 mgd. The projected average daily water demand was estimated based on a combination of the County of Hawai‘i's Department of Water Supply (DWS) Water System Standards and an adjusted version of the estimated current Waikoloa Village usage rates for planned uses within Nakahili including

multifamily rental apartments, commercial and light industrial uses, farm dwellings on one to five plus acre agricultural lots, and the "community green" neighborhood park and regional park.

Domestic water for Nakahili will be provided by new wells located on the Property at the high elevations just makai of Māmalahoa Highway. Tom Nance Water Resource Water Engineering expects that wells in this location are almost certain to produce potable quality water and may, in fact, encounter high level rather than basal groundwater. Well Construction/Pump Installation Permits from the Commission on Water Resource Management (CWRM) will be required for the new Nakahili wells.

On Hawai'i, groundwater is the primary source of drinking water. In South Kohala, groundwater occurs as both basal groundwater and high-level (dike-impounded perched) groundwater. The Property is located within the West Mauna Kea Sector, Waimea Aquifer System (80301). Groundwater from this aquifer system is primarily pumped from the basal zone (where fresh groundwater is suspended over seawater). However, the aquifer also includes high-level (or "dike-impounded") groundwater, which is impounded between dense, almost impermeable rock, or dikes, and is typically of excellent quality due to its inland location that prevents salt water intrusion. According to the Hawai'i Water Plan Water Resource Protection Plan (WRPP) (CWRM, 2008), the aquifer sector has a sustainable yield of approximately 24 million gallons per day (mgd) and current use (as of 2005) was 9.173 mgd, or approximately 38 percent of the sustainable yield.

The State Department of Land Natural Resources (DLNR) is in the process of updating the WRPP and released the WRPP 2019 Update Public Review Draft in October 2018. The 2019 Update Public Review Draft estimates the sustainable yield of West Mauna Kea Sector, Waimea Aquifer System (80301) at approximately 16 mgd and quantifies that current use has reached 13.83 mgd, or approximately 86.4 percent of the sustainable yield.

Public hearings on the 2019 Update Public Review Draft are scheduled in February of 2019. Barring any significant and substantive revisions, DLNR staff plan to submit the WRPP 2019 Update to the Commission on Water Resource Management (CWRM) for adoption in April or May of 2019. If significant and substantive revisions are required, DLNR staff will hold additional public hearings statewide. In that case, adoption of WRPP 2019 Update may occur in the fall of 2019. Should the final WRPP 2019 Update maintain the same sustainable yield estimates as in the 2019 Update Public Review Draft, the full build-out of Nakahili may not be realized and alternative plans may be pursued.

Pressure Zones

Because of the significant elevation range of the Property, there will be five pressure zones throughout the community. The determination of each pressure zone boundary is based on the assumed location of the well(s) being at the highest point of the north portion of the Property. The lowest elevation of each pressure zone was determined in accordance with the DWS Water System Standards requirement of a maximum static pressure of 125 pounds per square inch (psi). The

highest elevation of each pressure zone was based on providing a minimum static pressure between 50 psi and 60 psi, which is expected to meet the DWS Water System Standards requirement of providing a minimum residual pressure of 40 psi in the system during peak hour conditions.

Water Storage

The Nakahili water system will include two 1.0-million-gallon water storage tanks, sized in compliance with DWS Water System Standards. The water storage tanks will be located on the Property at the high elevations just makai of Māmalahoa Highway. Due to the elevation of one of the water storage tanks relative to areas of the community at similar or slightly lower elevations, a booster pump pressure system will necessary for one of the water pressure zones. The other four water pressure zones will have adequate water pressure due to the elevation of the water storage tanks relative to the lower elevations of the service zones.

Fire Protection

Fire flow requirements are included in the domestic water demand estimates and the water storage tank capacities. Calculations are based on the proposed uses within Nakahili including low-rise apartments, commercial and industrial, and single-family farm dwellings on lots greater than 10,000 square feet. In addition, water distribution lines are sized in accordance with fire flow requirements.

Water Distribution System

Water distribution pipelines will be located within the Nakahili roadways. Fire hydrants will be installed at a maximum of 300-foot intervals for multi-family, commercial and industrial areas, and at 600-foot intervals within agricultural farm dwelling areas. The pipe sizing for the water distribution system is based on the DWS Water System Standards in accordance with pressure and fire flow requirements.

Water Conservation

To conserve water resources, all Nakahili dwellings will include low-flow and water-efficient plumbing fixtures and devices pursuant to the Hawai‘i County Water Use and Development Plan reference to the Plumbing Code. In addition, in developing Nakahili, where possible and feasible, Work Force Developers will consider climate-adaptive native plants (and other species considered low-risk of becoming invasive) for roadway landscaping, parks, and other common areas. Further, Work Force Developers envisions that future residents may choose to: 1) to plant climate-adaptive, non-invasive plant species (including plant species that may contribute to returning the land to active agricultural production); and 2) not irrigate the entire area of their lots.

Wastewater

The Property is not served by a wastewater collection system. The nearest wastewater treatment plants are located at Waikoloa Village, the closest one being almost six miles from the Property.

POTENTIAL IMPACTS AND MITIGATION MEASURES

A connection to the existing WWTP located at Waikoloa Village was considered. However, due to the distance from the Property and the upgrades required to expand the available capacity at the Waikoloa Village WWTP, it was determined to be a too costly and infeasible option.

Nakahili will include a small wastewater treatment plant (WWTP) within the neighborhood commercial "village" area to service: 1) the multifamily rental apartments and commercial and light industrial uses; and 2) single-family farm dwellings within 1,000 feet of the initial well site. The system would be operated and maintained by a certified WWTP operator and company.

An aerobic biological WWTP capable of treating wastewater to an R-2 effluent level is proposed. The facility would include a primary and a backup soil aquifer treatment basin for effluent disposal, since currently there is no planned use of the effluent. Aerobic treatment systems are widely used and are considered an industry standard for output of reliable R-2 water. Aerobic biological WWTP systems consist of several processes that function together to produce a high-quality effluent, including debris removal, aeration, clarification and biosolids recirculation. In addition, aerobic biological systems have a smaller footprint than various other biological treatment systems and produce very consistent water quality as compared to wastewater treatment ponds and lagoons.

At some point in the future, a larger WWTP may be needed to serve additional any single-family farm dwellings within 1,000 feet of the second well site, the village green, the and regional park. This larger WWTP is proposed be located in the makai area of the community near the regional park. The larger WWTP would be designed to produce R-1 quality effluent allowing the effluent to be used for irrigation purposes as Nakahili is built out and begins to generate enough wastewater. If the larger WWTP is necessary and constructed, wastewater from the smaller WWTP in the neighborhood commercial village area is likely to be directed to the larger WWTP, allowing the smaller WWTP to be decommissioned and the site re-purposed to accommodate full buildout of the neighborhood commercial village area.

ATA estimates that collectively the neighborhood commercial village area, single-family (SF) farm dwellings within 1,000 feet of the well sites, village green, and regional park will generate an average daily flow of 175,078 gpd at full buildout of these uses.

Wastewater from agricultural lot farm dwellings not within 1,000 feet from a well site will be serviced by individual wastewater systems on each agricultural lot. Individual farm dwellings are expected to generate an average daily flow wastewater of approximately 230 gpd per dwelling. In total the farm dwellings are expected to generate an average daily flow of 264,670 gpd.

The individual wastewater systems will be in compliance with all DOH requirements, as provided under Hawai‘i Administrative Rules (HAR) Title 11, Chapter 62, Wastewater Systems (Wastewater System Rules). The purpose of these rules is, in part, to ensure that the disposal of wastewater from wastewater systems does not: "…contaminate or pollute any drinking water or potential drinking water supply, or the waters of any beaches, shores, ponds, lakes, streams, groundwater, or shellfish growing waters…" (see Section 11-62-02, HAR). In addition, the Wastewater System Rules state, in part: "The department of health seeks to ensure that the use and disposal of wastewater and wastewater sludge does not contaminate or pollute any valuable water resource…" and "Individual wastewater systems may be utilized in remote areas and in areas of low population density." (see Section 11-62-01, HAR). The Wastewater System Rules also specify that the "total wastewater flow into one individual wastewater system shall not exceed one thousand gallons, and one individual wastewater system shall not serve more than five bedrooms, whether they are in one dwelling unit or two…" (see Section 11-32.61.1, HAR).

Drainage System

The Property is undeveloped and has no onsite drainage infrastructure. The runoff generally sheet flows overland from the east portion of the Property to the west portion of the Property and concentrates into four onsite gulches that transverse through and divide the Property into four watersheds. The gulches form natural surface water drainage ways that drain to ‘Auwaiakeakua Gulch makai of the Property. The existing undeveloped condition of the Property (pre-development) generates approximately 2,513 cfs of runoff based on a 100-year design storm.

The mauka (east) offsite drainage areas that flow through the Property consist of over 4,455 acres and generate approximately 3,447 cubic feet per second (cfs) of runoff. The offsite runoff flows into the four gulches within the Property that drain into ‘Auwaiakeakua Gulch. The runoff ultimately flows into four off-site culverts, located makai (west) of the Property.

The County of Hawai‘i stormwater rules state that drainage areas exceeding 100 acres are to be designed to the 100-year storm. A summary of drainage analysis for 50- and 100-year storms is included in Table 1 of the PER.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. With the development of Nakahili, the Property will continue to be divided into four watersheds similar to existing conditions. The onsite drainage system will be designed to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development). The County of Hawai‘i Department of Public Works Storm Drainage Standards require that drainage areas exceeding 100 acres be designed to accommodate a 100-year storm event. Preserving the existing drainage patterns will allow for existing mauka offsite runoff to continue to flow through the Property, as under existing conditions.

After buildout (post-development) Nakahili is expected to generate 3,316 cfs of runoff (an increase of 803 cfs compared to existing conditions), based on a 100-year storm event. To accommodate the increased runoff, the total storage volume required for Nakahili is calculated to be approximately 120 acre-feet (ac-ft). This storage volume will be provided with several retention basins throughout the Property to capture and retain post-development stormwater onsite. The onsite retention basins are shown conceptually on the Conceptual Master Plan and more specifically in Appendix E, Exhibit 9.

The drainage design will incorporate Low Impact Development (LID) features as practical and feasible, such as vegetated buffers/filter strips, grass swales, and infiltration basins.

Electrical System

The Property is undeveloped and does not have any connections to electrical services, but a Hawai‘i Electric Light Company (HELCO) 69 kV transmission line runs north-to-south along the Property’s eastern boundary within the Māmalahoa Highway right-of-way and the Property is in the vicinity of HELCO’s Ke‘āmuku Switching Station.

POTENTIAL IMPACTS AND MITIGATION MEASURES

At full build-out, Nakahili would add approximately 6 Mega Volt-Amperes (MVA) of load to HELCO’s system. To provide electrical service to Nakahili HELCO would likely need a substation site (approximately 20,000 square feet in size) on the Property, preferably along Māmalahoa Highway to avoid extension of the 69 kV line too far into the Property.

To the extent practicable, an underground HELCO duct system consisting concrete encased PVC conduits is proposed within the Nakahili road right-of-ways with interval handholes or manholes to allow for utility laterals to lots and intersection utility extensions. Construction of the duct system will conform to Chapter 6-73, HAR. As an option, overhead utilities may be used where undergrounding is infeasible and/or cost prohibitive.

At the commencement of the engineering design, HELCO will determine if single-phase transformers will be placed to serve multiple lots or if individual lots will each have a transformer based on the lot’s projected load. If HELCO determines that single phase transformers are to be placed to serve multiple lots, HELCO will require easements for these transformers. For electric service to the on-site water well, water pumping stations and wastewater facility, three-phase distribution lines will be required along the infrastructure roadways servicing as access roadways to these facilities.

To meet State energy conservation and clean energy goals (HRS Chapters 344 and 226), measures for energy efficiency and cost-effective energy conservation will be implemented to reduce the maximum electrical load and energy consumption. Solar water heater systems will be included for all single-family farm dwellings sold by Work Force Developers, as required under Section 196-

6.5, HRS; or alternatively energy-efficient gas water heating systems may be used, as may be permitted under the variance provisions of Section 196-6.5, HRS. Other energy-saving technologies and features to be considered include:

- ENERGY STAR qualified appliances in dwellings sold or rented by Work Force Developers
- Maximum use of day lighting.
- High efficiency lighting.
- Roof and wall insulation, radiant barriers, and energy efficient windows
- Installation of light-colored roofing.
- Use of landscaping for shading of buildings.
- Use of landscaping for dust control and to minimize heat gain.
- Use of solar parking lot lighting.

Communication System

The Property is undeveloped and does not have any connections to communication systems, however the utility pole lines along Māmalahoa Highway have Hawaiian Telcom (HTCO) and Charter Communications (Charter) lines.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Both HTCO Charter are expected to provide service to Nakahili, although their utility pole lines along Māmalahoa Highway Māmalahoa Highway may not currently have sufficient capacity. Per HTCO's PUC approved tariff and Charter's DCA franchise, off-site infrastructure costs are typically borne by the respective utility company based on the anticipated revenue from the Development. Both HTCO and Charter have the capability to provide bundled telecommunications services (i.e. telephone lines, cable television and broadband, via a fiber optic cable installation).

Highway and Street Lights

The Property is undeveloped and does not have any highway and street lights.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The new proposed access roads to the Property from Māmalahoa Highway will require a highway lighting system, which typically extends 1,000 – 1,500 feet on either side of the intersection. Per a maintenance agreement between the State Department of Transportation (DOT) and the County of Hawai‘i, the highway light poles and luminaires will utilize County standard materials. The County will maintain the highway light poles and luminaires; however, the highway lighting system must have its own electrical meter and electrical system. A final determination of the extent of the required highway lighting system will be made by DOT when reviewing the plans for the new roadway access to the Property.

The street lighting system along roadways within the Property will utilize COH standard poles and luminaires as well as require one or more sets of electrical meters and service equipment. The street lighting system conductors will run parallel with the electric and telecommunications infrastructure and will be in compliance with Chapter 14, Article 9, HHC, which provides standards to limit degradation of the night visual environment by minimizing light glare, pollution, and trespass through regulation of the type and use of outdoor lighting.

Solid Waste

The County Department of Environmental Management (DEM) Wastewater/Solid Waste Division operates two landfills, one in Kona (West Hawai‘i Sanitary Landfill) and the other in Hilo (Hilo Landfill). There are also several solid waste transfer stations located around the island. The transfer station nearest to the Property is the Waimea Transfer Station and Recycling Center, located an approximately 12.5 miles north of the Property. Waimea Transfer Station and Recycling Center is also a green waste collection site.

Solid waste generated in the Waikoloa region that is not recycled is transported to the West Hawai‘i Sanitary Landfill in Pu‘uanahulu, located approximately nine miles south west of the Property. As of 2008, approximately 9.4 pounds of solid waste per capita daily is generated in Hawai‘i County, much greater than the U.S. average of 4.6 pounds per capita daily during the same time year (County of Hawai‘i, 2009). The West Hawai‘i Sanitary Landfill receives approximately 61.2 percent of the County’s solid waste (the equivalent of approximately 128,543 tons of solid waste per year) from. However, at the end of 2017, the County began the planning process to close the Hilo Landfill, which will cause all non-recyclable waste to be diverted to West Hawai‘i Sanitary Landfill for final disposal (DEM, 2017).

Approximately 29.2 percent of solid waste in the County was diverted from landfills in 2008 (an equivalent of 86,443 tons) (County of Hawai‘i, 2009).

Construction and Demolition (C&D) waste from the region is disposed of at the West Hawai‘i Sanitary Landfill, although the County has been considering the addition of a C&D facility like those which currently exist on O‘ahu and Maui.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Waste generated by site preparation will primarily consist of vegetation, rocks, and debris from clearing, grubbing, and grading. Soil and rocks displaced from grading and clearing will be used as fill within the Property as needed and if of suitable quality. Construction waste will consist of waste lumber, concrete, and other building materials. Demolition and construction waste that cannot be recycled will be taken to the West Hawai‘i Sanitary Landfill through use of a private waste management service, such as Pacific Waste, Inc.

After construction, Nakahili residents will generate solid waste related to household and agricultural uses. The County's Waimea Transfer Station and Recycling Center provides services for residential refuse drop-off and recycling. Waste that cannot be recycled will be disposed of in the West Hawai'i Sanitary Landfill.

In the long-term, solid waste generated from Nakahili households is not expected to significantly to increase the total solid waste generated or anticipated to be generated on the island, as Nakahili will provide homes primarily for Hawai'i residents who would generate approximately the same amount of solid waste regardless of if they reside at Nakahili.

Agricultural operations will generate a small increase in waste, however, much of this waste will be made up of organic materials, which can be used for homeowner compositing or disposed of at greenwaste recycling facilities throughout the county.

4.9 SOCIO-ECONOMIC CHARACTERISTICS

Population and Demographics

County Population and Household Trends

Hawai'i County (County) has exhibited strong and sustained population growth for decades, increasing 24 percent between the US Census counts in 1990 and 2000, and another 25 percent between 2000 and 2010. By comparison, the State's population increased only 9 percent and 12 percent respectively, over the two past decades, and population is estimated to have declined slightly in 2017 and 2018.

As of 2017, Hawai'i County was estimated to have a population of 200,381 residents, 8 percent or 15,305 more than the 185,079 enumerated in 2010 , and 0.9 percent or 1,700 more than estimated a year earlier, in July 2016. This represents an average annual increase of 1.1 percent (U.S. Census Bureau, 2018). County population estimates are not yet available for 2018.

Going forward, State projections indicate the County's resident population could increase at 1.3 to 1.4 percent per annum through 2025, with annual rates of increase slowing to 1.1 percent by 2035 (DBEDT, 2018). This would result in a County resident population of some 248,500 persons by 2035, an increase of more than 48,000 persons.

Table 4-7: Estimated and Projected Population, County of Hawai'i

	2017	2020	2025	2030	2035
Population	200,381	209,000	222,400	235,600	248,500
Change since prior date	15,305	8,600	13,400	13,200	12,900

	2017	2020	2025	2030	2035
Change since 2017	0	8,600	22,000	35,200	48,100
Annual rate of growth since prior date	1.1%	1.4%	1.3%	1.2%	1.1%

Sources: Census 2018 (2017 estimate) and DBEDT 2018 (2020 to 2035 projections)[2]

Area Population and Housing Characteristics

Within Hawai‘i County, the number of persons residing in the South Kohala District, in which Nakahili is located, has increased faster than the County as a whole. Average annual growth in South Kohala is estimated by ESRI at 3.0 percent between 2000 and 2010, and 1.8 percent between 2010 and 2018, compared to 2.2 percent and 1.3 percent for the County as a whole in the same periods. South Kohala's more rapid growth is attributed to its jobs base and accessibility to additional opportunities in the North Kona District immediately to its south.

Demographics are examined further for South Kohala and an area referred to as "North Hawai‘i". North Hawai‘i combines the South Kohala, North Kohala and Hāmākua districts, and is of interest because it is the geographic reporting unit used in several of the housing studies presented in the next section. Thus, the table below shows demographic and housing data as estimated for 2018 for the South Kohala District, North Hawai‘i, and the County. Some observations:

- South Kohala currently houses about 20,300 persons, about 10% of County population, while North Hawai‘i houses some 34,300, or 17 percent of County population.
- At 2.80 and 2.85, respectively, average household sizes appear to be somewhat higher in South Kohala and North Hawai‘i than in the County as a whole, where they are estimated at 2.75. Although not shown in the table, average household sizes appear to have been increasing in all areas considered.
- Median household income in South Kohala, at about $80,000, is about 140 percent of the median estimated for the County by ESRI ($57,000). North Kohala's estimated median income of about $70,000 is lower than for South Kohala alone, still higher than the County estimate.
- Median home values are notably higher in South Kohala (about $470,000) and North Hawai‘i (about $434,000) than for the County as a whole (about $335,000).

[2] Figures as of July 1; changes for 2017 reflect comparisons to April 1, 2000 U.S. Census count.

Table 4-8: Demographic and Home Value Profiles

Subject	South Kohala	North Hawai‘i [3]	North Hawai‘i as % of County	Hawai‘i County
Population	20,273	34,262	17%	205,188
Median age	40.8	42.0	99%	42.3
Households	7,157	11,920	16%	73,242
Average household size	2.80	2.85	104%	2.75
Median household income	$80,149	$69,960	123%	$57,081
Home values:				
Median	$479,199	$434,457	130%	$334,574
Average	$579,790	$492,965	120%	$409,799

Source: ESRI, 2018.

County Employment Trends

According to the University of Hawai‘i Economic Research Organization (UHERO, 2018). Hawai‘i County’s unemployment averaged 2.8 percent in 2017, continuing a downward trend from the 3.7 percent observed in 2016, and 10.2 percent at its last peak in 2009. The civilian labor force was estimated at 91,400 persons in 2017, of which 88,800 were employed.

The largest sectors of employment include retail, government, health services, eating and drinking places, business services, construction, and accommodations. Going forward, the State of Hawai‘i, DBEDT anticipates higher than average rates of growth in professional, business, educational and health services, as well as in eating and drinking places and wholesale trade.

While government positions are concentrated in the County seat of Hilo, employment in the South Kohala area is led by health services, eating and drinking, construction, and accommodations.

Housing Market Demand

The need for additional primary residential housing in the County has been well documented and widely discussed for decades. The 2018 losses, through August, of more than 700 homes in the Puna District have exacerbated this issue on an island-wide basis. This section references recent studies that provide particular context to Nakahili.

[3] Includes South Kohala District, as well as districts of North Kohala and Hāmākua. This composite area is referenced by various studies cited subsequently.

County Housing Inventory

The U.S. Census identified 88,096 housing units in the County as of 2017, representing a 0.9 percent rate of increase since 2010. While this was the most rapid increase among the State's four counties, it still lagged the County's population growth, which increased 1.1 percent per annum over the same period.

Moreover, based on survey data collected by the American Community Survey and reported by SMS in 2017, about 17 percent of this inventory consists of units not available as primary residences, most often because they are held for seasonal or recreational use (SMS, 2017). Based on this ratio, some 14,700 homes of the current inventory are estimated to be not available for primary housing purposes. The County's incidence of nonresidential housing was higher than any other county, and well above the statewide average of 9 percent (Hawai'i Housing Planning Study (HHPS)-Inventory, Table 1).

Pent-Up Demand

A commonly accepted measure of pent-up demand for housing is the incidence of households that are crowded and/or doubled-up. These are considered indicators that household formation has been constricted by the availability, affordability, or other barriers to obtainment of adequate housing. A 2016 study by SMS describes the two factors for Hawai'i County (SMS, 2016):

- **Crowded** – HHPS defined crowding based on number of persons per bedroom - more than one person per bedroom. This threshold, applied by SMS in its 2016 study, is more restrictive than the U.S. Census definition of this term, which is based on more than one person per room (not just bedrooms). While the County-wide incidence of crowding has been somewhat stable at 7 percent to 8 percent of households since 1997, doubled-up households have become more prevalent (SMS, 2016).

- **Doubled up** – Doubling-up is defined as two or more families, or groups of persons not related by birth, marriage or adoption, living together in one housing unit. While some local culture encourages extended-family living, SMS indicates it measured doubling-up due to financial reasons only. Using this measure, about 11 percent of County households are reported to have been doubled-up in 2016, compared to about 9 percent in 2003.

- **Overall** – The combined rate of households thought to be crowded and/or doubled up is less than the sum of the incidences of each, since some households are both crowded and doubled up. County-wide, the combined rate was estimated at 16 percent in 2016, or about 10,700 households.

Table 4-9: Households and Pent-up Demand Indicators,

	North Hawai‘i	County
2016 households	10,203	66,989
Crowded and/or doubled-up		
Number	1,765	10,718
Percent	17%	16%

Source: SMS, 2016, Table K-4.

The HHPS also details the magnitude and nature of current demand for housing, with attention to districts within the island. In this study, the South Kohala District, in which Nakahili is located, is grouped together with the adjacent North Kohala and Hāmākua districts, which are far less populous: South Kohala is estimated to account for about two-thirds of all households in this combined area.

The HHPS reports 10,203 households in North Hawai‘i in 2016, with 17 percent of those, or about 1,765, estimated to be crowded and/or doubled up. This is a potential indicator of current pent-up demand originating from the North Hawai‘i area. However, the 10,700 crowded and/or doubled up households observed County-wide is also an important indicator, since those potential new households may choose to live outside of their current area of residence, and such choices are likely to be strongly influenced by the availability and affordability of housing options in any given area.

Growth-Based Demand

In addition to current demand, Hawai‘i County and its North Hawai‘i area will need substantial new housing development to accommodate household formation due to anticipated population growth. Referencing the 48,100-person County population growth anticipated after 2017, this suggests a need for 17,800 more homes by 2035, at the current average household size of 2.7 persons. Adding a conservative allowance for 5 percent vacancy to permit turnover, some 18,700 more homes could be needed to accommodate population growth by 2035.

Conclusions for Total Demand

Considering current demand together with the demand that will be generated by anticipated rates of population increase, the future need for additional primary resident-oriented housing on Hawai‘i Island is formidable. Adding the estimated pent-up demand and growth-based demand components together, the County could require up to 28,400 more homes delivered by 2035 (10,700 pent-up demand plus 18,700 future demand).

Corroborating this conclusion, a 2015 study prepared by DBEDT examined needs as then seen for the 2015 to 2025 period, considering demands that can be expected to originate from future population increases as well as the need to create a reasonable level of vacancy in the existing housing stock, and considering visitor-related uses of housing inventory (DBEDT, 2015). The study forecasted a need for 19,600 to 20,100 additional housing units throughout the County, between 2015 and 2025. About 16,300 units of this need, more than 80 percent, was due to the demand for County resident household formation over the period.

The studies suggest a need to add 1,600 to 2,000 new primary residential homes in an average year to meet needs. In contrast, private residential permitting for Hawai‘i County between 2015 and 2017 averaged only 784 units annually, or 752 when associated demolitions are deducted (DBEDT, 2018). Moreover, not all of these permitted units will get built on a timely basis, or ever, and many are likely to target non-residential markets.

Tenure and Location of Demand

Another insight to housing demand and its characteristics is residents' interest in moving from their current home. The HHPS study surveyed County households regarding their desire to move. The study defined "Effective Demand Movers" as those who stated they wish to move within the next 10 years, have an idea about the timeframe of their move, and plan to remain within the State. County-wide, these intended movers represented over 24,500 households; in North Hawai‘i alone, there were an estimated 4,100 such intended movers.

Among the groups "Effective Demand Movers", 36 percent of then-North Hawai‘i residents, and 46 percent of County residents indicated a plan to buy their next home, while the balance, or the majority of potential future movers, indicated plans to rent or pursue some other arrangement.

Table 4-10: "Effective Demand" to Move, 2016

	North Hawai‘i	County
"Effective Demand Movers"	4,144	24,570
Plan to buy	*36%*	*46%*
Plan to rent or other	*64%*	*55%*

Source: SMS, 2016, Tables K-5 and K-6.

The HHPS survey also asked the preferred area of residence for these intended movers. First, 21 percent of those planning to buy and 12 percent of those planning to rent indicated no locational preference. Where a location was named, North Kona and the Hilo area were the most preferred. Both are areas close to jobs and established communities. The North Hawai‘i area (which includes Waimea Town) was the third most frequently referenced for both buyers and renters, and was the strong area of preference for persons already living in North Hawai‘i.

Affordable Housing Standards

State Standards

To qualify as a 201H project, the State of Hawai‘i requires that at least 50 percent of homes to be developed, plus one unit, be designated affordable to households earning 140 percent or less of the area median income (AMI).

County Pricing Guidelines

The County OHCD's 2018 Affordable Housing Guidelines provide affordable housing sales prices based on income levels and household sizes. Applying these guidelines, Table 4-11 shows maximum sales prices for a 3-bedroom unit that would accommodate a 4-person household within the income ranges considered[4]:

Table 4-11: Affordable Housing For-Sale Prices, 2018

% of Median	Maximum Household Income	Maximum Sales Price
80%	$62,800	$322,300
100%	$78,500	$402,800
120%	$94,200	$483,400
140%	$109,900	$564,000

Table 4-12 shows OHCD's corresponding 2018 guidelines for affordable rentals, for 1- and 2-bedroom units.

Table 4-12: Affordable Rental Guidelines: 1- and 2-Bedroom Homes, 2018[5]

Credits	% of Median	Monthly Rent, 1-BR	Monthly Rent, 2-BR
2.0	60%	$883	$1,060
1.5	80%	$1,178	$1,414
1.0	100%	$1,472	$1,767
0.5	120%	$1,766	$2,120

Market Conclusions for Nakahili

Nakahili could be an important component of a County plan to meet an anticipated future demand for some 28,400 resident-oriented housing by 2035. Nakahili is located near to existing community

[4] Figures effective May 15, 2018, and consider a 30-year conventional fixed mortgage, fixed interest rate of 4.00%, and a down payment equal to 5% of the sales price.
[5] Guidelines effective May 15, 2018. Affordable rents are based on 30% of gross monthly income and include utilities (water, sanitary sewage service, electricity and/or gas.)

infrastructure at Waikoloa Village, and within a short drive of major job centers in Waimea Town, South Kohala resorts, and myriad public and private sector opportunities in the adjacent North Kona District.

As a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, a majority of the Nakahili dwellings (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. In addition, OHCD requires the following additional affordability criteria:

- A minimum of 4% of the total units must be affordable to households with incomes at or below 80% of the median income.
- A minimum of 8% or more of the total units must be affordable to households with incomes at or below 100% of the median income.
- A minimum of 12% or more of the total units must be affordable to households with incomes at or below 120% of the median income.
- A minimum of 20% or more of the total units must be affordable to households with incomes at or below 140% of the median income.

Unlike many other West Hawai‘i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households. Nakahili is seen to serve diverse market segments including new householders, first-time buyers, move-up buyers, downsizing households, and seniors. Notably, it would produce a substantial inventory of rental housing opportunities, in alignment with the State's 2016 HHPS finding that more than half of intended County movers, including those currently living in North Hawai‘i, do not expect to purchase their next home. In addition, with its 300 apartments, of which at least 50% are planned to be made available for rent at affordable rates by 2023, Nakahili would also represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawai‘i.

Economic and Public Fiscal Impact Assessment

The State of Hawai‘i has experienced an economic resurgence since the 2008-09 recession and is expected to continue positive growth in 2019, according to the State of Hawai‘i, Department of Business, Economic Development and Tourism (DBEDT website, 2018).

The University of Hawai‘i Economic Research Organization (UHERO) Forecast Project notes that all four of the state's counties continue to enjoy robust economic conditions, with good prospects for continued growth (UHERO, 2018). Visitor arrivals, construction and nonfarm payrolls all show increases, and unemployment rates are at all-time lows. In fact, the major economic concerns have to do with congestion due to high visitation, limited labor availability, high housing costs, and homelessness.

The West Hawai‘i region has experienced significant and accelerating development over the past four decades, becoming one of the leading resort and residential areas in the State, known for its high-quality destination resorts, upscale hotels and timeshare units, diverse residential inventory. The area is a fundamental driver of the County of Hawai‘i economy, tax base, and employment.

POTENTIAL IMPACTS

In addition to addressing the demand for housing due to pent-up demand and population growth, Nakahili will: attract new capital investment; create direct jobs in construction and on-going maintenance/renovation activity; and stimulate the Hawai‘i economy. This will in turn generate enhanced secondary employment and business opportunities for island residents and companies while further expanding the tax base for the State and County.

Nakahili’s economic impacts include:

- Capital investment related to Nakahili’s planning, design and construction;
- Creation of direct jobs related to development, including for: design and other professionals; infrastructure and building construction workers; and real estate, marketing, finance, and administrative support persons– for both the initial project build-out of the workforce homes and subsequent construction of homes on the 15 market lots;
- Creation of direct jobs related to consumer spending on furnishing the new homes, as well as their ongoing maintenance; and
- Indirect and induced impacts related to the above, with impacts concentrated on Hawai‘i but realized throughout the state.

Fiscal impacts include:

- For the County:
    - Increased real property taxes;
    - Other miscellaneous taxes and fees; and
- For the State:
    - General excise tax on direct, indirect, and induced development and operations expenditures;
    - Income taxes attributable to development-related employment; and
    - Other miscellaneous taxes and fees.

4.10 PUBLIC SERVICES AND FACILITIES

As discussed in Section 2.3, Nakahili addresses the demand for housing in Hawai‘i County due to a growing population. State population projections indicate that the Hawai‘i County population is projected to increase to approximately 222,400 residents by 2025, and to 248,500 residents by 2035 (DBEDT, 2018). As such, Nakahili is not expected to cause a significant increase in the population of the island, but rather it will provide homes for Hawai‘i’s growing population. Families living at Nakahili would require the same public services, whether residing at Nakahili, or elsewhere on Hawai‘i.

Complete build-out of Nakahili is projected to occur over approximately 20 years and thus the need for additional public services to serve Nakahili residents is expected to occur incrementally. The needs of a growing population relating to public services and other issues will need to be addressed regardless of whether Nakahili is built.

Nakahili is located between Waimea and Kailua-Kona, which include government facilities such as police and fire protection services, schools, and other government services.

Nakahili will contribute to State and County revenues in the form of property taxes, general excise taxes, and income taxes from increased employment. Should the State of Hawai‘i and County of Hawai‘i choose to allocate these tax revenues to fund more services to protect public health, welfare, and safety, any cost to the public that may result will effectively be minimized.

Schools

Waikoloa Elementary and Intermediate School is located approximately four miles west of the Property within Waikoloa Village. Waimea Elementary School is approximately 8 miles north of the Property and Waimea Middle Public Charter School is approximately 8.5 miles north of the Property. Hawai‘i Preparatory Academy, open to grades K-12, is approximately 7.7 miles north of the Property in Waimea. The closest high school is Honoka‘a High and Intermediate School, located approximately 25 miles northeast of the Property, while Kealakehe High School is the second closest high school, approximately 28.5 miles south west of the Property in Kailua-Kona.

Student enrollment at Waimea Elementary School has declined on average over the past 10 years (2008-2018), with 505 students enrolled in 2018. However, the State Department of Education (DOE) projects that student enrollment will gradually increase over the next five years and projects 541 students enrolled by the 2023-2024 school year. In contrast, student enrollment at Waikoloa Elementary and Intermediate School has been gradually increasing over the past 10 years, with 833 students enrolled in 2018. However, the DOE projects that the student enrollment will gradually decline over the next five years, with a projection of 786 students enrolled by the 2023-2024 school year.

Waimea Middle Public Charter School has had a gradual, but consistent decline in student enrollment over the past 10 years, with 259 students enrolled in 2018. Honoka‘a High and Intermediate School has likewise seen a gradual, yet steady decline in student enrollment, with 611 students enrolled in 2018. The DOE projects that enrollment will continue to decrease, with a projection of 567 students enrolled by the 2023-2024 school year. Student enrollment at Kealakehe High School has also been declining on average over the past 10 years, although the high school did have significant growth in student enrollment from 2015 to 2018, exceeding past projections for 2018 with 1,374 students enrolled. The DOE projects that student enrollment will continue to increase, with a projection of 1,549 students enrolled by the 2023-2024 school year.

Table 4-13: Public School and Public Charter School Existing and Projected Enrollment

School	2018 -2019 Enrollment	Projected 2023-2024 Enrollment	% change projected from 2018
Waimea Elementary	505	541	7.1%
Waikoloa Elementary and Intermediate	833	786	-5.6%
Waimea Middle Public Charter	259	n/a	n/a
Honokaʻa Intermediate and High	611	567	-7.2%
Kealakehe High	1,374	1,549	12.7%

Source: (State of Hawaiʻi, Department of Education, 2018)

POTENTIAL IMPACTS AND MITIGATION MEASURES

Sections 302A-1601 to Section 320A-1612, HRS, regarding school impact fees, establish a structure for assessing school impact fees for residential development. Work Force Developers will comply with all laws regarding school impact fees.

Police, Fire, and Medical

Police Protection

The Property is located within the Hawaiʻi Police Department, South Kohala Patrol District. The South Kohala Patrol District extends south from the North Kohala District boarder at Kiowa to the north boundary of the Kona District at Kauaʻi Point. The central station for the district is Waimea Station located at 67-5185 Kamāmalu Street in Waimea, approximately 11 miles from the Property.

Fire Protection

The Hawaiʻi County Fire Department's (HCFD) Fire Protection Division has the responsibility of protecting life and property from fire and other multifarious emergencies. The Fire Department's multi-emergency work force manages a variety of crises throughout the Island of Hawaiʻi and adjacent shores. HCFD provides the following services for all Hawaiʻi Island residents and visitors: 1) fire suppression (structural, vehicular, brush, crop, etc.); 2) medical emergencies (pre-hospital for traumatic or natural illness); 3) land and sea rescues involving water sports or fishing, overdue hikers, hunters, or fishermen, etc.; 4) vehicular or other extrications; and 5) hazardous materials mitigation. The County has contracted with the State Department of Health for emergency medical ambulance services. All fire department personnel who provide basic and advanced life support are licensed or certified as required by State law.

The HCFD has 20 full-time fire/medic stations, and twenty volunteer fire stations. There are over 60 pieces of fire service apparatus, equipment, and vehicles available for a variety of emergencies that may occur on the island's 4,028 square miles. For firefighting purposes, the County of Hawaiʻi is divided into two battalion areas, East and West.

The closest fire station is the Waimea Fire Station (Hawai‘i County Fire Station #9, West Battalion), approximately 11 miles north of the Property. The Waimea Fire Station is located on Kamāmalu Street in Waimea.

Medical Services

The closest medical services include the Kaiser Permanente Waimea Clinic and North Hawai‘i Community Hospital, located approximately 10 miles north of the Property. In addition, Kaiser Permanente Kona Medical Office and The Queen’s Medical Center are located approximately 24 miles to the south east of the Property in Kailua-Kona.

The North Hawai‘i Community Hospital is a 35-bed rural acute care hospital located in Waimea. The main hospital employs over 300 hospital staff and over a dozen physicians, in addition to the outpatient clinics located in the Lucy Henriques Medical Center and at the Hale Ola Pono Primary Clinic located less than a mile from the hospital. The hospital also provides 24-hour emergency medical services.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili is not expected to create an increased demand on existing Police, Fire, or Medical services after construction, as Nakahili will not generate an increase in student population. It is noted however, that there will be an occasional and unavoidable need for one or more of these services.

Recreational Facilities

The Hawai‘i County Spencer Park at ‘Ōhai‘ula beach is located approximately 9.7 miles north west of the Property with beach access for swimming and snorkeling in addition to camping sites with public facilities such as picnic areas, pavilions, showers, bathrooms, and drinking water stations. The Waimea District Park is located approximately 8.5 miles north of the Property, which includes tennis courts, a baseball diamond, skate park, and an adjacent community center.

Hāpuna Beach State Park, located approximately 7.6 miles makai of the Property, is one of the closest beaches to the Property for swimming, snorkeling, bodysurfing, and other beach activities. The state park also provides facilities such as bathrooms, showers, picnic areas, and concession areas, along with camping grounds and hiking trails. In contrast, the Kīholo State Park Reserve, approximately 13.2 miles south west of the Property, is a remote, coastal lava park with campsites and limited to no public water sources or bathrooms.

Other parks in the vicinity of the Property include Waimea Nature Park (Ulu Lā‘au), just south of the Waimea District Park. The Waimea Nature Park also provides access to the Waimea Stream Trail (Ke Ala Kahawai O Waimea). The Waimea Community Park and the Parker Ranch Soccer field are also located in Waimea, approximately 10 miles north of the Property.

West of the Property is the Waikoloa Dryland Wildfire Safety Park, located within Waikoloa Village, which includes an educational garden of native Hawaiian plant species that can provide fire-resistant landscaping. Further makai are a variety of beach parks along the coastline, including Kalahuipua‘a Historic Park that has trails leading through preserved historic fishponds. The Holoholokai Beach Park, approximately 16 miles west of the Property and just north of the Kalahuipua‘a Historic Park, includes rocky, white sand beaches.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Nakahili is not expected to have a significant impact on nearby recreational facilities, such as those in Waimea and Waikoloa. While future residents of Nakahili may choose to use these facilities, Nakahili will include additional onsite community facilities that will be more accessible to the residents, especially given the fact that existing recreational facilities would only be accessible by car.

The Nakahili plan includes an approximately 29-acre regional park located in the lower (makai) central area, as well as a smaller community green adjacent to the village area. Future plans may also include the expansion of the Nakahili regional park to adjacent land makai of the planned park boundaries, as well as potential for a pedestrian and equestrian trail to be included within the planned firebreak along the Property boundary.

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5 LAND USE CONFORMANCE

State of Hawai‘i and County of Hawai‘i land use laws, rules policies, and plans relevant to the Nakahili are described below.

5.1 STATE OF HAWAI‘I

Constitution of the State of Hawaii, Article IX, Section 1

Work Force Developers understands that pursuant to Article IX, Section 1 of the Hawai‘i State Constitution, all public natural resources are held in trust by the State for the benefit of the people. Such natural resources include land, water, minerals and energy resources. Based upon the analyses contained and referenced this EA, approval of Nakahili will be consistent with the public trust doctrine. No adverse impact on surface waters is anticipated. The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. The onsite drainage system will be designed to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development). Ground water resources will be developed and used in compliance with the State Water Code (Chapter 174C, HRS), County of Hawai'i requirements, and State Department of Health requirements. Wastewater systems will be designed and operated in compliance with the DOH Wastewater System Rules (Title 11, Chapter 62, HAR). With Nakahili, land and resources of the Property and the surrounding area will be put to reasonable and beneficial uses which are consistent with public trust principles. Nakahili will not compromise the public's future use of resources.

Hawai‘i Housing Finance and Development Corporation, Chapter 201H, HRS

Section 201H-38, HRS which was enacted to encourage the development of affordable housing. Section 201H-38, HRS (titled "Housing development; exemption from statutes, ordinances, charter provisions, and rules"), provides that the various County Council's shall authorize the development of housing projects that "shall be exempt from all statutes, ordinances, charter provisions, and rules of any government agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of dwelling units thereon" as long as: the project meets minimum requirements of health and safety; the project does not contravene any safety standards, tariffs, or rates and fees approved by the Public Utilities Commission for public utilities or of the Board of Water Supply; and the County Council approves the project by resolution.

Discussion: Approvals for Nakahili are proposed be processed under Section 201H-38, HRS. See Section 5.3 for more information regarding the categories of exemptions expected to be sought for Nakahili.

State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

The State Land Use Law (Chapter 205, HRS), establishes the State Land Use Commission (LUC) and authorizes this body to designate all lands in the State into one of four Districts: Urban, Rural, Agricultural, or Conservation. The Property is located within the State Land Use Agricultural District (State Agricultural District) (Figure 4).

Nakahili's family agricultural area will generally conform to the development standards set forth under HHC Chapter 25 (Zoning) for Family Agricultural Districts, which provide for a blend of small-scale agricultural operations associated with small acreage farms, farm estates, and subsistence lots within the State Agricultural District.

Nakahili's family agricultural lots will range in size from one acre to over five acres in accordance with Section 205-5(b), HRS, which specifies that the minimum lot size within the State Agricultural District shall not be less than one acre. Thus, all the family agricultural lots will be in compliance with the minimum lot size required in the State Agricultural District and will remain in the State Agricultural District. Under Section 205-2(d)(7), HRS, farm dwellings are a permitted use within the State Agricultural District. "Farm dwelling," as defined under Section 205-4.5(a)(4), "means a single-family dwelling located on and used in connection with a farm."

Nakahili's neighborhood commercial "village" area will be 15 acres in size or less and will generally conform to the development standards set forth under HHC Chapter 25 (Zoning) for Neighborhood Commercial Districts, which apply to strategically located commercial centers that supply goods and services to a residential or working population on a frequent need or convenience basis. Nakahili's neighborhood commercial area will contain apartments and limited retail and light industrial uses, which are not permitted uses within the State Agricultural District but would be permitted within the State Land Use Urban District (State Urban District). Work Force Developers will comply with all requirements necessary pertaining to Chapter 205, HRS to allow the uses proposed within the neighborhood commercial "village" area.

Coastal Zone Management Act, Chapter 205A, Hawai‘i Revised Statutes

The U.S. Congress enacted the Coastal Zone Management (CZM) Act to assist States in better managing coastal and estuarine environments. The act provides grants to States that develop and implement Federally-approved CZM plans. The State of Hawai‘i's CZM Act Program was enacted pursuant to Chapter 205A, HRS. The program outlines management objectives centered around ten (10) areas: 1) Recreational Resources; 2) Historic Resources; 3) Scenic and Open Space Resources; 4) Coastal Ecosystems; 5) Economic Uses; 6) Coastal Hazards; 7) Managing Development; 8) Public Participation in Coastal Management; 9) Beach Protection; and 10) Marine Resources. All lands within the State of Hawai‘i fall within the CZM area, including the Property.

The Property is located outside of the Special Management Area (SMA). The objectives and policies of the CZM Program, along with a discussion of how the Nakahili conforms to these objectives and policies, are discussed in Table 5-1 below.

Table 5-1. Compliance with the Coastal Zone Management Act, Chapter 205A, HRS

COASTAL ZONE MANAGEMENT ACT, CHAPTER 205A, HRS (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
RECREATIONAL RESOURCES			
Objective: (A) Provide coastal recreational opportunities accessible to the public.			
Policies:			
(A) Improve coordination and funding of coastal recreational planning and management; and			X
(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:			X
(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;			X
(ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;			X
(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;			X
(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;	X		
(v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;			X
(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;			X
(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and			X
(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.			X
Discussion: Nakahili will include two parks: 1) an approximately six-acre "community green" neighborhood park located adjacent to the village area; and 2) an approximately 29-acre regional park in the lower (makai) central area (see Section 2.3.1 and Figure 8).			
HISTORIC RESOURCES			
Objective: (A) 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.			

COASTAL ZONE MANAGEMENT ACT, CHAPTER 205A, HRS (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Policies:			
(A) Identify and analyze significant archaeological resources;	X		
(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and	X		
(C) Support state goals for protection, restoration, interpretation, and display of historic resources.	X		
Discussion: Nakahili is not anticipated to have a negative impact on archeological or cultural resources. ASM Affiliates (ASM) conducted: 1) an Archaeological Inventory Survey (AIS) to identify any archaeological sites on the Property; and 2) a Cultural Impact Assessment (CIA) to identify traditional customary practices associated with the Property. The AIS identified seven sites (one Precontact and six Historic) within the Property and recommends: 1) no further work for the six Historic sites; and 2) preparation of a data recovery plan for the Precontact site (a C-shape enclosure). Regarding cultural resources, ASM concludes that that given the consultation and assessment documented in the CIA, "it is our conclusion that the proposed development of the Nakahili Community on TMKs: (3) 6-8-002:005, 006, 028, 029, and 030 will not result in impacts to any traditionally valued cultural or historical resources nor will it impact any traditional cultural practices or beliefs." Work Force Development, LLC and its contractors will comply with all State and County laws and rules regarding the preservation of archaeological and historic sites.			
SCENIC AND OPEN SPACE RESOURCES			
Objective: (A) Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.			
Policies:			
(A) Identify valued scenic resources in the coastal zone management area;	X		
(B) 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;	X		
(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and			
(D) Encourage those developments that are not coastal dependent to locate in inland areas.			
Discussion: Nakahili will not substantially affect scenic vistas or view planes identified in the County General Plan or the South Kohala CDP. Neither the backdrop of the rolling Kohala Mountains nor dramatic view of Mauna Kea in the distance will be substantially affected. Some impact to the visual character of open space grasslands may occur due to the creation of Nakahili, and the view of the Property will change from open space to a family agricultural community with farm dwellings and agricultural uses. However, with the descending elevation from Māmalahoa Highway, Nakahili will not impact clear views of the coastline and bright coastal waters from the highway. In addition, Nakahili will not impede views of South Kohala's unique "Five Mountain Views" of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā. See Section 4.3 for more information regarding visual resources.			

COASTAL ZONE MANAGEMENT ACT, CHAPTER 205A, HRS (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
COASTAL ECOSYSTEMS			
Objective: (A) Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.			
Policies:			
(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;			X
(B) Improve the technical basis for natural resource management;			X
(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;	X		
(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and	X		
(E) 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.			X
Discussion: No state or federal water quality standards will be violated during development or after occupancy of Nakahili. The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. The onsite drainage system will be designed to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development). The drainage design will incorporate Low Impact Development (LID) features as practical and feasible, such as vegetated buffers/filter strips, grass swales, and infiltration basins. See Section 4.8.4 for further information regarding drainage. A NPDES permit will be required before grading of areas one acre or greater. The NPDES permit requires erosion control measures and covers storm water runoff discharges associated with construction activities, including clearing, grading, excavation and construction support activities (see HAR Chapter 11-55). in compliance with the Clean Water Act, a Section 401 Water Quality Certification from the State Department of Health (DOH), Clean Water Branch (CWB) will be obtained if it is determined that may grading and related activities may result in any discharge into navigable waters or is otherwise triggered.			
ECONOMIC USES			
Objective: (A) Provide public or private facilities and improvements important to the State's economy in suitable locations.			
Policies:			
(A) Concentrate coastal dependent development in appropriate areas;			X
(B) 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,			X

COASTAL ZONE MANAGEMENT ACT, CHAPTER 205A, HRS (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and			
(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:			X
(i) Use of presently designated locations is not feasible;			X
(ii) Adverse environmental effects are minimized; and			X
(iii) The development is important to the State's economy.	X		
Discussion: Nakahili is not a coastal dependent development. Nakahili will: attract new capital investment; create direct jobs in construction and on-going maintenance/renovation activity; and stimulate the State's economy.			
COASTAL HAZARDS			
Objective: (A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.			
Policies:			
• Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;			X
• Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;			X
• Ensure that developments comply with requirements of the Federal Flood Insurance Program; and	X		
• Prevent coastal flooding from inland projects.	X		
Discussion: Nakahili is located inland from the shoreline and thus is not subject to storm waves and tsunamis. The FEMA FIRM for Hawai'i County designates the Property as within Zone X, outside the 500-year floodplain. Appropriate engineering, design, and construction measures will be undertaken to minimize potential erosion of soils during grading. All grading will be done in compliance with all applicable Federal, State, and County regulations and rules for erosion control, including Chapter 10 of the Hawai'i County Code, relating to erosion and sedimentation control. In addition, a National Pollutant Discharge Elimination System (NPDES) permit will be required before grading areas greater than one acre.			
MANAGING DEVELOPMENT			
Objective: (A) Improve the development review process, communication, and public participation in the management of coastal resources and hazards.			

COASTAL ZONE MANAGEMENT ACT, CHAPTER 205A, HRS (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Policies:			
(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;			X
(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and	X		
(C) 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.	X		
Discussion: Nakahili is not a coastal development; however, during the course of planning Nakahili Work Force Developers representatives meet with State and County agencies, elected officials, and community groups and a pre-consultation letter was sent to State and County agencies, elected officials, and community groups (see Section 8). In addition, this EA discusses potential impacts and mitigation measures regarding Nakahili. Further, public and government agency comments will be received on this EA and the Hawai‘i County Council will hold public hearings as part of its deliberations on Nakahili.			
PUBLIC PARTICIPATION			
Objective: (A) Stimulate public awareness, education, and participation in coastal management.			
Policies:			
(A) Promote public involvement in coastal zone management processes;			X
(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and	X		
(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.	X		
Discussion: Nakahili is not a coastal development; however, during the course of planning Nakahili Work Force Developers representatives meet with State and County agencies, elected officials, and community groups and a pre-consultation letter was sent to State and County agencies, elected officials, and community groups (see Section 8). In addition, this EA discusses potential impacts and mitigation measures regarding Nakahili. Further, public and government agency comments will be received on this EA and the Hawai‘i County Council will hold public hearings as part of its deliberations on Nakahili.			

COASTAL ZONE MANAGEMENT ACT, CHAPTER 205A, HRS (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
BEACH PROTECTION			
Objective: (A) Protect beaches for public use and recreation.			
Policies:			
(A) 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;			X
(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and			X
(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.			X
(D) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and			X
(E) 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.			X
Discussion: Nakahili is not a coastal dependent development, is not located on the coastline, and is not in the SMA; therefore, these policies are not applicable. The Property is located away from the shoreline, such that adverse impacts on beach resources and processes are not expected.			
MARINE RESOURCES			
Objective: (A) Promote the protection, use, and development of marine and coastal resources to assure their sustainability.			
Policies:			
(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;			
(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;			
(C) 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;			
(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and			
(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.			
Discussion: Nakahili is not a coastal dependent development, is not located on the coastline, and is not in the SMA; therefore, these policies are not applicable. The Property is located away from the shoreline, such that adverse impacts on beach resources and processes are not expected. No state or federal water quality standards will be violated during development or after occupancy of Nakahili. The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage			

COASTAL ZONE MANAGEMENT ACT, CHAPTER 205A, HRS (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
patterns. The onsite drainage system will be designed to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development). The drainage design will incorporate Low Impact Development (LID) features as practical and feasible, such as vegetated buffers/filter strips, grass swales, and infiltration basins. See Section 4.8.4 for further information regarding drainage.			

Hawai‘i State Plan

The Hawai‘i State Plan (Chapter 226, HRS), establishes a set of goals, objectives and policies that serve as long-range guidelines for the growth and development of the State. This section analyzes the Project's consistency with the objectives, policies, and priority guidelines set forth in HRS Chapter 226, included in Table 5-2 below.

Table 5-2. Compliance with the Hawai‘i State Plan, Chapter 226, HRS

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
HRS § 226-1: Findings and Purpose			
HRS § 226-2: Definitions			
HRS § 226-3: Overall Theme			
HRS § 226-4: State Goals. *In order to guarantee, for the present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve:* *(1) A strong, viable economy, characterized by stability, diversity and growth that enables fulfillment of the needs and expectations of Hawaii's present and future generations.* *(2) A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.* (3) *Physical, social and economic well-being, for individuals and families in Hawaii, that nourishes a sense of community responsibility, of caring and of participation in community life.*			
Discussion: Nakahili will contribute to these goals by: • Addressing the demand for housing on due to a growing population • Providing dwellings located near to existing residential and commercial uses at Waikoloa Village, and within a short drive of major job centers in Waimea Town, South Kohala resorts, and myriad public and private sector opportunities in the adjacent North Kona District, thus allowing Nakahili residents to live near jobs and urban services and perhaps enabling them spend less time commuting, have more time for family and recreation actives, lessen pollution, and improve overall quality of life; • Providing a well-designed and thought-out neighborhood, with agricultural lots and allows for small-scale agricultural uses, including small-scale farms to enable self-sufficiency and promote sustainability; • Contributing to State and County revenues in the form of property taxes, general excise taxes, and income taxes from increased employment.			

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
HRS § 226-5: Objectives and policies for population.			
Objective: *It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic and social objectives contained in this chapter.*			
Policies:			
(1) Manage population growth statewide in a manner that provides increased opportunities for Hawaii's people to pursue their physical, social and economic aspirations while recognizing the unique needs of each County.	X		
(2) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires.	X		
(3) Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.	X		
(4) Encourage research activities and public awareness programs to foster an understanding of Hawaii's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawaii's population.	X		
(5) Encourage federal actions and coordination among major governmental agencies to promote a more balanced distribution of immigrants among the states, provided that such actions do not prevent the reunion of immediate family members.			X
(6) Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population.			X
(7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.		X	
Discussion: Nakahili will promote increased opportunities for Hawai‘i's people to pursue their physical, social, and economic aspirations by: • Addressing the demand for housing in Hawai‘i County due to a growing population; • Providing dwellings located near to existing residential and commercial uses at Waikoloa Village, and within a short drive of major job centers in Waimea Town, South Kohala resorts, and myriad public and private sector opportunities in the adjacent North Kona District; and • Creating jobs and other positive economic impacts during the build-out period and after build-out on a long-term stabilized basis.			
HRS § 226-6: Objectives and policies for the economy in general.			
Objectives: *Planning for the State's economy in general shall be directed toward achievement of the following objectives:*			
(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.	X		
(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.	X		

Hawai'i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Policies:			
(1) Promote and encourage entrepreneurship within Hawaii by residents and nonresidents of the State.			X
(2) Expand Hawaii's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.			X
(3) Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.			X
(4) Transform and maintain Hawaii as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities.			X
(5) Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawaii.			X
(6) Seek broader outlets for new or expanded Hawaii business investments.			X
(7) Expand existing markets and penetrate new markets for Hawaii's products and services.			X
(8) Assure that the basic economic needs of Hawaii's people are maintained in the event of disruptions in overseas transportation.	X		
(9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.	X		
(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaii's small scale producers, manufacturers, and distributors.	X		
(11) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.	X		
(12) Encourage innovative activities that may not be labor-intensive, but may otherwise contribute to the economy of Hawaii.			X
(13) Foster greater cooperation and coordination between the government and private sectors in developing Hawaii's employment and economic growth opportunities.			X
(14) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.	X		
(15) Maintain acceptable working conditions and standards for Hawaii's workers.			X
(16) Provide equal employment opportunities for all segments of Hawaii's population through affirmative action and nondiscrimination measures.			X
(17) Stimulate the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.			X
(18) Encourage businesses that have favorable financial multiplier effects within Hawaii's economy, particularly with respect to emerging industries in science and technology.			X
(19) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.	X		
(20) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new, potential growth industries in particular.			X
(21) Foster a business climate in Hawaii--including attitudes, tax and regulatory policies, and financial and technical assistance programs--that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.			X

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Discussion: Nakahili will contribute to this objective and these polices by: • Providing dwellings for Hawai‘i growing population; • Providing dwellings located near to existing residential and commercial uses at Waikoloa Village, and within a short drive of major job centers in Waimea Town, South Kohala resorts, and myriad public and private sector opportunities in the adjacent North Kona District; and; • Providing agricultural lots for small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community • Creating jobs and other positive economic impacts during the build-out period and after build-out on a long-term stabilized basis; • Contributing to State and County revenues in the form of property taxes, general excise taxes, and income taxes from increased employment.			
HRS § 226-7: Objectives and policies for the economy – agriculture			
Objectives: *Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:*			
(1) Viability of Hawaii's sugar and pineapple industries.			X
(2) Growth and development of diversified agriculture throughout the State.	X		
(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.	X		
Policies:			
(1) Establish a clear direction for Hawaii's agriculture through stakeholder commitment and advocacy.	X		
(2) Encourage agriculture by making best use of natural resources.	X		
(3) Provide the governor and the legislature with information and options needed for prudent decision making for the development of agriculture.			X
(4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.			X
(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawaii's economy.	X		
(6) Seek the enactment and retention of federal and state legislation that benefits Hawaii's agricultural industries.			X
(7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawaii's food producers and consumers in the State, nation, and world.	X		
(8) Support research and development activities that strengthen economic productivity in agriculture, stimulate greater efficiency, and enhance the development of new products and agricultural by-products.			X
(9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.	X		
(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.	X		

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.	X		
(12) In addition to the State's priority on food, expand Hawaii's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.	X		
(13) Promote economically competitive activities that increase Hawaii's agricultural self-sufficiency, including the increased purchase and use of Hawaii-grown food and food products by residents, businesses, and governmental bodies as defined under section 103D-104.	X		
(14) Promote and assist in the establishment of sound financial programs for diversified agriculture.	X		
(15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.			X
(16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.	X		
(17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko i‘a, māla, and irrigated lo‘i, and growth of traditional Hawaiian crops, such as kalo, ‘uala, and ‘ulu.	X		
(18) Increase and develop small-scale farms.	X		
Discussion: Nakahili will contribute to these objectives and policies by making the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. The agricultural lots will provide ample space for small farms and diversified agriculture, including small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community. See Section 2.3 for more information about Nakahili’s agricultural feasibility and potential contribution to diversified agriculture.			
HRS § 226-8: Objectives and policies for the economy – visitor industry			
Objectives: *Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawaii's economy.*			
Policies:			
(1) Support and assist in the promotion of Hawaii's visitor attractions and facilities.			X
(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people.			X
(3) Improve the quality of existing visitor destination areas by utilizing Hawaii's strengths in science and technology.			X
(4) Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.			X
(5) Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawaii's people.			X
(6) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the visitor industry.			X

Hawai'i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
(7) Foster a recognition of the contribution of the visitor industry to Hawaii's economy and the need to perpetuate the aloha spirit.			X
(8) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawaii's cultures and values.			X
Discussion: Nakahili will not impact the visitor industry. A detailed description of the proposed action can be found in Section 2.3.			
HRS § 226-9: Objective and policies for the economy – federal expenditures			
Objective: *Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaii's economy.*			
Policies:			
(1) Encourage the sustained flow of federal expenditures in Hawaii that generates long-term government civilian employment.			X
(2) Promote Hawaii's supportive role in national defense in a manner consistent with Hawaii's social, environmental, and cultural goals by building upon dual-use and defense applications to develop thriving ocean engineering, aerospace research and development, and related dual-use technology sectors in Hawaii's economy.			X
(3) Promote the development of federally supported activities in Hawaii that respect state-wide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawaii's environment.			X
(4) Increase opportunities for entry and advancement of Hawaii's people into federal government service.			X
(5) Promote federal use of local commodities, services, and facilities available in Hawaii.			X
(6) Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaii.	X		
(7) Pursue the return of federally controlled lands in Hawaii that are not required for either the defense of the nation or for other purposes of national importance, and promote the mutually beneficial exchanges of land between federal agencies, the State, and the counties.			X
Discussion: Consultation with the U.S. Army Corps of Engineers (USACE) regarding cleanup and recommendations for the Waikoloa Maneuver Area Formerly Used Defense Sites is ongoing and the project team will continue to consult with the appropriate federal, state, and county agencies as needed throughout planning and construction. More information can be found in section 4.4.			
HRS § 226-10: Objectives and policies for the economy – potential growth activities.			
Objective: *Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.*			

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Policies:			
(1) Facilitate investment and employment growth in economic activities that have the potential to expand and diversify Hawaii's economy, including but not limited to diversified agriculture, aquaculture, renewable energy development, creative media, health care, and science and technology-based sectors.	X		
(2) Facilitate investment in innovative activity that may pose risks or be less labor-intensive than other traditional business activity, but if successful, will generate revenue in Hawaii through the export of services or products or substitution of imported services or products.	X		
(3) Encourage entrepreneurship in innovative activity by academic researchers and instructors who may not have the background, skill, or initial inclination to commercially exploit their discoveries or achievements.	X		
(4) Recognize that innovative activity is not exclusively dependent upon individuals with advanced formal education, but that many self-taught, motivated individuals are able, willing, sufficiently knowledgeable, and equipped with the attitude necessary to undertake innovative activity.			X
(5) Increase the opportunities for investors in innovative activity and talent engaged in innovative activity to personally meet and interact at cultural, art, entertainment, culinary, athletic, or visitor-oriented events without a business focus.			X
(6) Expand Hawaii's capacity to attract and service international programs and activities that generate employment for Hawaii's people.			X
(7) Enhance and promote Hawaii's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts.			X
(8) Accelerate research and development of new energy- related industries based on wind, solar, ocean, and underground resources and solid waste.			X
(9) Promote Hawaii's geographic, environmental, social, and technological advantages to attract new or innovative economic activities into the State.	X		
(10) Provide public incentives and encourage private initiative to attract new industries that best support Hawaii's social, economic, physical, and environmental objectives.	X		
(11) Increase research and the development of ocean-related economic activities such as mining, food production, and scientific research.			X
(12) Develop, promote, and support research and educational and training programs that will enhance Hawaii's ability to attract and develop economic activities of benefit to Hawaii.			X
(13) Foster a broader public recognition and understanding of the potential benefits of new or innovative growth-oriented industry in Hawaii.			X
(14) Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawaii's social, economic, physical, and environmental objectives.	X		
(15) Increase research and development of businesses and services in the telecommunications and information industries.			X
(16) Foster the research and development of nonfossil fuel and energy efficient modes of transportation			X
(17) Recognize and promote health care and health care information technology as growth industries.			X
Discussion: Nakahili will attract new capital investment; create direct jobs in construction and on-going maintenance/renovation activity; and stimulate the Hawai‘i economy. This will in turn generate enhanced secondary			

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
employment and business opportunities for island residents and companies while further expanding the tax base for the State and County. Nakahili's economic impacts include: • Capital investment related to Nakahili's planning, design and construction; • Creation of direct jobs related to development, including for: design and other professionals; infrastructure and building construction workers; and real estate, marketing, finance, and administrative support persons– for both the initial project build-out of the workforce homes and subsequent construction of homes on the 15 market lots; • Creation of direct jobs related to consumer spending on furnishing the new homes, as well as their ongoing maintenance; and • Indirect and induced impacts related to the above, with impacts concentrated on Hawai‘i but realized throughout the state. More information can be found in section 4.9.			
HRS § 226-10.5: Objectives and policies for the economy – information industry			
Objective: *Planning for the State's economy with regard to telecommunications and information technology shall be directed toward recognizing that broadband and wireless communication capability and infrastructure are foundations for an innovative economy and positioning Hawaii as a leader in broadband and wireless communications and applications in the Pacific Region.*			
Policies:			
(1) Promote efforts to attain the highest speeds of electronic and wireless communication within Hawaii and between Hawaii and the world, and make high speed communication available to all residents and businesses in Hawaii;			X
(2) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawaii to accommodate future growth and innovation in Hawaii's economy;	X		
(3) Facilitate the development of new or innovative business and service ventures in the information industry which will provide employment opportunities for the people of Hawaii;			X
(4) Encourage mainland- and foreign-based companies of all sizes, whether information technology-focused or not, to allow their principals, employees, or contractors to live in and work from Hawaii, using technology to communicate with their headquarters, offices, or customers located out-of-state;			X
(5) Encourage greater cooperation between the public and private sectors in developing and maintaining a well- designed information industry;			X
(6) Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people;			X
(7) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the information industry;			X
(8) Foster a recognition of the contribution of the information industry to Hawaii's economy; and			X
(9) Assist in the promotion of Hawaii as a broker, creator, and processor of information in the Pacific.			X

Hawai'i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Discussion: Nakahili will support local expansion of telecommunications infrastructure in South Kohala, however, Nakahili will not otherwise have an impact on the information industry. For more information, see section 4.8.			
HRS § 226-11: Objectives and policies for the physical environment – land-based, shoreline, and marine resources.			
Objectives: *Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives.*			
(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.	X		
(2) Effective protection of Hawaii's unique and fragile environmental resources.			X
Policies:			
(1) Exercise an overall conservation ethic in the use of Hawaii's natural resources.	X		
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.	X		
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.	X		
(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.	X		
(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.	X		
(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.			X
(7) Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion.			X
(8) Pursue compatible relationships among activities, facilities, and natural resources.	X		
(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.	X		
Discussion: Nakahili's agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. While Nakahili will not impact shoreline or marine resources, careful planning will be implemented for the design and construction of Nakahili to best utilize and protect land-based resources. More information can be found in sections 2.3.			
HRS § 226-12: Objectives and policies for the physical environment – scenic, natural beauty, and historic resources.			
Objective: *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.*			
Policies:			
(1) Promote the preservation and restoration of significant natural and historic resources.			X

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities.			X
(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.	X		
(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.			X
(5) Encourage the design of developments and activities that complement the natural beauty of the islands.	X		
Discussion: Nakahili will not impact scenic amenities nor any historic and cultural amenities. No named pu‘u, geologic, or natural features were identified on the Property as a result of examining historical maps, documentation, and testimonies in the course of research conducted as part of the Cultural Impact Assessment (see section 4.2). In addition, Nakahili will not interfere with scenic views of the shoreline or of the mountains (see section 4.3).			
HRS § 226-13: Objectives and policies for the physical environment – land, air, and water quality.			
Objectives: *Planning for the State’s physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:*			
(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.	X		
(2) Greater public awareness and appreciation of Hawaii's environmental resources.			X
Policies:			
(1) Foster educational activities that promote a better understanding of Hawaii’s limited environmental resources.			X
(2) Promote the proper management of Hawaii’s land and water resources.	X		
(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.			X
(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.	X		
(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.	X		
(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.	X		
(7) Encourage urban developments in close proximity to existing services and facilities.		X	
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii’s people, their cultures and visitors.			X
Discussion: Nakahili will not negatively impact existing air, noise, or water quality. Nakahili’s agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property (see section 2.3). In addition, natural hazards associated with the location of the Property will be mitigated such that there is no increased risk to the residents of Nakahili or the surrounding area (see section 3.5).			
HRS § 226-14: Objective and policies for facility systems – in general			

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Objective: *Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.*			
Policies:			
(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.	X		
(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.	X		
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.	X		
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.	X		
Discussion: Nakahili will be designed to accommodate the resource capacities of the area along with the needs of its residents. New infrastructure that will serve the Property will allow Nakahili to contribute to state goals for affordable housing and expansion of agricultural activities. Additional information can be found in section 2.2 and 4.8.			
HRS § 226-15: Objectives and policies for facility systems – solid and liquid wastes.			
Objectives: *Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:*			
(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.	X		
(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.	X		
Policies:			
(1) Encourage the adequate development of sewerage facilities that complement planned growth.	X		
(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.	X		
(3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.			X
Discussion: Infrastructure related to solid and liquid wastes will implemented to adequately serve the Property as well as maintain basic health and sanitation standards for Nakahili and the surrounding area. More information regarding infrastructure related to solid and liquid waste can be found in section 4.8.			
HRS § 226-16: Objectives and policies for facility systems – water.			
Objective: *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.*			

Hawai'i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Policies:			
(1) Coordinate development of land use activities with existing and potential water supply.	X		
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.			X
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.	X		
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.	X		
(5) Support water supply services to areas experiencing critical water problems.			X
(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.	X		
Discussion: While current reports indicate a sufficient water supply to support Nakahili, water resources and availability will continue to be assessed in light of the upcoming Water Resources Protection Plan 2019 Update prior to the development of Nakahili. Nakahili will also incorporate water conservation BMPs including, but not limited to low-flow and water-efficient plumbing fixtures and devices. Additional information on water supply and infrastructure for Nakahili can be found in section 4.8.			
HRS § 226-17: Objectives and policies for facility systems – transportation.			
Objective: *Planning for the State's facility systems with regard to transportation shall be directed toward the achievement of the following objectives:*			
(1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods.	X		
(2) A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State.	X		
Policies:			
(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter;	X		
(2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives;	X		
(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties;	X		
(4) Provide for improved accessibility to shipping, docking, and storage facilities;			X
(5) Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs;	X		
(6) Encourage transportation systems that serve to accommodate present and future development needs of communities;	X		
(7) Encourage a variety of carriers to offer increased opportunities and advantages to interisland movement of people and goods;			X
(8) Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs;			X

Hawai'i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
(9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification;			X
(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment;			X
(11) Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation;	X		
(12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives; and	X		
(13) Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.	X		
Discussion: While Nakahili will not have negative long-term impacts om public roads in the vicinity of the Property, improvements at various Waikoloa Road intersections are anticipated to provide adequate capacity in the mid-term for both regional through traffic and local traffic. Improvements will also be made to surrounding roads to encourage the use of public transit, bike, and pedestrian facilities in the vicinity of the Property. For additional information, see section 4.7.			
HRS § 226-18: Objectives and policies for facility systems – energy.			
Objectives: *Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:*			
(1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;			X
(2) Increased energy security and self-sufficiency through the reduction and ultimate elimination of Hawaii's dependence on imported fuels for electrical generation and ground transportation;			X
(3) Greater diversification of energy generation in the face of threats to Hawaii's energy supplies and systems;	X		
(4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use; and			X
(5) Utility models that make the social and financial interests of Hawaii's utility customers a priority.			X
Policies: *To achieve the energy objectives, it shall be the policy of this State to ensure the short- and long-term provision of adequate, reasonably priced, and dependable energy services to accommodate demand. To further achieve the energy objectives, it shall be the policy of this State to:*			
(1) Support research and development as well as promote the use of renewable energy sources;	X		
(2) Ensure that the combination of energy supplies and energy-saving systems is sufficient to support the demands of growth;	X		
(3) Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits;	X		
(4) Promote all cost-effective conservation of power and fuel supplies through measures including:			

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(A) Development of cost-effective demand-side management programs;	X		
(B) Education; and			X
(C) Adoption of energy-efficient practices and technologies;	X		
(D) Increasing energy efficiency and decreasing energy use in public infrastructure;			X
(5) Ensure to the extent that new supply-side resources are needed, the development or expansion of energy systems utilizes the least-cost energy supply option and maximizes efficient technologies;			X
(6) Support research, development, demonstration, and use of energy efficiency, load management, and other demand-side management programs, practices, and technologies;	X		
(7) Promote alternate fuels and energy efficiency;	X		
(8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications;	X		
(9) Support actions that reduce, avoid, or sequester Hawaii's greenhouse gas emissions through agriculture and forestry initiatives.	X		
(10) Provide priority handling and processing for all state and county permits required for renewable energy projects;			X
(11) Ensure that liquefied natural gas is used only as a cost-effective transitional, limited-term replacement of petroleum for electricity generation and does not impede the development and use of other cost-effective renewable energy sources; and			X
(12) Promote the development of indigenous geothermal energy resources that are located on public trust land as an affordable and reliable source of firm power for Hawaii.			X

Discussion: Nakahili will include solar water heater systems for all single-family farm dwellings sold by Work Force Developers, as required under Section 196-6.5, HRS; or alternatively energy-efficient gas water heating systems may be used, as may be permitted under the variance provisions of Section 196-6.5, HRS. Other energy-saving technologies and features to be considered include:

- ENERGY STAR qualified appliances in dwellings sold or rented by Work Force Developers
- Maximum use of day lighting.
- High efficiency lighting.
- Roof and wall insulation, radiant barriers, and energy efficient windows
- Installation of light-colored roofing.
- Use of landscaping for shading of buildings.
- Use of landscaping for dust control and to minimize heat gain.
- Use of solar parking lot lighting.

For additional information, see section 4.8.

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HRS § 226-18.5: Objectives and policies for facility systems—telecommunications.			
Objective: *Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people.*			
Policies: *To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand. To further achieve the telecommunications objective, it shall be the policy of this State to:*			
(1) Facilitate research and development of telecommunications systems and resources;			X
(2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning;			X
(3) Promote efficient management and use of existing telecommunications systems and services; and			X
(4) Facilitate the development of education and training of telecommunications personnel.			X
Discussion: Nakahili will not impact the telecommunications industry.			
HRS § 226-19: Objectives and policies for socio-cultural advancement – housing.			
Objectives: *Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:*			
(1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaii's population.	X		
(2) The orderly development of residential areas sensitive to community needs and other land uses.	X		
(3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people.	X		
Policies:			
(1) Effectively accommodate the housing needs of Hawaii's people.	X		
(2) Stimulate and promote feasible approaches that increase affordable rental and for sale housing choices for extremely low-, very low-, lower-, moderate-, and above moderate-income households.	X		
(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.	X		
(4) Promote appropriate improvement, rehabilitation, and maintenance of existing rental and for sale housing units and residential areas.			X
(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.	X		

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.			X
(7) Foster a variety of lifestyles traditional to Hawaii through the design and maintenance of neighborhoods that reflect the culture and values of the community.			X
(8) Promote research and development of methods to reduce the cost of housing construction in Hawaii.			X
Discussion: Nakahili could be an important component of a County plan to meet an anticipated future demand for some 28,400 resident-oriented housing units by 2035. Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households. Nakahili is seen to serve diverse market segments including new householders, first-time buyers, move-up buyers, downsizing households, and seniors. Notably, it would produce a substantial inventory of rental housing opportunities, in alignment with the State's 2016 HHPS finding that more than half of intended County movers, including those currently living in North Hawai‘i, do not expect to purchase their next home. In addition, with its 300 apartments, of which at least 50% are planned to be made available for rent at affordable rates by 2023, Nakahili would also represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawaii. For more information, see section 2.2.			
HRS § 226-20: Objectives and policies for socio-cultural advancement – health			
Objectives: *Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:*			
(1) Fulfillment of basic individual health needs of the general public.			X
(2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.	X		
(3) Elimination of health disparities by identifying and addressing social determinants of health.			X
Policies:			
(1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.			X
(2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.			X
(3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.			X
(4) Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures.			X
(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.	X		
(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.	X		
(7) Prioritize programs, services, interventions, and activities that address identified social determinants of health to improve native Hawaiian health and well-being consistent with the United States Congress' declaration of policy as codified in title 42 United States Code section 11702, and to reduce health disparities of disproportionately affected demographics, including native Hawaiians, other Pacific Islanders, and Filipinos. The			X

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prioritization of affected demographic groups other than native Hawaiians may be reviewed every ten years and revised based on the best available epidemiological and public health data.			
Discussion: Nakahili will provide housing, community, and agricultural facilities that will promote healthy living conditions for its residents. For more information, see section 2.3.			
HRS § 226-21: Objectives and policies for socio-cultural advancement – education.			
Objectives: *Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.*			
Policies:			
(1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.	X		
(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.	X		
(3) Provide appropriate educational opportunities for groups with special needs.			X
(4) Promote educational programs which enhance understanding of Hawaii's cultural heritage.			X
(5) Provide higher educational opportunities that enable Hawaii's people to adapt to changing employment demands.			X
(6) Assist individuals, especially those experiencing critical employment problems or barriers, or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities.			X
(7) Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.			X
(8) Emphasize quality educational programs in Hawaii's institutions to promote academic excellence.			X
(9) Support research programs and activities that enhance the education programs of the State.			X
Discussion: Nakahili will support existing educational facilities that will serve its residents through school impact fees. These fees will be determined through a structure for assessing school impact fees for residential development, established within Sections 302A-1601 to Section 320A-1612, HRS. Work Force Developers will comply with all laws regarding school impact fees. For more information, see section 4.10.			
HRS § 226-22: Objective and policies for socio-cultural advancement – social services			
Objective: *Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being.*			

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Policies:			
(1) Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities.			X
(2) Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society.			X
(3) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawaii's communities.			X
(4) Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations.			X
(5) Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect.			X
(6) Promote programs which assist people in need of family planning services to enable them to meet their needs.			X
Discussion: Nakahili will not affect social services available to Hawai‘i residents.			
HRS § 226-23: Objectives and policies for socio-cultural advancement – leisure.			
Objective: *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.*			
Policies:			
(1) Foster and preserve Hawaii's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.			X
(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.	X		
(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.	X		
(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.	X		
(5) Ensure opportunities for everyone to use and enjoy Hawaii's recreational resources.	X		
(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.	X		
(7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaii's people.			X
(8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.			X
(9) Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawaii's population to participate in the creative arts.			X
(10) Assure adequate access to significant natural and cultural resources in public ownership.			X

Hawai'i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES (Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
Discussion: As a family agricultural community, Nakahili will include farm dwellings and agricultural operations on agricultural lots and provide a small neighborhood commercial "village" area with apartments and limited retail uses to serve the community. Nakahili will also include two parks: 1) an approximately six-acre "community green" neighborhood park will be located adjacent to the village area; and 2) an approximately 29-acre regional park will be in the lower (makai) central area. At some point in the future, the regional park within Nakahili could eventually connect to an even larger regional park area (for a total of up to approximately 150 acres) on adjacent property to the west (makai) owned by the Waikoloa Village Association. Another regional amenity under consideration is a greenway/fire break pedestrian and equestrian trail extending more than four miles from Nakahili to Waikoloa Village over land owned by the Waikoloa Village Association. For more information, see section 2.3.			
HRS § 226-24: Objective and policies for socio-cultural advancement – individual rights and personal well-being.			
Objective: *Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations.*			
Policies:			
(1) Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment.			X
(2) Uphold and protect the national and state constitutional rights of every individual.			X
(3) Assure access to, and availability of, legal assistance, consumer protection, and other public services which strive to attain social justice.			X
(4) Ensure equal opportunities for individual participation in society.			X
Discussion: The development of Nakahili will not impact the constitutional rights of any individual.			
HRS § 226-25: Objectives and policies for socio-cultural advancement – culture.			
Objective: *Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawaii's people.*			
Policies:			
(1) Foster increased knowledge and understanding of Hawaii's ethnic and cultural heritages and the history of Hawaii.			X
(2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawaii's people and which are sensitive and responsive to family and community needs.			X
(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawaii.			X

Hawai'i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
(4) Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawaii's people and visitors.	X		
Discussion: Nakahili will not impact any cultural resources or practices associated with the Property. ASM concludes that given the consultation and assessment documented in the CIA, "it is our conclusion that the proposed development of the Nakahili Community on TMKs: (3) 6-8-002:005, 006, 028, 029, and 030 will not result in impacts to any traditionally valued cultural or historical resources nor will it impact any traditional cultural practices or beliefs." For more information, see section 4.2.			
HRS § 226-26: Objectives and policies for socio-cultural advancement – public safety.			
Objectives: *Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives:*			
(1) Assurance of public safety and adequate protection of life and property for all people.			X
(2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic well-being of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.			X
(3) Promotion of a sense of community responsibility for the welfare and safety of Hawaii's people.	X		
Policies related to public safety:			
(1) Ensure that public safety programs are effective and responsive to community needs.			X
(2) Encourage increased community awareness and participation in public safety programs.	X		
Policies related to criminal justice:			
(1) Support criminal justice programs aimed at preventing and curtailing criminal activities.			X
(2) Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies.			X
(3) Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community.			X
Policies related to emergency management:			
(1) Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times.			X
(2) Enhance the coordination between emergency management programs throughout the State.			X
Discussion: Nakahili will not affect initiatives associated with criminal justice or the coordination of emergency management programs. Consultation has been initiated with county services, including the police and fire departments and appropriate public safety features for the Property will be incorporated into planning and design as the project progresses. For additional information, see section 4.10.			

Hawai‘i STATE PLAN, CHAPTER 226, HRS – PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES **(**Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable)	**S**	**N/S**	**N/A**
HRS § 226-27: Objectives and policies for socio-cultural advancement – government.			
Objectives: *Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:*			
(1) Efficient, effective, and responsive government services at all levels in the State.			X
(2) Fiscal integrity, responsibility, and efficiency in the state government and county governments.			X
Policies:			
(1) Provide for necessary public goods and services not assumed by the private sector.			X
(2) Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response.			X
(3) Minimize the size of government to that necessary to be effective.			X
(4) Stimulate the responsibility in citizens to productively participate in government for a better Hawaii.			X
(5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.			X
(6) Provide for a balanced fiscal budget.			X
(7) Improve the fiscal budgeting and management system of the State.			X
(8) Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible.			X
Discussion: The development of Nakahili is not related to government operations.			

Environmental Impact Statement Law, Chapter 343, HRS

Section 343-5, HRS establishes nine types of actions that “trigger” compliance with Chapter 343, HRS, the State of Hawai‘i Environmental Impact Statement Law.

Discussion: Compliance with Chapter 343, HRS is required for Nakahili as described in Section 1.5 of this EA.

5.2 COUNTY OF HAWAI‘I

County-specific land use plans and ordinances pertaining to the Project include the County of Hawai‘i General Plan, and the South Kohala Community Development Plan.

County of Hawai‘i General Plan

The County of Hawai‘i’s General Plan (amended 2005) is the policy document for the long range comprehensive development of Hawai‘i. The General Plan is intended to guide the pattern of future development in the County based on long-term goals, while identifying and promoting the visions, values, and priorities important to its people.

Land Use Pattern Allocation Guide

With regard to land use within County of Hawai‘i, a high degree of emphasis is given to the General Plan’s Land Use Pattern Allocation Guide (LUPAG) map, which sets forth desired land use patterns and allocations for the island, including South Kohala. The LUPAG designates the Property as Important Agricultural Lands (see Figure 5).

As a family agricultural community, Nakahili will include approximately 700 one-acre agricultural lots surrounded by approximately 150 larger agricultural lots ranging from two to five areas (and slightly larger) located around the perimeter of Nakahili to serve as a buffer to adjacent, larger agricultural properties. All of the family agricultural lots will be in compliance with the minimum lot size required in the State Agricultural District and will remain in the State Agricultural District. Nakahili will also include a small neighborhood commercial “village” area (15 acres or less in size) with apartments and limited retail uses to serve the community, however, Nakahili’s primary use will be small-scale farms with single-family farm dwellings.

While it is recognized the County zoning of the Property is A-20a (Agricultural District – minimum lot size of 20 acres; see Figure 7), Nakahili’s family agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. The agricultural lots will provide ample space for small farms and diversified agriculture, including small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community.

As the State of Hawai‘i and County of Hawai‘i continue transitioning from large-scale monocrop planation agriculture and ranching operations, increasingly small-scale farms to enable self-sufficiency and promote sustainability may become the new norm for marginal agricultural lands. Compared to existing conditions, where limited cattle grazing is taking place on the Property, and given that it is likely that large-scale agricultural production or ranching operations may never be viable on the Property, Nakahili’s lower intensity, small-scale family farms will increase agricultural use of the Property. Section 3.5 subsection, Agricultural Feasibility, of this EA provides information and analysis regarding the agricultural feasibility of Nakahili’s agricultural lots, including information on economically viable crops on small agricultural lots and suggestions regarding increasing the overall economic value of crops through creation an association or cooperative among multiple lot owners to provide shared knowledge and support.

While Nakahili's small neighborhood commercial "village" area will not be an agricultural use, it will be designed to generally conform to the development standards set forth under Chapter 25, HCC, Neighborhood Commercial Districts, which apply to strategically located commercial centers that supply goods and services to a residential or working population on a frequent need or convenience basis. The intent of the neighborhood commercial "village" is to provide a core area with stores and services (such as a neighborhood grocery store, shops, and restaurants) targeted to the community to provide frequently needed items and convenience, thus potentially reducing car trips outside of Nakahili for all needs. The intent also is to provide affordable rentals specifically envisioned for those who work in the region and need an affordable place to live within a short drive from their workplaces (as compared to other areas of the island from which some people may commute), for example, employees of nearby resorts. Work Force Developers will comply with all requirements necessary to allow the uses proposed within the neighborhood commercial "village" area.

According to the General Plan (amended 2005):

> *Important Agricultural Land: Important agricultural lands are those with better potential for sustained high agricultural yields because of soil type, climate, topography, or other factors. Important agricultural lands were determined by including the following lands:*
>
> - *Lands identified as "Intensive Agriculture" on the 1989 General Plan Land Use Pattern Allocation Guide maps.*
> - *Lands identified in the Agricultural Lands of Importance to the State of Hawaii (ALISH) classification system as "Prime" or "Unique".*
> - *Lands classified by the Land Study Bureau's Soil Survey Report as Class B "Good" soils. (There are no Class A lands on the island of Hawaii)*
> - *Lands classified as at least "fair" for two or more crops, on an irrigated basis, by the USDA Natural Resource Conservation Service's study of suitability for various crops.*
> - *In North and South Kona, the "coffee belt", a continuous band defined by elevation, according to input from area farmers.*
> - *State agricultural parks.*

While the Property may have been identified as "Intensive Agriculture" on the 1989 General Plan Land Use Pattern Allocation Guide maps, this designation is likely due to the historic cattle ranching in the region and on the Property.

Notably, the Property does not meet any of the other General Plan criteria for designation Important Agricultural Land:

- The Property is identified in the ALISH classification system as "Other" (not "Prime" or "Unique") (see Figure 12)
- The LSB classifies the soils of the Property soils as Class D "Poor" soils (not Class B "Good" soils) (see Figure 11)

- The USDA Natural Resource Conservation Service classifies approximately 95 percent of the soils as within Waikaloa-Puu Pa complex (see Figure 10), with a Farmland Classification of "Not prime farmland"
- The Property is not in the North and South Kona and is not in the "coffee belt"
- The Property is not a State agricultural park.

In consideration of the above analysis, requesting exemptions to the LUPAG and the A-20 zoning to allow Nakahili, with the primary use as family agricultural community consisting of small-scale farms with farm dwellings, is not impracticable or imprudent.

To allow the Nakahili's agricultural lots and neighborhood commercial "village" Work Force Developers proposes to request and from the County of Hawai'i General Plan. Although it is premature to identify specific exemptions that will be requested for Nakahili, it is expected that Work Force Developers will consult with applicable agencies and gather related information during the EA process. Section 5.3, Approvals and Permits, contains additional information regarding the scope of, and rational for, the exemptions that may be requested. After completion of the EA process, Work Force Developers will prepare a 201H Application that will include a list of requested exemptions and submit it to OHCD for review.

General Plan Goals and Policies

Specific General Plan goals and policies applicable to Nakahili are discussed below.

Section 2 – ECONOMIC

Summary: Economic activity influences a variety of factors within a community, including population growth, income level, and to a certain extent, the standard of living. As such, it is the Government's responsibility to help protect and promote local economic sectors which are vital for balancing desired economic growth with environmental, social, and other objectives of the community. Among Hawai'i's economic amenities are its natural settings and resources, from scenic views to local agriculture. Hawai'i has many opportunities for expansion of agriculture as demand for fresh, local produce continues to grow. Furthermore, population growth throughout Hawai'i, including the South Kohala district, has been closely related to increasing economic developments in the visitor and agriculture industries.

Goals: *(a) Provide residents with opportunities to improve their quality of life through economic development that enhances the County's natural and social environments.*

Discussion: Nakahili will have a beneficial effect on the economic and social welfare of County residents by providing a significant number of workforce dwellings. The need for additional primary residential housing in the County has been well documented and widely discussed for decades (see Section 4.9 for more information). A review of several housing studies indicates that Hawai'i County could require up to 28,400 more homes by 2035.

As a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, a majority of the Nakahili dwellings (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. Unlike many other West Hawai‘i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households.

In addition to addressing the demand for housing Nakahili will: attract new capital investment; create direct jobs in construction and on-going maintenance/renovation activity; and stimulate the Hawai‘i economy. This will in turn generate enhanced secondary employment and business opportunities for island residents and companies while further expanding the tax base for the State and County. See Section 4.9 for more information regarding Nakahili's economic and public fiscal impacts.

Policies:

(d) Require a study of the significant cultural, social and physical impacts of large developments prior to approval.

(u) Encourage the establishment of open farmers markets to allow local agricultural producers to market their products.

Discussion: This EA provides a study of the significant cultural, social, and physical impacts of Nakahili. See: Section 4.1 regarding archeological and historic resources; Section 4.2 regarding cultural resources; Chapter 3 and 4 overall regarding potential physical impacts and mitigation measures to ensure there are no significant impacts.

Nakahili's agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. Nakahili's small-scale family farms have the potential to provide crop to the abundant number of farmers markets across the County. Likely farmers markets in the vicinity of Nakahili include: Waikoloa Village Farmers Market, Waimea Town Market, Farmers' Market at Hāmākua Harvest, Waimea Midweek Farmers Market, Hawaiian Homestead Farmers Market, Kamuela Farmers Market, Kings' Shops Farmers Market, Kona Sunset Farmers Market, Kona Village Farmers Market, Ho‘oulu Farmers Market, Keauhou Farmers Market, South Kona Fruit Stand, and Pure Kona Green Market. See Section 2.3.3 for more information regarding the agricultural feasibility of Nakahili and potential crops that could be sold a nearby farmer's markets.

Section 2.4.6 – *South Kohala*

Summary: The major economic activities of this district include tourism, cattle ranching, agriculture, educational institutions, and scientific research associated with the Mauna Kea observatories. Growth in tourism, in particular, has resulted in dramatic population growth

in the South Kohala district and, subsequently, the lowest unemployment rate and highest median income of all the districts for 1997.

South Kohala has attracted considerable investor interest through the addition of visitor units and for its world-class golf courses. Three large resorts within the district, the Mauna Kea Resort, Mauna Lani Resort, and the Waikoloa Beach Resort, account for 40 percent of all hotel rooms within the County. From 1980 to 1998, 3,400 new visitor units were developed from just ten properties, including many big-name resorts.

Courses of Action:

(a) Assist in the development of agriculture by protecting important agricultural land from urbanization, providing or having provided the necessary capital improvements, such as water, and working cooperatively with the agricultural sector and government.

(c) Recognize the diversity of climate, the quality of the ocean water and the natural beauty of the hills as vital economic and social assets of the region to be protected through appropriate regulations.

Discussion: Nakahili's agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. See Section 2.3.3 regarding the agricultural feasibility of Nakahili.

Nakahili will not substantially affect scenic vistas or view planes identified in the County General Plan or the South Kohala CDP. Neither the backdrop of the rolling Kohala Mountains nor dramatic view of Mauna Kea in the distance will be substantially affected.

Some impact to the visual character of open space grasslands may occur due to the creation of Nakahili, and the view of the Property will change from open space to a family agricultural community with farm dwellings and agricultural uses. However, with the descending elevation from Māmalahoa Highway, Nakahili will not impact clear views of the coastline and bright coastal waters from the highway. In addition, Nakahili will not impede views of South Kohala's unique "Five Mountain Views" of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā.

Section 4 – ENVIRONMENTAL QUALITY

Summary: Environmental quality can affect the quality of life for the County's residents and is also a major economic asset for Hawai'i. Many of the County's primary industries depend on a "clean" environment to achieve optimum growth, including agriculture, tourism, and scientific and technological enterprises. Air, water, soil, and noise pollution are of particular concern to Hawai'i

County and are linked to both man-made sources such as agricultural chemicals, traffic, and sewage, as well as natural sources such as volcanic smog ("vog"). While Federal and State regulations for environmental quality help to address larger environmental quality issues, County guidance is also needed to maintain the quality of environmental resources at the local level.

Goals: *(a) Define the most desirable use 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.

Standards:

(a) Pollution shall be prevented, abated, and controlled at levels that will protect and preserve the public health and well being, through the enforcement of appropriate Federal, State and County standards.
(b) Incorporate environmental quality controls either as standards in appropriate ordinances or as conditions of approval.
(c) Federal and State environmental regulations shall be adhered to.

Discussion: Nakahili will not have a significant impact on environmental quality. No Federal, State or County standards related to health, safety, and the environment will be violated during development or after occupancy of Nakahili. This EA provides a thorough discussion of: 1) existing conditions related to the natural environment (see Chapter 3) and the human environment (see Chapter 4); 2) potential impacts; and 3) mitigation measures to ensure there are no significant impacts to the environmental quality of the Property and surrounding region.

Section 5 – FLOODING AND OTHER NATURAL HAZARDS

Summary: Hawai'i's geology is relatively young and, in most areas, doesn't have well-defined watercourses to provide natural flood control, like many other islands. South Kohala is one of the handful of districts that is particularly impacted by flooding events, which can include ponding, surface runoff, high seas, storm surges, and tsunami inundation. Past storms in Hawai'i County that resulted in major flooding, have caused damage to or even complete destruction of roads, bridges, power lines, businesses, and homes, costing millions of dollars in damage. Flooding can also lead to massive erosion, which can destroy agricultural and farm lands. Flood plain regulation is addressed at federal, state, and local levels, including on the flooding risks from development of vacant lands (typically as they transition to urban uses) as well as surface water and sediment runoff from agricultural and conservation lands. However, there is still a need for better

coordination between the construction of planned drainage systems and increasing urban development.

In addition, Hawai‘i experiences other natural hazards that can exacerbate the effects or potential for flooding, as well as cause other problems

Goals: *(a) Protect human life.*
(b) Prevent damage to man-made improvements.
(c) Control pollution.
(e) Reduce surface water and sediment runoff.
(f) Maximize soil and water conservation.

Policies:
(g) Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.
(m) Encourage grassed shoulder and swale roadway design where climate and grade are conducive.
(p) Where applicable, natural drainage channels shall be improved to increase their capacity with special consideration for the practices of proper soil conservation, and grassland and forestry management.
(q) Consider natural hazards in all land use planning and permitting.

Standards:
(a) "Storm Drainage Standards," County of Hawai‘i, October, 1970, and as revised.
(b) Applicable standards and regulations of Chapter 27, "Flood Control," of the Hawai‘i County Code.
(c) Applicable standards and regulations of the Federal Emergency Management Agency (FEMA).
(d) Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation Control," of the Hawai‘i County Code.
(e) Applicable standards and regulations of the Natural Resources Conservation Ser-vice and the Soil and Water Conservation Districts. Incorporate environmental quality controls either as standards in appropriate ordinances or as conditions of approval.

Section 5.5.6 – South Kohala

One of two watersheds within the district extends makai from the peaks of Mauna Kea and Mauna Loa to the shoreline between ‘Anaeho‘omalu and Kawaihae. This semi-arid area provides few well-defined channels and infrequent stream flows, which lead to flash flooding during rare storms. These flash flooding events create high flows through beach parks and have in some instances overtopped drainageways, causing damage to private property, County roads, and drainage facilities. Fires in the upper slope areas also reduce available ground cover, which exacerbates the susceptibility of this watershed to flooding, and threatens the coastal areas.

Discussion: The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. The onsite drainage system is designed: 1) in conformance with the County of Hawai'i Department of Public Works Storm Drainage Standards; and 2) to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development). Drainage design will incorporate Low Impact Development (LID) features as practical and feasible, such as vegetated buffers/filter strips, grass swales, and infiltration basins. In addition, Nakahili's internal roadway will be designed with wide gravel shoulders and drainage swales on both sides to minimize runoff from excessive impervious services and allow runoff to infiltrate into the ground. Standards See Section 4.8.4 for further information regarding drainage.

A NPDES permit will be required before grading of areas one acre or greater. The NPDES permit requires erosion control measures and covers storm water runoff discharges associated with construction activities, including clearing, grading, excavation and construction support activities (see HAR Chapter 11-55). in compliance with the Clean Water Act, a Section 401 Water Quality Certification from the State Department of Health (DOH), Clean Water Branch (CWB) will be obtained if it is determined that may grading and related activities may result in any discharge into navigable waters or is otherwise triggered.

Section 6 – HISTORIC SITES

Goals: *(a)Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawaii.*

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.*
- *(n) Consider requiring Cultural Assessments for certain developments as part of the rezoning process.*

Discussion: Nakahili is not anticipated to have a negative impact on archeological or cultural resources. ASM Affiliates (ASM) conducted: 1) an Archaeological Inventory Survey (AIS) to identify any archaeological sites on the Property; and 2) a Cultural Impact Assessment (CIA) to identify traditional customary practices associated with the Property. The AIS identified seven sites (one Precontact and six Historic) within the Property and recommends: 1) no further work for the six Historic sites; and 2) preparation of a data recovery plan for the Precontact site (a C-shape enclosure). Regarding cultural resources, ASM concludes that that given the consultation and assessment documented in the CIA, "it is our conclusion that the proposed development of the

Nakahili Community on TMKs: (3) 6-8-002:005, 006, 028, 029, and 030 will not result in impacts to any traditionally valued cultural or historical resources nor will it impact any traditional cultural practices or beliefs."

Section 7 – NATURAL BEAUTY

Goals: *(b) Protect scenic vistas and view planes from becoming obstructed.*
(c) Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

Policies:

(a) Increase public pedestrian access opportunities to scenic places and vistas.
(h) Protect the views of areas endowed with natural beauty by carefully considering the effects of proposed construction during all land use reviews.

Standards:

(d) Natural or native vegetation attractive to a particular area.

Section 7.5.6 – South Kohala
West of Waimea, decreasing elevations cause the sloping landscape to transition from green uplands to pale yellow grasslands and finally to red and brown coastal areas. The coastline consists of green kiawe and white sand beaches with barren lava flows from Mauna Loa reaching the coast just below the southern boundary of South Kohala.

Discussion: Nakahili will not substantially affect scenic vistas or view planes identified in the County General Plan or the South Kohala CDP. Neither the backdrop of the rolling Kohala Mountains nor dramatic view of Mauna Kea in the distance will be substantially affected.

Some impact to the visual character of open space grasslands may occur due to the creation of Nakahili, and the view of the Property will change from open space to a family agricultural community with farm dwellings and agricultural uses. However, with the descending elevation from Māmalahoa Highway, Nakahili will not impact clear views of the coastline and bright coastal waters from the highway. In addition, Nakahili will not impede views of South Kohala's unique "Five Mountain Views" of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā.

To minimize visual impacts, all Nakahili farm dwellings will be in compliance with the development standards set forth under Chapter 25, HCC (Zoning) for Family Agricultural Districts. Lot sizes will be a minimum of one acre to maintain the agricultural character of the area and provide space for agricultural uses.

All outdoor lighting will be in compliance with Chapter 14, Article 9, HHC, which provides standards to limit degradation of the night visual environment by minimizing light glare, pollution, and trespass through regulation of the type and use of outdoor lighting.

See Section 4.3 for more information about visual impacts.

In developing Nakahili, where possible and feasible, Work Force Developers will consider climate-adaptive native plants (and other species considered low-risk of becoming invasive) for roadway landscaping, parks, and other common areas.

Section 8 – NATURAL RESOURCES AND SHORELINE

Goals: *(a) Protect and conserve the natural resources from undue exploitation, encroachment and damage.*
(c) Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.
(d) Protect rare or endangered species and habitats native to Hawaii.
(f) Ensure that alterations to existing land forms, vegetation, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.

Policies:

(p) Encourage the use of native plants for screening and landscaping.

Discussion: The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. The onsite drainage system will be designed to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development).

A biological survey of the Property (see Section 3.6 and Appendix A) concludes that Nakahili will not adversely affect native vegetation or sensitive flora or fauna, as the Property is dominated by non-native species and no rare, threatened or endangered species are present. In addition, the U.S. Fish and Wildlife Service (USFWS), has not designated critical habitat for endangered plant species on or near the Property (see Figure 16).

Planting climate-adaptive native plants (and other species considered low-risk of becoming invasive) for roadway landscaping, parks, and other common areas will be considered as more detailed design progresses.

Section 9 – HOUSING

Adequate housing is an important part of a government's considerations for the public health, welfare, and safety of its residents. For most families, housing becomes one of the largest expenditures of income and usually represents long term commitment to a place and community. Housing not only has a key role in the personal and social needs of residents, but also affects economic and environmental well-being. In an economic setting, the availability of housing is an essential contributor to business, industry and employment, while the location of housing can affect the location of other economic and employment opportunities, such as agriculture or resort developments. Housing and residential land use also utilizes a significant portion of the County's urban lands. Placement or settlement patterns of these residential lands and the form of housing are major influences on the environment and aesthetic setting of the island.

In existing urban areas, the supply of readily available housing and residential zoned lands is nearing a point where flexibility in choice of location and price will be limited and will contribute to rising costs of housing unless additional and alternative areas are made available for residential development. In rural and agricultural areas, affordable housing for both independent farmers and agricultural employees place competitive demands on the land. In addition to the expanding urban needs, rural and agricultural lands are being sought for rural/residential estate use.

Goals: *(a) Attain safe, sanitary, and livable housing for the residents of the County of Hawai'i.*
(b) Attain a diversity of socio-economic housing mix throughout the different parts of the County.
(c) Maintain a housing supply that allows a variety of choices.
(d) Create viable communities with affordable housing and suitable living environments.
(e) Improve and maintain the quality and affordability of the existing housing inventory.
(f) Seek sufficient production of new affordable rental and fee-simple housing in the County in a variety of sizes to satisfactorily accommodate the needs and desires of families and individuals.
(h) Make affordable housing available in reasonable proximity to employment centers.
(i) Encourage and expand home ownership opportunities for residents.

Policies:

(a) Encourage a volume of construction and rehabilitation of housing sufficient to meet growth needs and correct existing deficiencies.
(d) Support the construction of housing for minimum wage and agricultural workers.
(e) Continue to review codes and ordinances for overly stringent restrictions that may impose unnecessary hardship and adopt amendments if warranted.
(f) Continue to study and implement appropriate measures to curb property speculative practices that result in increased housing costs.
(i) Intilize housing powers and programs to accomplish housing goals and seek out new programs and resources to address the housing needs of the residents.

(j) Initiate and participate in activities with the private sector including the provision of leadership and expertise to neighborhoods and nonprofit organizations in the development of housing and community development projects.
(k) Increase rental opportunities and choices in terms of quality, cost, amenity, style and size of housing, especially for low and moderate income households.
(t) Ensure that adequate infrastructure is available in appropriate locations to support the timely development of affordable housing.
(v) Work with, encourage and support private sector efforts in the provision of affordable housing.

Section 7.5.6 – South Kohala
Since the 1970s, the population of South Kohala has almost doubled after every decade, while the increase in housing units grew by less than 25 percent in the 1990s. Housing constructions and subdivisions of land in South Kohala have occurred mostly in Waimea and Waikoloa Village, the latter containing slightly over half of the district's newly constructed parcels. In addition, Waikoloa Village has a large amount of undeveloped land zoned for residential use, which is anticipated to significantly contribute to the housing inventory for the entire district. While it is likely that these residential-zoned lands will accommodate mostly market-rate housing, the Waikoloa Development Company has dedicated approximately 300 acres to the County of Hawai‘i for affordable housing projects.

Discussion: The need for additional primary residential housing in the County has been well documented and widely discussed for decades. A review of several housing studies indicates that Hawai‘i County could require up to 28,400 more homes by 2035. See Section 4.9 for more information.

As a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, a majority of the Nakahili dwellings (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. Unlike many other West Hawai‘i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households. In addition, Nakahili is located near to existing residential and commercial uses at Waikoloa Village, and within a short drive of major job centers in Waimea Town, South Kohala resorts, and myriad public and private sector opportunities in the adjacent North Kona District.

Nakahili will serve diverse market segments including new householders, first-time buyers, move-up buyers, downsizing households, and seniors. Notably, it would produce a substantial inventory of rental housing opportunities, in alignment with the State's 2016 HHPS finding that more than half of intended County movers, including those currently living in North Hawai‘i, do not expect to purchase their next home. In addition, with its 300 apartments, of which at least 50% are planned

to be made available for rent at affordable rates by 2023, Nakahili would also represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawai‘i.

To ensure that adequate infrastructure is available support the timely development of Nakahili's workforce housing, Section 2.5 and Figure 9, provides information regarding Nakahili phasing, including phasing of infrastructure.

Section 12 – 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 types of facilities.
(b) Improve existing public facilities for optimum usage.
(c) Recreational facilities shall reflect the natural, historic, and cultural character of the area.
(m) Develop a network of pedestrian access trails to places of scenic, historic, natural or recreational values. This system of trails shall provide, at a minimum, an islandwide route connecting major parks and destinations.
(o) Develop facilities and safe pathway systems for walking, jogging, and biking activities.

Section 12.5.6 – South Kohala

Courses of Action:

(d) Encourage the establishment of neighborhood parks.

(i) Develop recreational facilities in Waikoloa, including an enclosed community center/sports complex.

Discussion: Nakahili is not expected to have a significant impact on regional recreational facilities, as Nakahili will include two parks: 1) an approximately six-acre "community green" neighborhood park located adjacent to the village area; and 2) an approximately 29-acre regional park in the lower (makai) central area (see Section 2.3.1 and Figure 8).

Section 13 – TRANSPORTATION

The purpose of transportation planning is to provide safe, efficient travel that incorporates long term, financially viable developments. Modern transportation planning also considers the transportation system as a whole, including all modes of transportation that are economical in an

area. With increasing demand for new transportation systems, the General Plan considers long range plans for both new developments as well as various types of improvements to existing systems, including traffic engineering, that work in conjunction with land use plans.

Goals: *(a) Provide a transportation system whereby people and goods can move efficiently, safely, comfortably and economically.*

Policies:

(a) A framework of transportation facilities that will promote and influence desired land use shall be established by concerned agencies.

(d) Consider the provision of adequate transportation systems to enhance the economic viability of a given area.

Section 13.2 – Roadways

Goals: *(a) Provide a system of roadways for the safe, efficient and comfortable movement of people and goods.*

Policies:

(a) Encourage the programmed improvement of existing roadways by both public and private sectors.

(f) Consider the development of alternative means of transportation, such as mass transit, bicycle and pedestrian systems, as a means to increase arterial capacity.

(h) Provisions for on-street parking shall be incorporated into the design of street systems.

(l) Adopt street design standards that accommodate, where appropriate, flexibility in the design of streets to preserve the rural character of an area and encourage a pedestrian-friendly design, including landscaping and planted medians.

(n) Encourage the development of walkways, jogging, and bicycle paths within designated areas of the community.

Section 13.2.5.6 – South Kohala

Courses of Action:

(f) Support the installation of suitable bikeways and/or jogging paths.

Discussion: Nakahili is not anticipated impede the goal of a regional transportation system whereby people and goods can move efficiently, safely, comfortably and economically. Traffic Impact Analysis Report (TIAR) prepared for Nakahili (see Section 4.7 and Appendix D) concludes: "With the assumed and recommended regional and Project-specific roadway improvements, traffic in the Project area is expected to operate adequately by 2038 with acceptable levels of service at all study intersections."

Within Nakahili's neighborhood commercial "village" area the spine road is designed as a two-lane undivided street with a 66-foot wide right-of-way with: parking on both sides, wide gravel shoulders that can be used as a multi-use path, and grassed swales.

Section 14 – LAND USE

Summary: Land use is major focal point of public concern and policy, which the General Plan aims to address through alternative solutions and guidance regarding the use of County resources. The General Plan sets forth goals, policies and standards to guide location, density, and building intensities of various land uses. In addition, Regional and Community Development Plans are intended to implement broad regional goals that guide detailed development patterns and infrastructure needs throughout the County. As such the land use element of the General Plan intends to accommodate growth and development in the County without compromising the need to preserve lands for residential, commercial and visitor services, industry, agriculture, open space, and County service and circulation uses.

Goals: *(a) Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural, and physical environments of the County.*

(b) Protect and encourage the intensive and extensive utilization of the County's important agricultural lands.

Policies:

(a) Zone urban- types of uses in areas with ease of access to community services and employment centers and with adequate public utilities and facilities.

(c) Allocate appropriate requested zoning in accordance with the existing or projected needs of neighborhood, community, region and County.

(f) Encourage the development and maintenance of communities meeting the needs of its residents in balance with the physical and social environment.

(h) Develop community development or regional plans for all of the districts or combinations of districts in cooperation with community residents and periodically review and amend these documents as necessary or as mandated.

(j) Encourage urban development within existing zoned areas already served by basic infrastructure, or close to such areas, instead of scattered development.

Standards:

(a) The designated land uses will be delineated on the General Plan Land Use Pattern Allocation Guide Map. The broad-brush boundaries indicated are graphic expressions of the General Plan policies, particularly those relating to land uses. They are long-range guides to general location and will be subject to: a) existing zoning; and b) State Land Use District. Similarly, the acreages allocated represent alternatives for the various levels of economic activity and supporting functions, such as resort, residential, commercial and industrial activities. Land required for community and governmental

services and programs as well as new towns and resort centers may be accommodated within the allocated acreages.

Section 14.2 – Agriculture

Goals: *(a) Identify, protect and maintain important agriculture lands on the island of Hawaii. (b) Preserve the agricultural character of the island.*

Policies:

(a) Implement new approaches to preserve important agricultural land.

(d) Agricultural land may be used as one form of open space or as green belt.

(f) In order to minimize the potential conflicts between agricultural and non-agricultural uses, standards and guidelines for the establishment of well defined buffer areas as part of new, non-agricultural developments that are located adjacent to important agricultural lands shall be developed.

(h) Develop subdivision standards that make a distinction between agricultural and urban land uses.

(i) Designate, protect and maintain important agricultural lands from urban encroachment.

(j) Ensure that development of important agricultural land be primarily for agricultural use.

(n) Investigate possibilities to prevent non-agricultural uses that could interfere with potential or existing agricultural activities on important agricultural lands.

(s) Important agricultural lands shall not be rezoned to parcels too small to support economically viable farming units.

(t) Discourage speculative residential development on agricultural lands.

Standards:

(a) The designated land uses will be delineated on the General Plan Land Use Pattern Allocation Guide Map. The broad-brush boundaries indicated are graphic expressions of the General Plan policies, particularly those relating to land uses. They are long-range guides to general location and will be subject to: a) existing zoning; and b) State Land Use District. Similarly, the acreages allocated represent alternatives for the various levels of economic activity and supporting functions, such as resort, residential, commercial and industrial activities. Land required for community and governmental services and programs as well as new towns and resort centers may be accommodated within the allocated acreages.

Section 14.2.4.5 – South Kohala

Courses of Action:

(a) Protect important agricultural lands from urban encroachment.

(b) Encourage buffer zones or compatible uses between important agricultural land and adjacent uses of land.

Discussion: While the LUPAG map designates the Property as Important Agricultural Land (see Figure 5) and the County zoning of the Property is A-20a (Agricultural District – minimum lot size of 20 acres; see Figure 7), the Property does not meet five out of six General Plan criteria for designation as Important Agricultural Land.

Nakahili's family agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. The agricultural lots will provide ample space for small farms and diversified agriculture, including small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community.

While Nakahili's small neighborhood commercial "village" area will not be an agricultural use, it will be designed to generally conform to the development standards set forth under Chapter 25, HCC, Neighborhood Commercial Districts, which apply to strategically located commercial centers that supply goods and services to a residential or working population on a frequent need or convenience basis. The intent of the neighborhood commercial "village" is to provide: 1) a core area with stores and services (such as a neighborhood grocery store, shops, and restaurants) targeted to the community; and 2) affordable rentals specifically envisioned for those who work in the region and need an affordable place to live within a short drive from their workplaces, for example, employees of nearby resorts.

As a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, a majority of the Nakahili dwellings (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. Unlike many other West Hawai‘i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households. The need for additional primary residential housing in the County has been well documented and widely discussed for decades. A review of several housing studies indicates that Hawai‘i County could require up to 28,400 more homes by 2035. See Section 4.9 for more information on the need for housing.

Section 14.3 – Commercial Development

Goals: *(a)Provide for commercial developments that maximize convenience to users.*
(b) Provide commercial developments that complement the overall pattern of transportation and land usage within the island's regions, communities, and neighborhoods.

Policies:

(b) Commercial facilities shall be developed in areas adequately served by necessary services, such as water, utilities, sewers, and transportation systems. Should such services

not be available, the development of more intensive uses should be in concert with a localized program of public and private capital improvements to meet the expected increased needs.
(c) Distribution of commercial areas shall meet the demands of neighborhood, community and regional needs.
(e) Encourage the concentration of commercial uses within and surrounding a central core area.
(f) The development of commercial facilities should be designed to fit into the locale with minimal intrusion while providing the desired services. Appropriate infrastructure and design concerns shall be incorporated into the review of such developments.
(h) Require developers to provide basic infrastructure necessary for development.
(i) Encourage commercial areas to develop on an axis perpendicular to the highway.

Standards:

(a) Neighborhood Centers

- *Provide: Convenience goods, e.g., foods, drugs, and personal services.*
- *Major Shops: Supermarket and/or drug store.*
- *Number of Shops: 5 to 15.*
- *Acreage: 5 to 10 acres.*
- *Approximate Market: 3,000 people.*

Section 14.3.5.6 – South Kohala

Courses of Action:

(c) Continue the concentration of commercial uses in Waimea, Kawaihae, Waikoloa Village, and in the resort areas. Do not allow strip or spot commercial development on highways outside of these primary commercial areas.

Discussion: Nakahili will include a small neighborhood commercial "village" area with apartments and limited retail uses to serve the community. The neighborhood commercial "village" area will generally conform to the development standards set forth under Hawai'i County Code (HHC) Chapter 25 (Zoning) for Neighborhood Commercial Districts, which apply to strategically located commercial centers that supply goods and services to a residential or working population on a frequent need or convenience basis. The neighborhood commercial "village" area will not be a strip mall along Māmalahoa Highway, but rather will be within the community to recreate a "core" area targeted to community residents to provide frequently needed items and convenience, thus potentially reducing car trips outside of Nakahili for all needs

Section 14.4 – Industrial

Goals: *(a) Designate and allocate industrial areas in appropriate proportions and in keeping with the social, cultural, and physical environments of the County.*

Policies:

(a) Support the creation of industrial parks in appropriate locations as an alternative to strip development.

(c) Locate industrial areas convenient to transportation facilities, and provide a variety of industrial zoned districts and lot sizes, depending on the needs of the industries and the communities.

(d) Improve the aesthetic quality of industrial sites and protect amenities of adjacent areas by requiring landscaping, open spaces, buffer zones, and design guidelines.

(g) Industrial-commercial mixed use districts shall be provided in appropriate locations.

(h) Require developers to provide basic infrastructure necessary for development.

Standards:

(a) Industrial development shall maintain or improve the quality of the present environment

(c) Topography of industrial land shall be reasonably level.

(d) Industrial development shall be conveniently located to its labor resource.

Section 14.4.5.5 – South Kohala

Courses of Action:

(b) Industrial development should be in harmony with surrounding uses and the environment.

(c) Identify sites suitable for future industrial activities as the need arises.

Discussion: Nakahili neighborhood commercial "village" area will provide space for some limited light industrial uses, such as a self-storage facility or contractor or supplier warehouses or offices.

Section 14.5 – Multiple Residential

Goals: *(a) To provide for multiple residential developments that maximize convenience for its occupants.*

(b) To provide for suitable living environments that accommodate the physical, social and economic needs of the island residents.

(c) To enhance the overall quality of life in our residential communities.

Policies:

(c) Encourage flexibility in the design of residential sites, buildings and related facilities to achieve a diversity of socio-economic housing mix and innovative means of meeting the market requirements.

Standards:

(a) Areas shall be located in such a manner that traffic generated by high density development will not be required to travel through areas of lesser density en route to principal community facilities.
(c) Provide adequate access to arterial streets, shopping facilities, schools, employment centers, and other services.
(f) Recreational area and/or facilities shall be considered in multiple residential development.

Section 14.5.5.6 – South Kohala

Courses of Action:

(a) Basic infrastructure shall be provided to those areas zoned for higher density use.
(b) Appropriately zoned lands shall be allocated as the need arises.

Discussion: Nakahili will serve diverse market segments including new householders, first-time buyers, move-up buyers, downsizing households, and seniors. Notably, it would produce a substantial inventory of rental housing opportunities, in alignment with the State's 2016 HHPS finding that more than half of intended County movers, including those currently living in North Hawai‘i, do not expect to purchase their next home. In addition, with its 300 apartments, of which at least 50% are planned to be made available for rent at affordable rates by 2023, Nakahili would also represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawai‘i.

To ensure that adequate infrastructure is available support the timely development of Nakahili's workforce housing, Section 2.5 and Figure 9, provides information regarding Nakahili phasing, including phasing of infrastructure.

Section 14.6 – Single-Family Residential

Goals: *(a)To maximize choices of single-family residential lots and/or housing for residents of the County.*
(b) To ensure compatible uses within and adjacent to single-family residential zoned areas.
(d) To provide single-family residential areas conveniently located to public and private services, shopping, other community activities and convenient access to employment centers that takes natural beauty into consideration.
(e) To enhance the overall quality of life in our residential communities.

Policies:

(d) Incorporate reasonable flexibility in codes and ordinances to achieve a diversity of socio-economic housing mix and to permit aesthetic balance between single-family residential structures and open spaces.

(f) Designate and allocate single-family residential zoned lands at varying densities for future use in accordance with the needs of the communities and the stated goals, policies, and standards.

Standards:

(a) There shall be a transitional area between single-family residential areas and incompatible uses.

(c) Areas shall have basic improvements and amenities necessary for immediate use.

Discussion: Nakahili's primary use will be small-scale farms with single-family farm dwellings. Nakahili's unique design with single-family farm dwellings on small-scale agricultural lots provides choices of single-family residential lots and/or housing for residents of the County and will be an alternative to typical single-family homes on small lots. Nakahili will serve diverse market segments including new householders, first-time buyers, move-up buyers, downsizing households, and seniors.

Unlike many other West Hawai'i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households. In addition, Nakahili is located near to existing residential and commercial uses at Waikoloa Village, and within a short drive of major job centers in Waimea Town, South Kohala resorts, and myriad public and private sector opportunities in the adjacent North Kona District.

Section 14.8 – Open Space

Goals: *(a) Provide and protect open space for the social, environmental, and economic well-being of the County of Hawai'i and its residents.*

Discussion: Some impact to the visual character of open space grasslands may occur due to the creation of Nakahili, and the view of the Property will change from open space to a family agricultural community with farm dwellings and agricultural uses. However, with the descending elevation from Māmalahoa Highway, Nakahili will not impact clear views of the coastline and bright coastal waters from the highway. In addition, Nakahili will not impede views of South Kohala's unique "Five Mountain Views" of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā. For more information on open space and visual impacts see Section 4.3.

South Kohala Community Development Plan

This section includes the General Policies set forth in the South Kohala Community Development Plan that are relevant to Nakahili. The priority issues established by the Steering Committee, not in any order of priority, include the following:

- Preserve Culture/Sense of Place
- Traffic and Transportation
- Affordable Housing
- Emergency Preparedness
- Environmental Stewardship and Sustainability

GENERAL POLICY NO.1: PRESERVE THE CULTURE AND SENSE OF PLACE OF SOUTH KOHALA COMMUNITIES

1.3. Provide for more developed park space and recreational facilities in South Kohala.

Discussion: Nakahili will include two parks: 1) an approximately six-acre "community green" neighborhood park located adjacent to the village area; and 2) an approximately 29-acre regional park in the lower (makai) central area (see Section 2.3.1 and Figure 8).

1.6. It is recommended that the Planning Department provide opportunities and forums for public review and comment for all subdivisions, PUD's, plan developments, and cluster developments, proposed in the District of South Kohala.

Discussion: During the course of planning Nakahili Work Force Developers representatives meet with State and County agencies, elected officials, and community groups and a pre-consultation letter was sent to State and County agencies, elected officials, and community groups (see Section 8). In addition, this EA discusses potential impacts and mitigation measures regarding Nakahili. Further, public and government agency comments will be received on this EA and the Hawai'i County Council will hold public hearings as part of its deliberations on Nakahili.

GENERAL POLICY NO. 3: PROVIDE AFFORDABLE AND WORKFORCE HOUSING RESOURCES FOR LOW AND MODERATE INCOME INDIVIDUALS, FAMILIES, AND FOR THOSE RESIDENTS OF SOUTH KOHALA WITH SPECIAL NEEDS

3.1. The County shall establish policies and programs for the implementation of affordable and workforce housing projects in those areas of the island where such projects are most needed, including Waimea and Waikoloa Village.

Discussion: The need for additional primary residential housing in the County has been well documented and widely discussed for decades (see Section 4.9 for more information). A review of several housing studies indicates that Hawai'i County could require up to 28,400 more homes by 2035.

As a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, a majority of the Nakahili dwellings (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. Unlike many other West Hawai‘i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households.

Nakahili will serve diverse market segments including new householders, first-time buyers, move-up buyers, downsizing households, and seniors. Notably, it would produce a substantial inventory of rental housing opportunities, in alignment with the State's 2016 HHPS finding that more than half of intended County movers, including those currently living in North Hawai‘i, do not expect to purchase their next home. In addition, with its 300 apartments, of which at least 50% are planned to be made available for rent at affordable rates by 2023, Nakahili would also represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawai‘i.

GENERAL POLICY NO. 4: DEVELOP PROGRAMS AND STANDARDS THAT WILL PROTECT THE SOUTH KOHALA COMMUNITY FROM NATURAL HAZARDS, INCLUDING MAJOR STORMS, FLOODING, TSUNAMI, LAVA FLOWS, AND WILDFIRES

4.2 Adopt development standards and community plans that mitigate wildfire risk and maximize responder safety, where wildfire danger is present:

- *The County Planning Department should consider requiring all new subdivisions to incorporate through their covenants, codes, and restrictions "firewise landscaping principles" for common areas and for individual homes, including defensible space emphasizing fire and drought resistant plants, as well as native plants when appropriate. This requirement could be a condition for any final subdivision approvals.*
- *The County Planning Department should consider requiring all applicants for subdivision approvals to complete a wildfire hazard mitigation plan. This plan should be completed before final subdivision approval is granted. These plans should recommend specific measures for reducing wildfire hazard in the interface areas between the subdivision and any range/open lands or forests and in any open areas within the subdivision.*

Discussion: To mitigate risks posed by wild-land fires the Nakahili plan designates a 150-foot wide firebreak around the Property perimeter and an additional 150-foot wide firebreak through the middle of the Property (see Figure 8). Section 4.8 provides information on Nakahili's water system, including fire flow requirements water storage tank capacities. If required as part of the subdivision process, a wildfire hazard mitigation plan will be prepared for Nakahili.

GENERAL POLICY NO. 5: DEVELOP GUIDELINES AND PROGRAMS THAT PROMOTE ENVIRONMENTAL STEWARDSHIP AND THE CONCEPT OF SUSTAINABILITY

> *5.2 The County shall require water conservation measures and plans for new large scale development projects (i.e. residential and agricultural subdivisions, resorts, commercial and industrial centers, etc.) in South Kohala*

Discussion: To conserve water resources, all Nakahili dwellings will include low-flow and water-efficient plumbing fixtures and devices pursuant to the Hawai‘i County Water Use and Development Plan reference to the Plumbing Code. In addition, in developing Nakahili, where possible and feasible, Work Force Developers will consider climate-adaptive native plants (and other species considered low-risk of becoming invasive) for roadway landscaping, parks, and other common areas. Further, Work Force Developers envisions that future residents may choose to: 1) to plant climate-adaptive, non-invasive plant species (including plant species that may contribute to returning the land to active agricultural production); and 2) not irrigate the entire area of their lots.

> *5.5 Preserve visually and environmentally important open space grasslands, ocean views, views of the pu‘u, and South Kohala’s unique “Five Mountain Views” of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā.*

Discussion: Nakahili will not substantially affect scenic vistas or view planes identified in the County General Plan or the South Kohala CDP. Neither the backdrop of the rolling Kohala Mountains nor dramatic view of Mauna Kea in the distance will be substantially affected.

Some impact to the visual character of open space grasslands may occur due to the creation of Nakahili, and the view of the Property will change from open space to a family agricultural community with farm dwellings and agricultural uses. However, with the descending elevation from Māmalahoa Highway, Nakahili will not impact clear views of the coastline and bright coastal waters from the highway. In addition, Nakahili will not impede views of South Kohala’s unique “Five Mountain Views” of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā.

No named pu‘u, geologic, or natural features were identified on the Property as a result of examining historical maps, documentation, and testimonies in the course of research conducted as part of the Cultural Impact Assessment (see section 4.2). Therefore, Nakahili will not impact any known or traditionally valued pu‘u on the Property, as none have been identified.

To minimize visual impacts, all Nakahili farm dwellings will be in compliance with the development standards set forth under Chapter 25, HCC (Zoning) for Family Agricultural Districts. Lot sizes will be a minimum of one acre to maintain the agricultural character of the area and provide space for agricultural uses.

All outdoor lighting will be in compliance with Chapter 14, Article 9, HHC, which provides standards to limit degradation of the night visual environment by minimizing light glare, pollution, and trespass through regulation of the type and use of outdoor lighting.

> *5.7 Increase Enforcement of the County Lighting Code and modify the existing code as necessary.*

Discussion: All outdoor lighting will be in compliance with Chapter 14, Article 9, HHC, which provides standards to limit degradation of the night visual environment by minimizing light glare, pollution, and trespass through regulation of the type and use of outdoor lighting.

> *5.12 Incorporate the concept of "Sustainability" as defined in the State of Hawai'i "2050 Sustainability Plan" in all future planning and projects in South Kohala. The State of Hawai'i "2050 Sustainability Plan" defines sustainability as a Hawai'i that achieves the following:*
>
> - *Respects the culture, character, beauty and history of our State's island communities*
> - *Strikes a balance between economic, social and community, and environmental priorities*
> - *Meets the needs of the present without compromising the ability of future generations to meet their own needs.*

Discussion: Sustainable planning design and features of Nakahili include:

- A small neighborhood commercial "village" area with stores and services (such as a neighborhood grocery store, shops, and restaurants) targeted to the community to provide frequently needed items and convenience, thus potentially reducing car trips outside of Nakahili for all needs.
- Affordable rentals specifically envisioned for those who work in the region and need an affordable place to live within a short drive from their workplaces (as compared to other areas of the island from which some people may commute), for example, employees of nearby resorts, thus potentially reducing long-distance commuting and energy consumption.
- Agricultural lots to enable self-sufficiency, promote sustainability, and encourage sustainable food production, thus:
    - Reducing the environmental strain of conventional, energy-intensive food production
    - Providing for more diversified (and therefore more resilient) agricultural uses
    - Providing the opportunity for people who choose to have a more active role in their food production with the ability to know and control the quality of food they chose to consume
- Mitigating risks posed by wild-land fires by designating a 150-foot wide firebreak around the Property perimeter and an additional 150-foot wide firebreak through the middle of the Property (see Figure 8)

- Providing roadways with wide gravel shoulders and drainage swales on both sides to minimize runoff from excessive impervious services and allow runoff to infiltrate into the ground
- Preserving the existing drainage patterns, by minimizing grading.
- Conserving water by including low-flow and water-efficient plumbing fixtures and devices pursuant to the Hawai‘i County Water Use and Development Plan reference to the Plumbing Code Regulation for new developments
- Reducing energy consumption by including solar water heater systems for all single-family farm dwellings sold by Work Force Developers, as required under Section 196-6.5, HRS; or alternatively including energy-efficient gas water heating systems, as may be permitted under the variance provisions of Section 196-6.5, HRS

See Section 2.4 for additional sustainable planning and design features that may be considered (as practicable and feasible) as more detailed design progresses.

5.13 Support policies and programs that promote the concept of food sustainability.

Discussion: Nakahili's agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. The agricultural lots will provide ample space for small farms and diversified agriculture, including small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community. See Section 2.3 for more information on Nakahili's agricultural feasibly and discussion of sustainable food production.

County of Hawai‘i Zoning Code

The zoning regulations for the County of Hawai‘i are prescribed in Chapter 25 of the Hawai‘i County Code. This Zoning Code is applied and administered within the framework of the General Plan, and for the purpose of promoting health, safety, morals, and the general welfare of the County.

Under the Zoning Code, various zoning districts are established which regulate the type of development and permitted uses of property and are depicted on zoning district maps. The zoning for the Property is A-20 (Agricultural District – minimum lot size of 20 acres) see Figure 7.

Discussion: While it is recognized the County zoning of the Property is A-20a (Agricultural District – minimum lot size of 20 acres), Nakahili's agricultural lots will designed to generally conform to the development standards set forth under Chapter 25, HCC Family Agricultural Districts, which provide for a blend of small-scale agricultural operations associated with small acreage farms, farm estates, and subsistence lots within the State Land Use Agricultural District. All of the family agricultural lots will be in compliance with the minimum lot size required in the State Agricultural District and will remain in the State Agricultural District.

Nakahili's family agricultural lots will make the Property more viable for agricultural uses compared to the limited cattle grazing that currently occurs on the Property. The agricultural lots will provide ample space for small farms and diversified agriculture, including small-scale family farms and other agricultural uses to enable self-sufficiency, promote sustainability, and foster a family agricultural community. For more information on Nakahili's agricultural feasibility see Section 2.3.

As a family agricultural community, Nakahili will include approximately 700 one-acre agricultural lots surrounded by approximately 150 larger agricultural lots ranging from two to five areas (and slightly larger) located around the perimeter of Nakahili to serve as a buffer to adjacent, larger agricultural properties.

Nakahili will also include a small neighborhood commercial "village" area (15 acres or less in size) with apartments and limited retail uses to serve the community, however, Nakahili's primary use will be small-scale farms with single-family farm dwellings.

While Nakahili's small neighborhood commercial "village" area will not be an agricultural use, it will be designed to generally conform to the development standards set forth under Chapter 25, HCC, Neighborhood Commercial Districts, which apply to strategically located commercial centers that supply goods and services to a residential or working population on a frequent need or convenience basis.

The intent of the neighborhood commercial "village" is to provide: 1) a core area with stores and services (such as a neighborhood grocery store, shops, and restaurants) targeted to the community to provide frequently needed items and convenience; and 2) affordable rentals specifically envisioned for those who work in the region and need an affordable place to live within a short drive from their workplaces (as compared to other areas of the island from which some people may commute), for example, employees of nearby resorts. Work Force Developers will comply with all requirements necessary pertaining to Chapter 205, HRS to allow the uses proposed within the neighborhood commercial "village" area.

To allow the Nakahili's agricultural lots and neighborhood commercial "village" with the County's A-20 zone, Work Force Developers proposes to request exemptions from the County of Hawai‘i Zoning Code. Although it is premature to identify specific exemptions that will be requested for Nakahili, it is expected that Work Force Developers will consult with applicable agencies and gather related information during the EA process. Section 5.3, Approvals and Permits, contains additional information regarding the scope of, and rational for, the exemptions that may be requested. After completion of the EA process, Work Force Developers will prepare a 201H Application that will include a list of requested exemptions and submit it to OHCD for review.

5.3 APPROVALS AND PERMITS

Approvals for Nakahili are proposed be processed under Section 201H-38, HRS which was enacted to encourage the development of affordable housing. Section 201H-38, HRS (titled "Housing development; exemption from statutes, ordinances, charter provisions, and rules"), provides that the various County Council's shall authorize the development of housing projects that "shall be exempt from all statutes, ordinances, charter provisions, and rules of any government agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of dwelling units thereon" as long as: the project meets minimum requirements of health and safety; the project does not contravene any safety standards, tariffs, or rates and fees approved by the Public Utilities Commission for public utilities or of the Board of Water Supply; and the County Council approves the project by resolution.

In Hawai'i County, OHCD serves as the County's 201H coordinating agency. OHCD is the 201H coordinating agency for projects that are primarily designed for affordable housing, meaning that a majority of the housing units (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. In addition, OHCD requires the following additional affordability criteria under Chapter 11, HHC:

- A minimum of 4% of the total units must be affordable to households with incomes at or below 80% of the median income.
- A minimum of 8% or more of the total units must be affordable to households with incomes at or below 100% of the median income.
- A minimum of 12% or more of the total units must be affordable to households with incomes at or below 120% of the median income.
- A minimum of 20% or more of the total units must be affordable to households with incomes at or below 140% of the median income.

To develop Nakahili as a workforce family agricultural community, Work Force Developers will request exemptions from certain provisions of Hawaii Revised Statutes, the Hawai'i County Code and County Charter, and County rules and regulations. At this stage, Work Force Developers' exemptions are conceptual. It is expected that Work Force Developers will consult with applicable agencies and gather related information during the EA process. After completion of the Environmental Assessment process, Work Force Developers will prepare a 201H Application that will include a list of requested exemptions and submit it to OHCD for review.

The 201H Application will include the exemptions to be requested for Nakahili. OHCD will review, process and circulate the 201H Application to appropriate agencies for additional review. Modifications to the Nakahili plans and/or requested exemptions may be made in response to that agency review process. Further modifications may also be made by the Hawai'i County Council in taking action on the 201H request.

Although it is premature to identify specific exemptions that will be requested for Nakahili, Work Force Developers expects that the exemptions requested in the 201H Application will fall into the following broad categories: (i) State and County statutes, ordinances, codes, rules, and regulations and relating to land use planning, zoning, concurrency, subdivision, and related application, hearing, notice and processing times; (ii) State and County building and construction statutes, ordinances, codes, rules and regulations, (iii) fair share and land/park dedication requirements and processing times; and (iv) permit and plan review fees and processing times. (collectively the "Exemptions").

Exemptions are needed to achieve and maintain Nakahili's financial feasibility as a workforce family agricultural community. The Exemptions related to processing times will allow for expedited delivery of affordable dwellings. The Exemptions from State and County land use planning, zoning, concurrency, subdivision and related application, hearing, notice and processing times will reduce the lengthy processes that would otherwise be required to obtain the various land use changes needed to develop Nakahili, thereby encouraging the timely development of affordable housing. The Exemptions related to certain subdivision, building and construction codes, rules, and regulations and fair share and land/park dedication standards and related hearing, notice, and processing times will provide flexibility to allow for quicker delivery of affordable housing and related infrastructure. The Exemptions from various fees will further the affordability of Nakahili by reducing the costs for development. The Applicant may also seek exemptions from general excise taxes and real property taxes under other provisions of the law.

It is not expected that Nakahili, as a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS would be required to comply with Chapter 11, HHC, related to the development of affordable housing. Chapter 11, HCC is triggered upon certain types of rezoning and generally requires 20% of the total number of proposed units to qualify as affordable housing. Nakahili will not seek a formal rezoning. Moreover, Work Force Developers proposes to provide more than 50% of dwellings and lots at Nakahili at affordable prices, thereby far exceeding the affordability requirements under Chapter 11, HHC. Work Force Developers also expects to propose additional affordability provisions intended to further the County's goal of providing affordable housing that would exceed the requirements of Chapter 11, HCC.

Notwithstanding exceptions that Work Force Developers may seek, Table 5-3 provides a list of anticipated approvals and permits required, or likely required, for Nakahili.

Table 5-3: List of Anticipated Approvals & Permits

Approval/Permit	Responsible Agency	Status
Chapter 343, HRS Compliance	County OHCD	Pending public comments and agency acceptance.
201H exemptions to: • General Plan Land Use Pattern Allocation Guide map • South Kohala Community Development Plan • Zoning Code • Subdivision Code • Other State and County statutes, ordinances codes, rules, and regulations, rules, and fees as may be determined.	Processing Agency: County OHDC Approving Authority: Hawai'i County Council	201H application to be submitted after Chapter 343, HRS Compliance
State Land Use District Boundary Amendment (less than 15 acres)	Processing Agency: County OHDC or Planning Dept Approving Authority: Hawai'i County Council	Concurrent with 201H application or subsequent to 201H approval
Well Construction/Pump Installation Permits	State Dept of Land and Natural Resources, Commission on Water Resource Management	Application to be filed after 201H approval
Bulk Lot Subdivision Approval (no improvements)	County Planning Dept	Application to be filed after 201H approval
Subdivision Approval for Lots	County Planning Dept	Application(s) to be filed after Bulk Lot Subdivision Approval
Plan Approval for commercial and multiple-family residential units	County Planning Dept	First application to be filed concurrent with Subdivision Approval
Grading/Building Permits	County Dept of Public Works	Application to be filed after 201H approval
National Pollutant Discharge Elimination System (NPDES) construction site stormwater discharge permit	State Dept of Health	Application to be submitted prior to Building/Grading Permits.
Water Quality Certification	State Dept. of Health	Application to be submitted concurrent with NPDES permit.
Approval for Wastewater Treatment Facility	State Dept of Health	Application to be submitted after Plan Approval is received.
Individual Wastewater System Permit	State Dept of Health, Wastewater Branch	Application to be submitted after Plan Approval and Subdivision Approval is received.
Private Waterline Installation	County Dept of Water Supply/Dept of Public Works	Application to be submitted after Plan Approval and Subdivision Approval is received.

Approval/Permit	Responsible Agency	Status
Private Storm Drain Connection and/or Discharge Permit to the State of Hawai‘i Highways Division Storm Drain System	State Dept. of Transportation	Application to be submitted after Plan Approval and Subdivision Approval is received.
Permit to Perform Work within a State Right-of-Way	State Dept. of Transportation	Application to be submitted after Plan Approval and Subdivision Approval is received.

6 ALTERNATIVES

In the planning of Nakahili various alternatives were considered, including the alternatives discussed below.

6.1 NO ACTION ALTERNATIVE

Under the "No Action" Alternative, Nakahili would not be developed and the Property would remain its current state. This alternative would not provide workforce dwellings to meet an anticipated future demand for some 28,400 resident-oriented housing units by 2035 due to a growing population. The "No Action" Alternative would also forgo Nakahili's contribution to State and County revenues in the form of property taxes, general excise taxes, and income taxes from increased employment. (see Section 4.9 for more information on population, housing need, and economic and fiscal impacts). For these reasons, the "No Action" Alternative is undesirable

6.2 NON "201H" PROCESSING OF APPROVALS

Under the "Non 201H Alternative" approvals for Nakahili would be sought through State and County processes for amendments to the County of Hawai‘i General Plan and the County of Hawai‘i South Kohala CDP, and for a Change in Zoning. These processes could add years to the approval process, thereby stalling the provision of Nakahili's workforce agricultural lots and farm dwellings and rental apartments.

Private residential permitting for Hawai‘i County between 2015 and 2017 averaged only 784 units annually, or 752 when associated demolitions are deducted. Moreover, not all permitted units get built on a timely basis, or ever, and many are developed to target non-residential markets. With an average of only 784 units permitted annually, reaching the projected future demand for some 28,400 resident-oriented housing units by 2035 due to a growing population, may not be achievable, and thus increasing the strain on the housing supply and increasing housing prices for residents. In addition, without 201H exemptions, and the decrease in time necessary for approvals Nakahili would not be fiscally feasibility as a workforce family agricultural community. For these reasons the "Non 201H Alternative" is not desirable or feasible.

6.3 HIGHER DENSITY COMMUNITY

At a preliminary stage in planning for Nakahili, Work Force Developers considered much higher density plans, with more commercial area and over 4,300 lots and multifamily units. As planning progressed it was deemed that this higher density alternative may not be feasible for various reasons, including internal and regional infrastructure, costs, processing times, and market demand. For these reasons, the higher density plans were scaled back to the current Nakahili plan.

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7 FINDINGS AND DETERMINATION

To determine whether the creation of Nakahili may have a significant impact on the physical and human environment, all phases and expected consequences of Nakahili have been evaluated, including potential primary, secondary, short-range, long-range, and cumulative impacts. Based on this evaluation, the accepting agency, OHCD anticipates issuing a Finding of No Significant Impact (FONSI). The supporting rationale for this finding is presented below.

7.1 SIGNIFICANCE CRITERIA

The discussion below evaluates the significance of the Project's impacts based upon the Significance Criteria set forth in Hawai'i Administrative Rules section 11-200-12.

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

Discussion: Nakahili does not involve an irrevocable commitment to loss or destruction of any natural or cultural resource.

Chapter 3 of this EA discusses potential impacts and mitigation measures to the natural environment, including potential impacts and mitigation measures relating to hydrology and biological resources.

Nakahili is not anticipated to negatively impact: 1) surface water drainageways through the Property; and 2) groundwater resources. Regarding surface water drainageways, uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. See Section 4.8.4 for further information regarding drainage.

Regarding groundwater resources, according to the current WRPP (CWRM, 2008), the West Mauna Kea Sector, Waimea Aquifer System (80301), over which the Property is located, has a sustainable yield of approximately 24 million gallons per day (mgd) and current use of 9.173 mgd (as of 2005). At full build-out Nakahili's daily water demand is expected to average 1.39 mgd (see Section 4.8.1 for more information on Nakahili's water system), and thus the aquifer has adequate capacity to accommodate Nakahili's water demand without impacting the aquifer's sustainable yield. However, due to the pending WRPP 2019 Update and proposed estimates regarding sustainable yield, Work Force Developers will monitor the update process.

Nakahili's wastewater systems will be in compliance with all DOH requirements as provided under HAR Title 11, Chapter 62, Wastewater Systems (Wastewater System Rules). The purpose of these rules is, in part, to ensure that the disposal of wastewater from wastewater systems does not: "…contaminate or pollute any drinking water or potential drinking water supply, or the waters of any beaches, shores, ponds, lakes, streams, groundwater, or shellfish growing waters…" (see Section 11-62-02, HAR). In addition, the Wastewater System Rules state, in part: "The department

of health seeks to ensure that the use and disposal of wastewater and wastewater sludge does not contaminate or pollute any valuable water resource…" and "Individual wastewater systems may be utilized in remote areas and in areas of low population density." (see Section 11-62-01, HAR). See Section 4.8.2 for more information on Nakahili's wastewater systems.

A biological survey of the Property (see Section 3.6 and Appendix A) concludes that Nakahili will not adversely affect native vegetation or sensitive flora or fauna, as the Property is dominated by non-native species and no rare, threatened or endangered species are present. In addition, the U.S. Fish and Wildlife Service (USFWS), has not designated critical habitat for endangered plant species on or near the Property (see Figure 16).

Nakahili is not anticipated to have a negative impact on archeological or cultural resources. ASM Affiliates (ASM) conducted: 1) an Archaeological Inventory Survey (AIS) to identify any archaeological sites on the Property; and 2) a Cultural Impact Assessment (CIA) to identify traditional customary practices associated with the Property. The AIS identified seven sites (one Precontact and six Historic) within the Property and recommends: 1) no further work for the six Historic sites; and 2) preparation of a data recovery plan for the Precontact site (a C-shape enclosure). Regarding cultural resources, ASM concludes that that given the consultation and assessment documented in the CIA, "it is our conclusion that the proposed development of the Nakahili Community on TMKs: (3) 6-8-002:005, 006, 028, 029, and 030 will not result in impacts to any traditionally valued cultural or historical resources nor will it impact any traditional cultural practices or beliefs."

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

Discussion: Nakahili will not curtail, but rather will expand, the range of beneficial uses of the environment. With Nakahili, the use of the Property will change from open space with limited cattle grazing to a family agricultural community providing a significant number of workforce dwellings to Hawai‘i residents. Unlike many other West Hawai‘i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households. The need for additional primary residential housing in the County has been well documented and widely discussed for decades (see Section 4.9 for more information). Nakahili could be an important component of a County plan to meet an anticipated future demand for some 28,400 resident-oriented housing units by 2035. Thus, the use of the Property for Nakahili greatly expands the range of beneficial uses of the Property for the population of the island, compared to the current restricted use for limited cattle grazing.

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

Discussion: Nakahili does not conflict with State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS. The environmental policies enumerated in Chapter 344, HRS promote conservation of natural resources and an enhanced quality of life for all citizens. Nakahili is not expected to significantly impact any natural resources as discussed throughout this EA.

Nakahili is expected to enhance the quality of life of County of Hawai'i residents by providing a significant number of workforce dwellings as discussed in more detail in Section 4.9 and as summarized below under significance criterion 4.

(4) Substantially affects the economic or social welfare of the community or State;

Discussion: Nakahili will have a beneficial effect on the economic and social welfare of the County of Hawai'i and State of Hawai'i by providing a significant number of workforce dwellings for Hawai'i residents. The need for additional primary residential housing in the County has been well documented and widely discussed for decades (see Section 4.9 for more information). A review of several housing studies indicates that Hawai'i County could require up to 28,400 more homes by 2035.

As a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, a majority of the Nakahili dwellings (50% of the units, plus one additional unit) must be affordable to households with incomes at or below 140% of the area median income. Unlike many other West Hawai'i development proposals that emphasize a resort and second home-based marketplace, Nakahili is focused on the local market, with a strong commitment to addressing affordability and access for primary resident households.

Nakahili will serve diverse market segments including new householders, first-time buyers, move-up buyers, downsizing households, and seniors. Notably, it would produce a substantial inventory of rental housing opportunities, in alignment with the State's 2016 HHPS finding that more than half of intended County movers, including those currently living in North Hawai'i, do not expect to purchase their next home. In addition, with its 300 apartments, of which at least 50% are planned to be made available for rent at affordable rates by 2023, Nakahili would also represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawai'i.

(5) Substantially affects public health;

Discussion: Nakahili will not negatively affect public health. As a workforce housing agricultural community proposed to be developed under Section 201H-38, HRS, Nakahili, Work Force

Developers will request exemptions from certain provisions of Hawai‘i Revised Statutes, the Hawai‘i County Code and County Charter, and County rules and regulations (see Section 7.1) however as required under Section 201H-38, HRS, any requested exemptions much be such that the project meets minimum requirements of health and safety and the project does not contravene any safety standards.

In particular, Nakahili's wastewater systems will be in compliance with all DOH requirements, as provided under HAR Title 11, Chapter 62, Wastewater Systems (Wastewater System Rules). The purpose of these rules is, in part, to ensure that the disposal of wastewater from wastewater systems does not: "…contaminate or pollute any drinking water or potential drinking water supply, or the waters of any beaches, shores, ponds, lakes, streams, groundwater, or shellfish growing waters…" (see Section 11-62-02, HAR). In addition, the Wastewater System Rules state, in part: "The department of health seeks to ensure that the use and disposal of wastewater and wastewater sludge does not contaminate or pollute any valuable water resource…" and "Individual wastewater systems may be utilized in remote areas and in areas of low population density." (see Section 11-62-01, HAR). The Wastewater System Rules also specify that the "total wastewater flow into one individual wastewater system shall not exceed one thousand gallons, and one individual wastewater system shall not serve more than five bedrooms, whether they are in one dwelling unit or two…" (see Section 11-32.61.1, HAR).

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

Discussion: Nakahili is not anticipated to involve significant substantial secondary impacts, such as population changes or effects on public facilities. As discussed in Section 2.3, Nakahili addresses the demand for housing in Hawai‘i County due to a growing population. State population projections indicate that the Hawai‘i County population is projected to increase to approximately 222,400 residents by 2025, and to 248,500 residents by 2035 (DBEDT, 2018). As such, Nakahili is not expected to cause a significant increase in the population of the island, but rather it will provide homes for Hawai‘i's growing population. Families living at Nakahili would require the same public services, whether residing at Nakahili, or elsewhere on Hawai‘i.

Complete build-out of Nakahili is projected to occur over approximately 20 years and thus the need for additional public services to serve Nakahili residents is expected to occur incrementally. The needs of a growing population relating to public services and other issues will need to be addressed regardless of whether Nakahili is built.

Nakahili will contribute to State and County revenues in the form of property taxes, general excise taxes, and income taxes from increased employment. Should the State of Hawai‘i and County of Hawai‘i choose to allocate these tax revenues to fund more services to protect public health, welfare, and safety, any cost to the public that may result will effectively be minimized.

For additional discussion refer to significance criterion 8 below.

(7) Involves a substantial degradation of environmental quality;

Discussion: Nakahili does not involve a substantial degradation of environmental quality. This EA provides a thorough discussion of: 1) existing conditions related to the natural environment (see Chapter 3) and the human environment (see Chapter 4); 2) potential impacts; and 3) mitigation measures to ensure there are no significant impacts to the environmental quality of the Property and surrounding region.

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

Discussion: Cumulatively, Nakahili will not have a considerable effect on the environment or involve a commitment for larger actions. Mitigation measures are discussed throughout this EA to ensure that Nakahili will not have a considerable effect, or significant impact, on the environment.

Regarding a commitment for larger actions, development of Nakahili includes improvements and measures so that Nakahili does not involve a commitment for larger actions on the part of the County of Hawai‘i or State of Hawai‘i.

Infrastructure for Nakahili (including the water system, wastewater systems, roadways, drainage systems, etc.; see Section 4.8 and Appendix E) will be included on site and will be privately developed and operated, thus not burdening the County with infrastructure costs, during development or after occupancy.

Regarding traffic, the Traffic Impact Analysis Report (TIAR) prepared for Nakahili (see Section 4.7 and Appendix D) concludes: “With the assumed and recommended regional and Project-specific roadway improvements, traffic in the Project area is expected to operate adequately by 2038 with acceptable levels of service at all study intersections.”

Similarly, Nakahili is not expected to have a significant impact on regional recreational facilities, as Nakahili will include two parks: 1) an approximately six-acre “community green” neighborhood park located adjacent to the village area; and 2) an approximately 29-acre regional park in the lower (makai) central area (see Section 2.3.1 and Figure 8).

Regarding schools, Work Force Developers will comply with all laws regarding school impact fees, including Sections 302A-1601 to Section 320A-1612, HRS, which establish a structure for assessing school impact fees for residential development.

For additional discussion refer to significance criterion 6 above.

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

Discussion: Nakahili will not affect a rare, threatened or endangered species or its habitat. A biological survey of the Property (see Section 3.6 and Appendix A) concludes that Nakahili will not adversely affect native vegetation and sensitive flora or fauna, as the Property is dominated by

non-native species and no rare, threatened or endangered species are present. In addition, the U.S. Fish and Wildlife Service (USFWS), has not designated critical habitat for endangered plant species on or near the Property (see Figure 16).

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

Discussion: Nakahili will not detrimentally affect air or water quality or ambient noise levels.

Air: No state or federal air quality standards will be violated during development or after occupancy of Nakahili. Short-term temporary air quality impacts may occur during construction but will be mitigated by: 1) implementing dust control measures such as regular watering, sprinkling, and the installation of dust screens; and 2) compliance with the provisions of Chapter 11-60.1-33, HAR regarding fugitive dust. In the long-term, after construction and during occupancy, significant impacts to air quality are not anticipated due the relatively good air quality in the region and the predominant trade winds that typically carry emissions and other air pollutants from inland areas out toward the ocean. See Section 4.6 for more information on air quality.

Water: No state or federal water quality standards will be violated during development or after occupancy of Nakahili. The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. The onsite drainage system will be designed to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development). The drainage design will incorporate Low Impact Development (LID) features as practical and feasible, such as vegetated buffers/filter strips, grass swales, and infiltration basins. See Section 4.8.4 for further information regarding drainage.

A NPDES permit will be required before grading of areas one acre or greater. The NPDES permit requires erosion control measures and covers storm water runoff discharges associated with construction activities, including clearing, grading, excavation and construction support activities (see HAR Chapter 11-55). in compliance with the Clean Water Act, a Section 401 Water Quality Certification from the State Department of Health (DOH), Clean Water Branch (CWB) will be obtained if it is determined that may grading and related activities may result in any discharge into navigable waters or is otherwise triggered.

Nakahili is not anticipated to negatively impact: 1) surface water drainageways through the Property; and 2) groundwater resources. See the discussion under significance criterion 1 above for a summary of issues related to water quality.

Noise: No state or federal water quality standards will be violated during development or after occupancy of Nakahili. Potential impacts on the ambient quality of the Property and surrounding area due to development of Nakahili are primarily limited to short-term construction activity and, in the long-term, potential increases in traffic noise and sounds from human activity within the neighborhood, which are not anticipated to be significant. Noise from construction activities will

comply with State DOH noise regulations (HAR, Chapter 11-46, Community Noise Control). See Section 4.5 for further information regarding noise.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;

Discussion: Nakahili is not located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters, and therefore will not affect or suffer damage regarding the issues associated with such environmentally sensitive areas. See Chapter 3 regarding the natural environment, potential impacts of Nakahili, and mitigation measures to minimize impacts; in particular, see Section 3.5 which provides information regarding natural hazards and potential impacts and mitigation measures.

(12) Substantially affects scenic vistas and view planes identified in County or State plans or studies; or,

Discussion: Nakahili will not substantially affect scenic vistas or view planes identified in the County General Plan or the South Kohala CDP. Neither the backdrop of the rolling Kohala Mountains nor dramatic view of Mauna Kea in the distance will be substantially affected.

Some impact to the visual character of open space grasslands may occur due to the creation of Nakahili, and the view of the Property will change from open space to a family agricultural community with farm dwellings and agricultural uses. However, with the descending elevation from Māmalahoa Highway, Nakahili will not impact clear views of the coastline and bright coastal waters from the highway. In addition, Nakahili will not impede views of South Kohala's unique "Five Mountain Views" of the Kohala Mountains, Mauna Kea, Mauna Loa, Hualālai, and Haleakalā.

To minimize visual impacts, all Nakahili farm dwellings will be in compliance with the development standards set forth under Chapter 25, HCC (Zoning) for Family Agricultural Districts. Lot sizes will be a minimum of one acre to maintain the agricultural character of the area and provide space for agricultural uses.

All outdoor lighting will be in compliance with Chapter 14, Article 9, HHC, which provides standards to limit degradation of the night visual environment by minimizing light glare, pollution, and trespass through regulation of the type and use of outdoor lighting.

See Section 4.3 for more information about visual impacts.

(13) Requires substantial energy consumption.

Discussion: Nakahili is not anticipated to require substantial energy consumption relative to the power generating capacity of the island's primary energy provider, HELCO. In the course of planning for Nakahili, Work Force Developer's civil engineer: 1) estimated that at full build-out Nakahili would add approximately 6 Mega Volt-Amperes (MVA) of load to HELCO's system; and 2) contacted HELCO regarding the provision of electrical service to Nakahili. A HELCO 69 kV transmission line runs north-to-south along the Property's eastern boundary within the Māmalahoa Highway right-of-way and the Property is in the vicinity of HELCO's Keʻāmuku Switching Station. To provide electrical service to Nakahili, HELCO would likely need a substation site on the Property.

To meet State energy conservation and clean energy goals (HRS Chapters 344 and 226), measures for energy efficiency and cost-effective energy conservation will be implemented to reduce the maximum electrical load and energy consumption. Solar water heater systems will be included for all single-family farm dwellings sold by Work Force Developers, as required under Section 196-6.5, HRS; or alternatively energy-efficient gas water heating systems may be used, as may be permitted under the variance provisions of Section 196-6.5, HRS. Other energy-saving technologies and features to be considered include:

- ENERGY STAR qualified appliances in dwellings sold or rented by Work Force Developers
- Maximum use of day lighting.
- High efficiency lighting.
- Roof and wall insulation, radiant barriers, and energy efficient windows
- Installation of light-colored roofing.
- Use of landscaping for shading of buildings.
- Use of landscaping for dust control and to minimize heat gain.
- Use of solar parking lot lighting.

7.2 ANTICIPATED DETERMINATION

Pursuant to Chapter 343, HRS, OHCD is anticipated to issue a Finding of No Significant Impact (FONSI) based on this Environmental Assessment. This finding is founded on the basis of impacts and mitigation measures examined in this document and public comments received during the pre-consultation phase, and as analyzed under the above criteria.

8 CONSULTATION

8.1 AGENCY, COUNCILMEMBER, AND COMMUNITY CONSULTATION

The planning of Nakahili and the preparation of the Draft EA involved meetings and communication with County agencies, County Councilmembers, and community groups and individuals, including those listed below in Table 8-1.

Table 8-1. Initial Agency, Councilmember, and Community Consultation

Affiliation	Agency or Name	Meeting date
County of Hawai'i	Planning Dept, OHCD, Office of the Mayor	5-17-18
Waikoloa Village Association	Waikoloa Community Leadership Council	6-13-18
Waikoloa Village Association	Waikoloa Village Association Board	8-28-18
County of Hawai'i	Planning Dept, OHCD	9-11-18
County of Hawai'i	Councilmember Tim Richards	various
County of Hawai'i	Councilmember-elect Ashley Kierkiewicz	10-8-18
County of Hawai'i	Councilmember Susan Lee Loy	10-8-18
County of Hawai'i	Councilmember Aaron Chung	10-31-18
County of Hawai'i	Councilmember Valerie Poindexter	11-8-18
Big Island Housing Foundation	Executive Director Susan Akiyama	11-8-18
County of Hawai'i	Councilmember Maile David	11-9-18
County of Hawai'i	Councilmember Karen Eoff	11-9-18
State of Hawai'i	State Dept of Health Hazard Evaluation and Emergency Response (HEER) Office. Paul Chong, Sven Lindstrom	12-17-18
Waikoloa Village Association	Waikoloa Village Association Board	12-18-18
County of Hawai'i	Planning Dept, OHCD	1-4-19
State of Hawai'i	State Dept of Health HEER Office. Fenix Grange	2-1-19

8.2 PRE-CONSULTATION

In addition, initial agency, councilmember, and community consultation, a pre-assessment consultation letter was mailed to the following federal, state, and county agencies, private organizations, and community groups listed below in Table 8-2.

Table 8-2. Pre-Consultation Outreach and Comments

Agency	Pre-Consultation Letter Sent	Comment Date
State		
Department of Accounting and General Services	12/11/18	
Department of Agriculture	12/11/18	
Department of Business, Economic Development and Tourism (DBEDT)	12/11/18	
DBEDT – Hawai‘i State Energy Office	12/11/18	
DBEDT – Office of Planning	12/11/18	1/10/19
Department of Defense	12/11/18	
Department of Education	12/11/18	12/28/18
Department of Hawaiian Home Lands	12/11/18	
Department of Health (DOH)	12/11/18	
DOH, Environmental Health Administration	12/11/18	
DOH, Hazard Evaluation and Emergency Response Office (HEER)	12/11/18	
DOH – Office of Environmental Quality Control	12/11/18	
Department of Land and Natural Resources	12/11/18	1/10/19, 1/14/19, 1/18/19
DLNR – State Historic Preservation Division	12/11/18	
Department of Transportation	12/11/18	1/28/19
Office of Hawaiian Affairs	12/11/18	
Federal		
U.S. Army Corps of Engineers	12/11/18	1/22/19, 1/23/19
Federal Emergency Management Agency, Region IX	12/11/18	
County of Hawai‘i		
Department of Environmental Management	12/11/18	12/21/18
Department of Parks & Recreation	12/11/18	
Department of Research and Development	12/11/18	1/11/19
Department of Water Supply	12/11/18	1/10/19
Fire Department	12/11/18	
Planning Department	12/11/18	1/17/19
Police Department	12/11/18	
Mass Transit Agency	12/11/18	1/7/19

Agency	Pre-Consultation Letter Sent	Comment Date
Department of Public Works	12/11/18	
Civil Defense Agency	12/11/18	
Elected Officials		
State Senator David Tarnes	12/11/18	
State Representative Lorrain Inouye	12/11/18	
County Councilmember Valerie Poindexter	12/11/18	
County Councilmember Aaron Chung	12/11/18	
County Councilmember Susan Lee Loy	12/11/18	
County Councilmember Ashely Kierkiewicz	12/11/18	
County Councilmember Matt Kanealii-Kleinfelder	12/11/18	
County Councilmember Maile David	12/11/18	
County Councilmember Rebecca Villegas	12/11/18	
County Councilmember Karen Eoff	12/11/18	
County Councilmember Tim Richards	12/11/18	
Private Companies, Organizations, and Individuals		
Hawai‘i Electric Light Company, Inc.	12/11/18	
Spectrum	12/11/18	
Hawaiian Telcom	12/11/18	
Kohala Coast Resort Association	12/11/18	
Waikoloa Village Association	12/11/18	
Big Island Housing Foundation	12/11/18	
Hawai‘i Wildfire Management Organization	12/11/18	

8.3 DRAFT EA CONSULTATION

The following agencies, organizations, and individuals will be sent a copy of the DEA or a letter containing a link to the online version following the DEA publication in OEQC's *The Environmental Notice*. Comments received on the DEA will help to inform the preparation of the Final EA (FEA).

State of Hawai‘i

- Department of Accounting and General Services
- Department of Agriculture
- Department of Business, Economic Development and Tourism (DBEDT)
- DBEDT, Hawai‘i State Energy Office
- DBEDT, Office of Planning
- Department of Defense

- Department of Education
- Department of Hawaiian Home Lands
- Department of Health (DOH)
- DOH, Environmental Health Administration
- DOH, Health, Hazard Evaluation & Emergency Response Office
- DOH, Office of Environmental Quality Control
- Department of Land and Natural Resources (DLNR)
- DLNR, State Historic Preservation Division
- Department of Transportation
- Office of Hawaiian Affairs

Federal

- U.S. Army Corps of Engineers (USACE)
- Federal Emergency Management Agency, Region IX

County of Hawai‘i

- Department of Environmental Management
- Department of Parks & Recreation
- Department of Research and Development
- Department of Water Supply
- Fire Department
- Planning Department
- Police Department
- Mass Transit Agency
- Department of Public Works
- Civil Defense Agency

Elected Officials

- State Senator David Tarnes
- State Representative Lorrain Inouye
- County Councilmember Valerie Poindexter
- County Councilmember Aaron Chung
- County Councilmember Susan Lee Loy
- County Councilmember Ashely Kierkiewicz
- County Councilmember Matt Kanealii-Kleinfelder
- County Councilmember Maile David
- County Councilmember Rebecca Villegas
- County Councilmember Karen Eoff
- County Councilmember Tim Richards

Libraries

- Thelma Parker Memorial Community School Library
- Hilo Public Library
- Hawai‘i State Library - Hawai‘i Documents Center

Private Companies, Organizations, and Individuals

- Hawai‘i Electric Light Company, Inc.
- Spectrum
- Hawaiian Telcom
- Kohala Coast Resort Association
- Waikoloa Village Association
- Big Island Housing Foundation
- Hawaii Wildfire Management Organization

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Appendix A

Biological Survey

Biological Survey
TMK (3rd.) 6-8-002:005, 006, 028, 029, 030
Waikoloa, South Kohala, Island of Hawai‘i

By Ron Terry, Ph.D., and Patrick J. Hart, Ph.D.,
Geometrician Associates, LLC
Prepared for Work Force Developers, LLC
June 2018

Introduction

This biological survey was prepared to accompany various permit applications related to development of housing and farms within a 1,559.539-acre area comprised of five parcels (Tax Map Keys (TMK) (3) 6-8-002:005, 006, 028, 029, 030) makai of Mamalahoa Highway between Waikoloa Road and the Old Saddle Road junction (Figure 1).

The field survey involved a full assessment of flora and vegetation. The objectives of the botanical survey component were to 1) describe the vegetation; 2) list all species encountered; and 3) identify threatened or endangered plant species. The area was surveyed by Ron Terry and Pat Hart, along with several assistants, walking transects during three days in June 2018. 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 (USFWS 2018) threatened or endangered plant species, particularly uhiuhi (*Mezoneuron kavaiense*), halapepe (*Pleomele sandwicensis*) and *Portulaca sclerocarpa*, which we have previously encountered within three miles of the property.

The survey also included a limited faunal survey restricted to a list of birds and introduced mammals, reptiles, or amphibians observed during the botanical survey. Also considered in this report is the general value of the habitat for native birds and the Hawaiian hoary bat. Not included are evaluation of impacts to coastal aquatic life and invertebrates, although members of the Solanaceae plant family, many of which are known to be host plants for the endangered Blackburn’s Sphinx moth (*Manduca blackburnii*), were specifically searched for.

Vegetation Type and Influences

The geologic substrate in the surveyed areas is Pleistocene-era lavas from Mauna Kea (Wolfe and Morris 1996). The area is one of the driest on the Big Island, with an average annual rainfall of about 18 to 20 inches (Giambelluca et al 2013; UH Hilo Dept. of Geography 1998:57). It is difficult to speculate on the precise pre-human vegetation of the area, since the introduction of certain grasses, grazing animals and fire have changed the soil and microclimate of the area. Gagne and Cuddihy (1990) described the vegetation in fairly undisturbed areas with similar geology and climate as Lowland Dry Forest, which used to be dominated by pili grass (*Heteropogon contortus*) and shrubs such as ilima (*Sida fallax*) with a perhaps diverse but fairly sparse cover of native dry-forest trees and shrubs including lama (*Diospyros sandwicensis*) and alahe‘e (*Psydrax odoratum*) and now rare trees such as wiliwili (*Erythrina sandwicensis*), and uhiuhi.

Figure 1 Aerial Image of Property



Source: Google Earth ©. Note: property boundaries outline in white.

Cattle actively graze the property. Fences border most sections of the property except the southern boundary, and there are many internal fences as well. Cattle grazing infrastructure including small paddocks, corrals and cattle chutes are present near Mamalahoa Highway. The current vegetation of the area strongly reflects the historical and ongoing use for grazing, and is a grassland/shrubland comprised primarily of the alien fountain grass (*Cenchrus setaceus*) and the native a‘ali‘i (*Dodonaea viscosa*). Over most of the surveyed area, we estimate that these two plants account for more than 90 percent of biomass. Scattered individuals of eucalyptus (*Eucalyptus* spp.) are present in certain locations, especially on the mauka third of the property. Nearly all of them appear to have been intentionally planted as groves and windrows, with very little natural recruitment. Two other natives, ‘akia (*Wikstroemia pulcherrima*) and ‘uhaloa (*Waltheria indica*), are locally abundant, especially on rocky outcrops and hardpan surfaces. The grassland/shrubland has numerous other minor constituent species, primarily alien grasses and herbs, that vary in abundance from place to place. The low diversity was created and is maintained by the combination of low average annual rainfall, periodic severe droughts, overgrazing by cattle and feral goats, and fire. Along Mamalahoa Highway the extra water supplied by road runoff encourages weed diversity and shrubs that are otherwise uncommon on the property, including koa haole (*Leucaena leucocephala*). Figure 2 includes photos of various parts of the property.

Figure 2a Typical vegetation over most of property

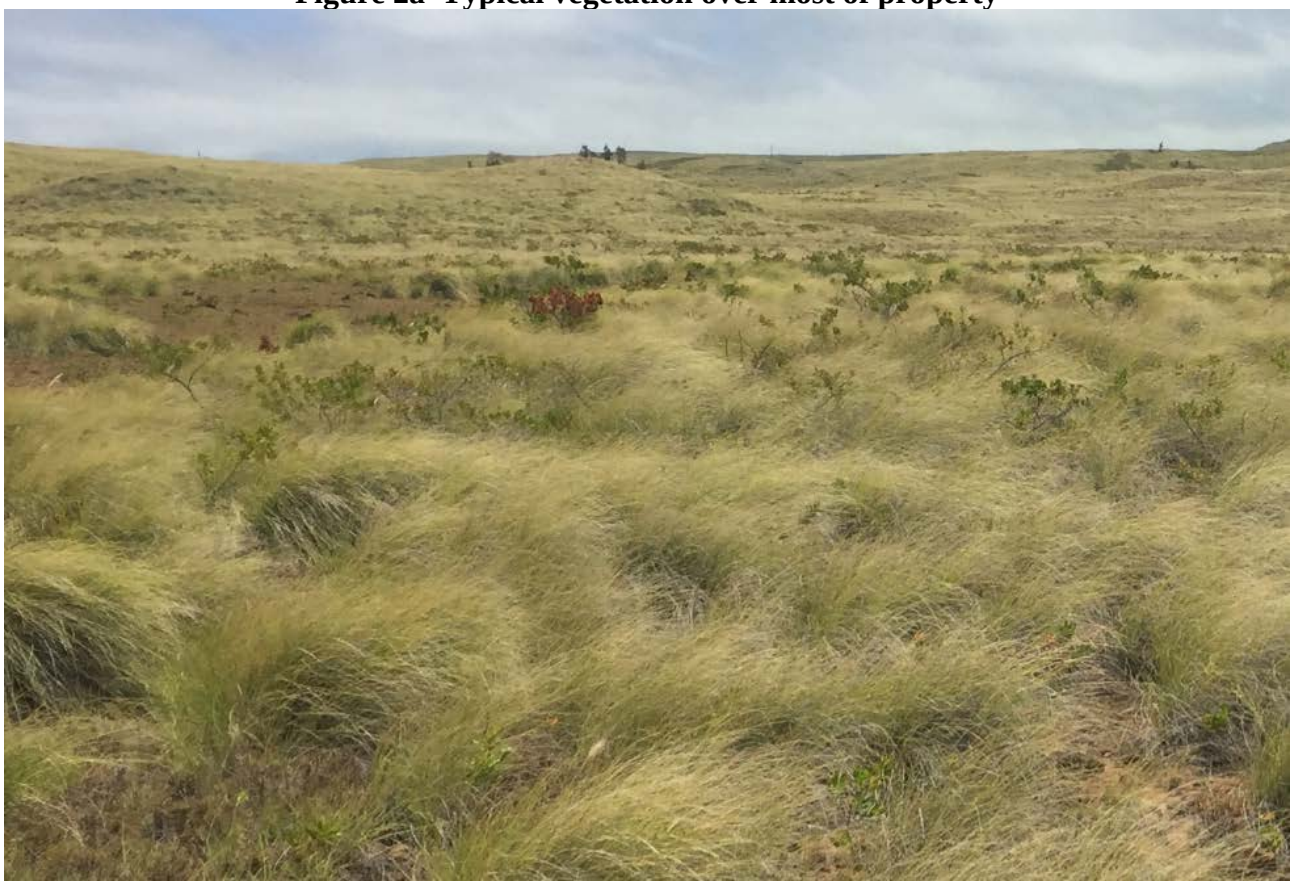

Figure 2b Hills with eucalyptus trees



Figure 2c Dense a‘ali‘i patch



Figure 2d ‘Akia on ‘a‘a outcrop



Two USGS-mapped minor drainages tributary to Auwaiakeakua Gulch traverse the property. These highly intermittent drainages have no aquatic or distinctly riparian vegetation, although the weedy vegetation there is greener, and some non-native plants are more common, than elsewhere on the property.

Flora

A full list of plant species found in the surveyed areas is contained in Table 1, below. Only eight of the more than four dozen plant species found on the property are natives, seven of which are indigenous (found in Hawai‘i as well as elsewhere) and one endemic (found in Hawai‘i and nowhere else). All are very common in various locations on the leeward side of the island. Aside from a‘ali‘i, which is abundant on the property, and ‘akia, which is sparingly present, the other natives are generally not common on the property. For example, only one individual of the whisk fern moa was observed.

Threatened and Endangered Plant Species

An online mapping tool provided by the U.S. Fish and Wildlife Service (http://ecos.fws.gov/ecp/report/table/critical-habitat.html accessed June 2018) indicates that no designated critical habitat for endangered plant (or animal) species is located in or near the property. Designated critical habitat units are present about three miles to the northeast, associated with a complex of species found on cinder cones. Proposed critical habitat (not yet shown on the USFWS map) for three dryland forest plant species is found directly adjacent to Waikoloa Village, about three miles west.

No listed or proposed threatened or endangered plant species were found. Given the current context, in an area prone to drought that is unprotected from intense cattle grazing and fire, it is unlikely that one would be found. The endangered plant species that have been found in various spots within three miles of the property are all located in somewhat unique micro-habitats that are not present on the property: cinder cones, lava tube cave collapses, and young lava flows.

Mammals, Reptiles, and Amphibians

Aside from domestic cattle (*Bos taurus*) and feral goats (*Capra h. hircus*), no mammal species were detected during the course of this survey. It is likely that feral cats (*Felis catus*), small Indian mongooses (*Herpestes a .auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.), domestic dogs, (*Canis f. familiaris*) and perhaps wild donkeys (*Equus a. asinus*) are or have been occasionally present on the property. None of these alien mammals have conservation value and all are deleterious to native flora and fauna.

Although not detected in the survey, which took place in daylight, the only native Hawaiian land mammal, the Hawaiian hoary bat (*Lasiurus cinereus semotus*), may also be present in the general area, as it is present in many areas on the island of Hawai‘i and has been observed in eucalyptus trees. Bats may forage for flying insects over portions of the project area on a seasonal basis, though the xeric nature of the habitat and the lack of dense vegetation provides little in the way of attractive food resources for a bat. Hawaiian hoary bats are vulnerable to disturbance during the summer pupping season.

Table 1. Plant Species Detected on Property

Scientific Name	Family	Common Name	Life Form	Status*
Abutilon grandifolium	Malvaceae	Hairy abutilon	Herb	A
Buddleja davidii	Scrophulariaceae	Butterfly bush	Shrub	A
Cenchrus ciliaris	Poaceae	Buffelgrass	Grass	A
Cenchrus setaceus	Poaceae	Fountain grass	Herb	A
Chamaecrista nictitans	Fabaceae	Partridge pea	Herb	A
Chamaesyce hirta	Euphorbiaceae	Garden spurge	Herb	A
Chenopodium murale	Chenopodiaceae	Chenopodium	Herb	A
Chloris barbata	Poaceae	Swollen finger grass	Herb	A
Crotalaria sp.	Fabaceae	Crotalaria	Herb	A
Cyperus polystachyos	Cyperaceae	Pycreus	Sedge	I
Desmodium incanum	Fabaceae	Spanish clover	Herb	A
Dodonaea viscosa	Sapindaceae	ʻAʻaliʻi	Shrub	I
Dysphania carinata	Chenopodiaceae	Dysphania	Herb	A
Eragrostis tenella	Poaceae	Lovegrass	Herb	A
Eucalyptus citriodora	Myrtaceae	Eucalyptus	Tree	A
Eucalyptus sp.	Myrtaceae	Eucalyptus	Tree	A
Festuca myuros	Poaceae	Rat-tail fescue	Herb	A
Gnaphalium sp.	Asteraceae	Gnaphalium	Herb	A
Grevillea robusta	Proteaceae	Silk oak	Tree	A
Heteropogon contortus	Poaceae	Pili grass	Grass	I
Indigofera spicata	Fabaceae	Creeping indigo	Herb	A
Indigofera suffruticosa	Fabaceae	Indigofera	Herb	A
Ipomoea indica	Convolvulaceae	Morning glory	Vine	I
Kalanchoe tubiflora	Crassulaceae	Chandelier plant	Herb	A
Lepidium bonariensis	Brassicaceae	Pepperwort	Herb	A
Leucaena leucocephala	Fabaceae	Haole koa	Shrub	A
Macroptilium lathyroides	Fabaceae	Cow pea	Vine	A
Malva parviflora	Malvaceae	Cheeseweed	Herb	A
Melilotus indica	Fabaceae	Sweet clover	Herb	A
Melinis repens	Poaceae	Natal red top	Grass	A
Neonotonia wightii	Fabaceae	Glycine	Vine	A
Olea europaea	Oleaceae	Olea	Tree	A
Opuntia ficus-indica	Cactaceae	Cactus apple	Shrub	A
Panicum maximum	Poaceae	Guinea grass	Herb	A
Parthenium hysterophorus	Asteraceae	False ragweed	Herb	A
Psilotum nudum	Psilotaceae	Moa	Herb	I
Ricinus communis	Euphorbiaceae	Castor bean	Shrub	A
Salsola tragus	Amaranthaceae	Tumbleweed	Shrub	A
Senecio madagascariensis	Asteraceae	Fireweed	Herb	A
Sida fallax	Malvaceae	ʻIlima	Herb	I
Sida rhombifolia	Malvaceae	Sida	Herb	A
Sida spinosa	Malvaceae	Sida	Herb	A
Solanum linnaeanum	Solanaceae	Apple of Sodom	Herb	A
Spergula arvensis	Caryophyllaceae	Corn spurry	Herb	A
Spermacoce assurgens	Rubiaceae	Buttonweed	Shrub	A
Sporobolus sp.	Poaceae	Dropseed	Grass	A

Tridax procumbens	Asteraceae	Coat buttons	Herb	A
Verbena litoralis	Verbenaceae	Verbena	Herb	A
Verbesina encelioides	Asteraceae	Golden crown beard	Herb	A
Waltheria indica	Sterculiaceae	ʻUhaloa	Herb	I
Wikstroemia pulcherrima	Thymelaeaceae	ʻAkia	Shrub	E

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

There are no native terrestrial reptiles or amphibians in Hawaiʻi. No reptiles and amphibians were detected during the survey.

Birds

The species of birds detected during the survey are typical of those found in similar lowland highly disturbed habitat (Table 2).

Table 2. Bird Species Detected on Property

Scientific Name	Common Name	Status
Acridotheres tristis	Common Myna	Alien Resident
Carpodacus mexicanus	House Finch	Alien Resident
Francolinus francolinus	Black Francolin	Alien Resident
Geopelia striata	Zebra Dove	Alien Resident
Lonchura malabarica	Warbling Silverbill	Alien Resident

No native landbirds were detected and it would be unlikely to find any except *Asio flammeus sandwichensis*, the Hawaiian endemic sub-species of the short-eared owl. Also called pueo, this diurnal bird of prey is regularly seen within the grasslands of North and South Kohala but was not noticed during the survey. There is some possibility the development of the property may temporarily displace short-eared owls. Any such disturbance will be of a temporary nature, as there is abundant additional suitable habitat within the Waikoloa uplands for any displaced owls to move into. This species is currently widespread in Kohala and does not have special protective status under either the State or federal endangered species statutes.

The endangered Hawaiian hawk (*Buteo solitarius*) is a wide-ranging raptor that nests in large trees and forages in forests, farms and even residential neighborhoods. It is seen throughout forested areas of the island. It is vulnerable to disturbance during the nesting season from March through September. Klavitter (2000), Klavitter et al (2003), Mitchell et al (2005) and Gorresen et al (2008) summarized hawk sightings around the island. According to one study (emphasis added): “Both native and exotic trees are used for nesting, but the majority of nests are built in mature ʻōhiʻa trees. Other nest trees include lama, koa, kōlea, eucalyptus, common ironwood, Christmas berry, coconut, macadamia nut, and mango” (USDA-NRCS 2007). However, these sources document no hawk sightings, and in particular, no hawk nests, in this area of South Kohala dominated by grasslands. The context of the property coupled with the lack of truly suitable trees indicates that the likelihood of hawks nesting on the property is exceedingly small.

The Hawaiian petrel (*Pterodroma sandwichensis*), the Hawaiian sub-species of Newell’s shearwater (*Puffinus auricularis newelli*), and the band-rumped storm-petrel (*Oceanodroma castro*) have been recorded over-flying various areas on the Island of Hawaiʻi between late April and the middle of

December each year. The Hawaiian petrel and band-rumped storm-petrel are listed as endangered, and Newell's shearwater as threatened, under both federal and State of Hawai‘i endangered species statutes. The petrels and shearwaters hunt over the ocean during the day and fly to higher elevations at night to roost and nest. The Hawaiian petrel and the band-rumped storm petrel are known to nest at elevations well above 5,000 feet on the Big Island, not within the project area. But during it breeding season from April through November, the Newell's shearwater burrows under ferns on forested mountain slopes. These burrows are used year after year and usually by the same pair of birds. Although capable of climbing shrubs and trees before taking flight, it needs an open downhill flight path through which it can become airborne. Although once abundant on all the main Hawaiian Islands, most birds today are found in the steep terrain between 500 to 2,300 feet on Kaua‘i.

The primary cause of mortality in these species in Hawai‘i is thought to be predation by alien mammalian species 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. There is no suitable nesting habitat within or close to the property for any of these pelagic seabird species. These listed seabirds would not directly utilize the property but could overfly it.

Endangered Invertebrates

The only endangered invertebrate that has some potential to be present on the property is Blackburn's sphinx moth (*Manduca blackburnii*). It is found at various locations throughout West Hawai‘i including Mamalahoa Highway frontage just south of the Daniel K. Inouye Highway. The adult moth feeds on nectar from native plants including beach morning glory (*Ipomoea pes-caprae*), ilie‘e (*Plumbago zeylanica*), and maiapilo (*Capparis sandwichiana*), none of which are present or likely to be present on the property. However, moth larvae that naturally feed upon the native aiea (*Nothocestrum* spp.) have adapted to feeding on non-native tree tobacco (*Nicotiana glauca*), which occupies disturbed areas such as open fields and roadway margins. No aiea or tree tobacco are present on the property and there is no aiea nearby, but tree tobacco is common in land near the property in Waikoloa Village, on Mamalahoa Highway, and in many other areas. Tree tobacco can be particularly abundant in very dry areas on ‘a‘a flows that have been disturbed by bulldozing. Most of the surface of the project area is undisturbed, and we observed no tree tobacco on the property. Various other members of the Solanaceae (tomato family) may also support moth larvae, although apparently not nearly as frequently as tree tobacco. Other than tree tobacco, the survey found just one member of the Solanaceae, Sodom apple (*Solanum linnaeanum*), which is found at low densities on the property and is believed to be a poor larval host. The potential for Blackburn's sphinx moth to be present is thus very low, but disturbance during construction could encourage the growth of tree tobacco. If tree tobacco sprouts, it should be removed before it reaches a height of one meter and offers a suitable a habitat for Blackburn's sphinx moth larva.

Impacts and Mitigation Measures

As the property is dominated by non-native species, and no rare, threatened or endangered species are present, the clearing of various parts of the property and use for housing will not adversely affect native vegetation and sensitive flora or fauna, given proper implementation of mitigation measures.

To minimize potential impacts to the endangered Hawaiian hoary bat, we recommend that woody plants taller than 15 feet not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Relatively few such trees are present, most in planted groves or directly along with highway.

To avoid potential impacts to listed seabirds, no construction or unshielded equipment maintenance lighting should be permitted after dark between the months of April and October. All permanent lighting should be shielded in conformance with Hawai‘i County Outdoor Lighting Ordinance (Hawai‘i County Code Chapter 9, Article 14), which requires shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting.

To avoid attracting the Blackburn’s sphinx moth to the Property, during construction graded areas should be monitored for the growth of tree tobacco. If tree tobacco sprouts, it should be removed before it reaches a height of one meter and offers a suitable a habitat for Blackburn’s sphinx moth larva.

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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Appendix B

Archaeological Inventory Survey

Archaeological Inventory Survey for the Proposed 1,559 Acre Nakahili Community

TMKs: (3) 6-8-002:005, 006, 028, 029, and 030

Waikōloa Ahupua'a
South Kohala District
Island of Hawai'i

DRAFT VERSION



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ASM Project Number 30410.00

An Archaeological Inventory Survey for the Proposed 1,559 Acre Nakahili Community

TMKs: (3) 6-8-002:005, 006, 028, 029, and 030

WaikōloaAhupuaʻa
South Kohala District
Island of Hawaiʻi

ASM affiliates

EXECUTIVE SUMMARY

At the request of Greg Brown of Work Force Developers, LLC, ASM Affiliates (ASM) conducted an Archaeological Inventory Survey (AIS) of roughly 1,559 acres within Tax Map Keys (TMK) (3) 6-8-002:005, 006, 028, 029, and 030 in Waikōloa Ahupuaʻa, South Kohala District, Island of Hawaiʻi. Waikoloa Investment Land Trust owns TMKs: (3) 6-8-002:005, 028, 029, and 030, while Parcel 006 is under ownership of the Globe Corporation. Work Force Developers, LLC is a development entity under contract to acquire the property from the landowners and intends to develop a workforce family agricultural community called "Nakahili" within the Study Area. This study was conducted in support of environmental documentation being prepared to comply with Hawaiʻi Revised Statues (HRS) Chapter 343 and expected permitting applications in anticipation of the Department of Land and Natural Resources-State Historic Preservation Division's (DLNR-SHPD) HRS Chapter 6E review of the proposed project.

Fieldwork for this study was conducted between June 12-14, June 18 and 19, June 26-28, and on July 2, 2018 by Matthew R. Clark, M.A., Lauren M. U. K. Tam Sing, Ivana Hall, B.A., Johnny Dudoit, B.A., and Robynn Namnama, B.A., under the direction of Robert B. Rechtman, Ph.D. No previous archaeological surveys of the Study Area are known to have been conducted. During the archaeological field survey, the entire (100%) ground surface of Study Area was visually inspected by field technicians walking transects oriented north-south, spaced no more than 30 meters apart. When archaeological features were encountered, their positions were plotted on a map of the Study Area using a Garmin handheld GPS unit (set to the NAD 83 Zone 5 North), along with areas of previous disturbance, and conspicuous landforms. Identified features located within the Study Area were then cleared of vegetation, photographed (both with and without a meter stick for scale), depicted on a scaled drafted plan map, and described using standardized feature record forms.

As a result of the fieldwork for this study, seven newly identified sites (Sites 50-10-12-30919, 30920, 30921, 30922, 30923, 30924, and 30925) comprising eight features were recorded within the Study Area. Although both Precontact coastal and inland and Historic Period trail networks have been documented throughout the South Kohala District, no evidence of these transportation systems were identified in the study area during fieldwork for this study. There have been no previously conducted archaeological surveys of the study area, thus, the sites identified during the fieldwork are all the sites known to exist within the Study Area. Site 30919 consists of a C-shape enclosure dating to the Precontact Period. Sites 30920 and 30925 are modified outcrops likely dating to the late nineteenth/early twentieth century. Site 30921 is a rectangular enclosure assumed to be Historic in age. Site 30922 is a linear wall, likely Historic in age. Site 30923 is a concrete water tank foundation and associated concrete trough dating to the early to mid-twentieth century. Site 30924 is a modified depression dating to the early part of the twentieth century and is likely related to the former or current alignment of the Kona-Waimea Belt Road. All of the identified sites are considered significant under Criterion "d", and no further work is the recommended for six of these sites (Sites 30920, 30921, 30922, 30923, 30924, and 30925). Site 30919, however, is significant for the information potential it still retains. Data recovery is the proposed treatment for this site, therefore the HRS Chapter 6E review determination for this project is "affect with agreed upon mitigation." A data recovery plan in accordance with HAR 13§13-278 will be prepared for Site 30919 and submited to DLNR-SHPD for review and acceptance.

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1. INTRODUCTION

At the request of Greg Brown of Work Force Developers, LLC, ASM Affiliates (ASM) conducted an Archaeological Inventory Survey (AIS) of roughly 1,559 acres within Tax Map Keys (TMK) (3) 6-8-002:005, 006, 028, 029, and 030 in Waikōloa Ahupuaʻa, South Kohala District, Island of Hawaiʻi (Figures 1, 2, and 3). Waikoloa Investment Land Trust owns TMKs: (3) 6-8-002:005, 028, 029, and 030, while Parcel 006 is under ownership of the Globe Corporation. Work Force Developers, LLC is a development entity under contract to acquire the property from the landowners and intends to develop a workforce family agricultural community called "Nakahili" that would contain 1) farm dwellings on agricultural lots; 2) a small neighborhood commercial "village" area with apartments and limited retail and light industrial uses; 3) parks; and 4) community infrastructure (Figure 4). This study was conducted in support of environmental documentation being prepared to comply with Hawaiʻi Revised Statues (HRS) Chapter 343 and expected permitting applications in anticipation of the Department of Land and Natural Resources-State Historic Preservation Division's (DLNR-SHPD) HRS Chapter 6E review of the proposed project.

This study was undertaken in accordance with Hawaiʻi Administrative Rules (HAR) §13–284 and was performed in compliance with the *Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports* as contained in HAR §13–276. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of both the Department of Land and Natural Resources and the County of Hawaiʻi Planning Department. This report contains background information describing the location and environment of the Study Area, a summary of the previous archaeological work conducted in the vicinity of the subject property, a detailed presentation of a culture-historical context for the Study Area, an explanation of the survey methods, detailed descriptions of all of the encountered archaeological features, interpretation and evaluation of the resources' significance, along with treatment recommendations for all of the documented sites.

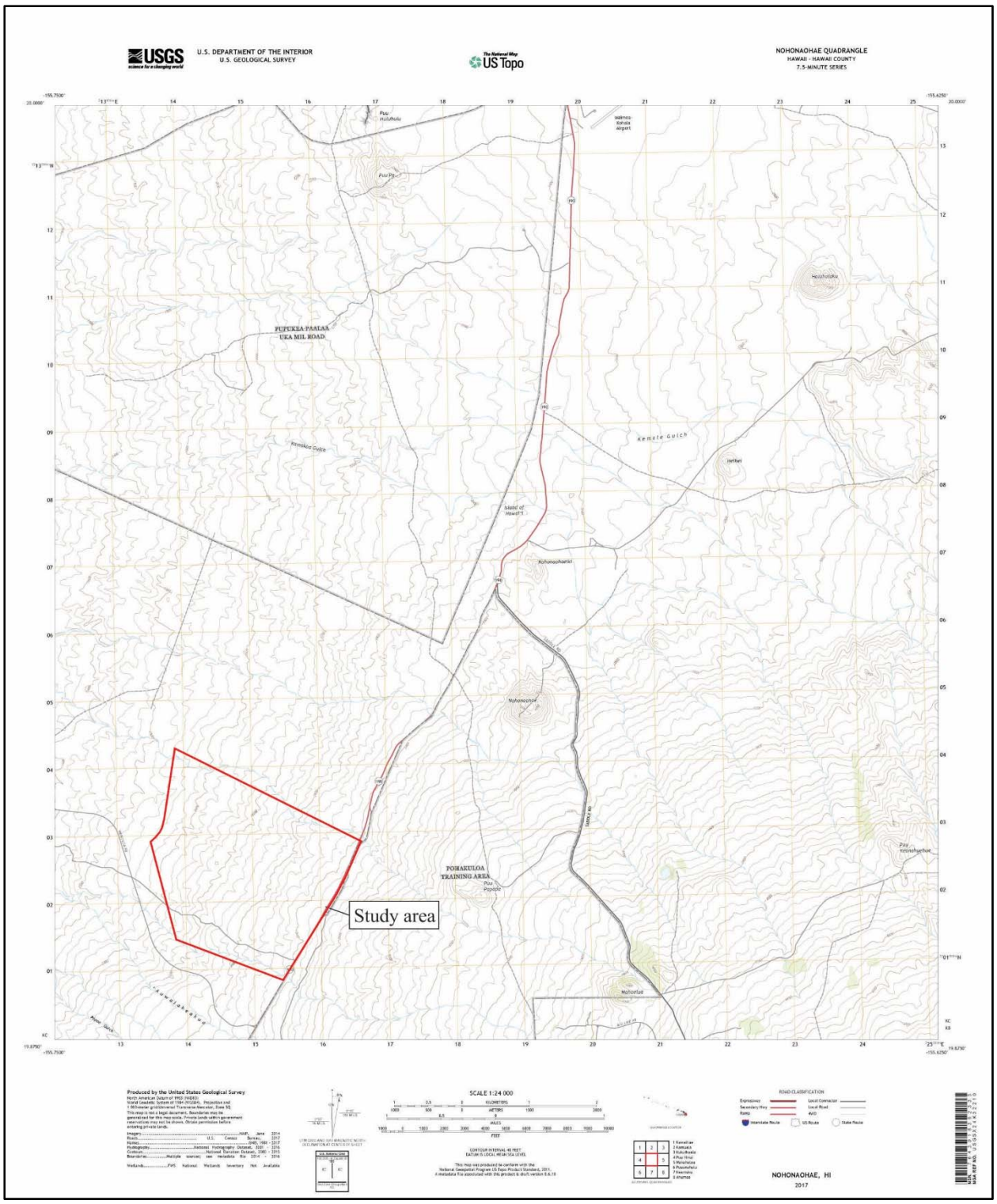

Figure 1. Study Area location plotted on 2017 Nohonaohae USGS quadrangle map.

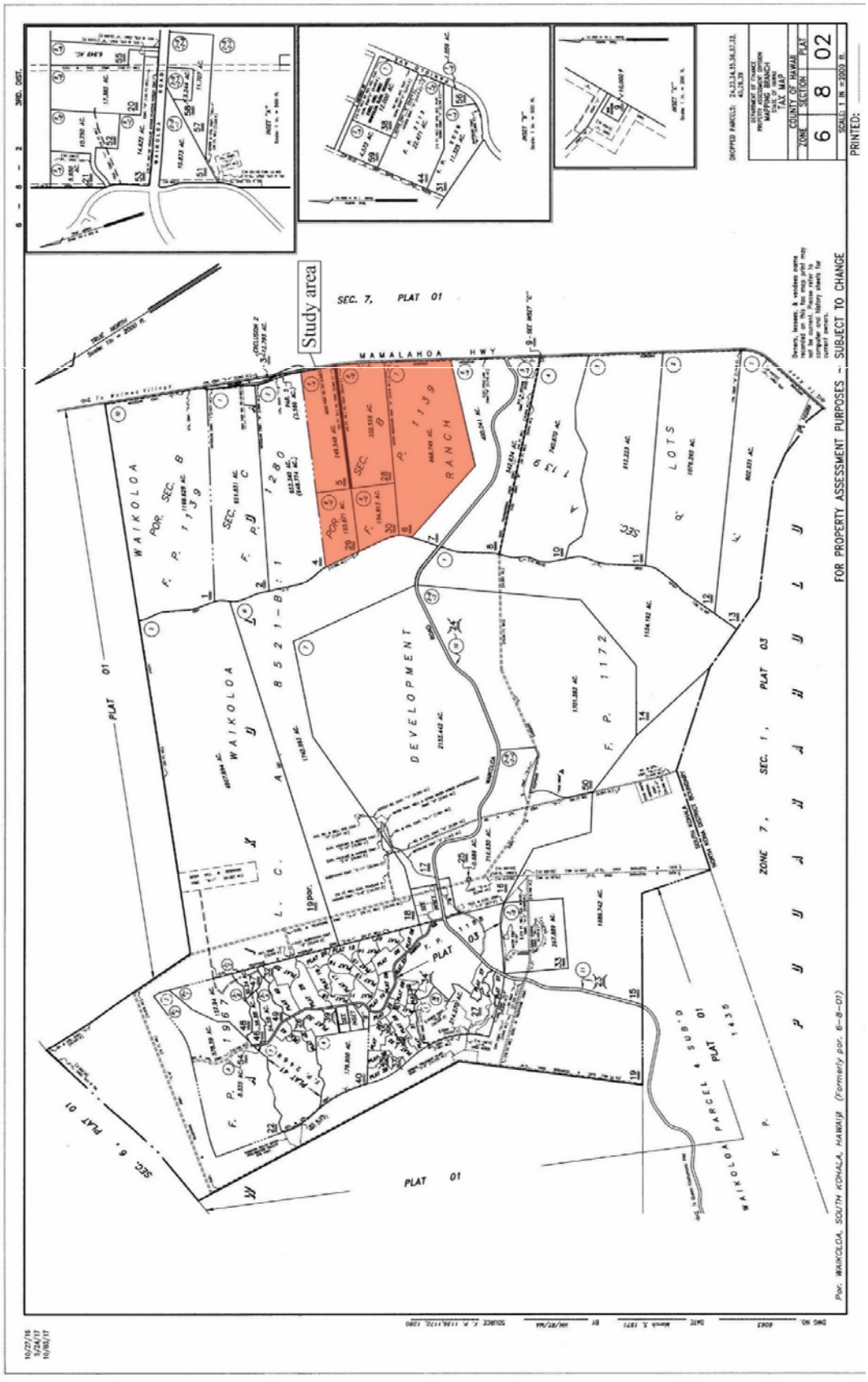

Figure 2. Tax Map Key (3) 6-8-002 showing location of Study Area (shaded red).



Figure 3. Google Earth™ satellite image showing Study Area location (outlined in red).

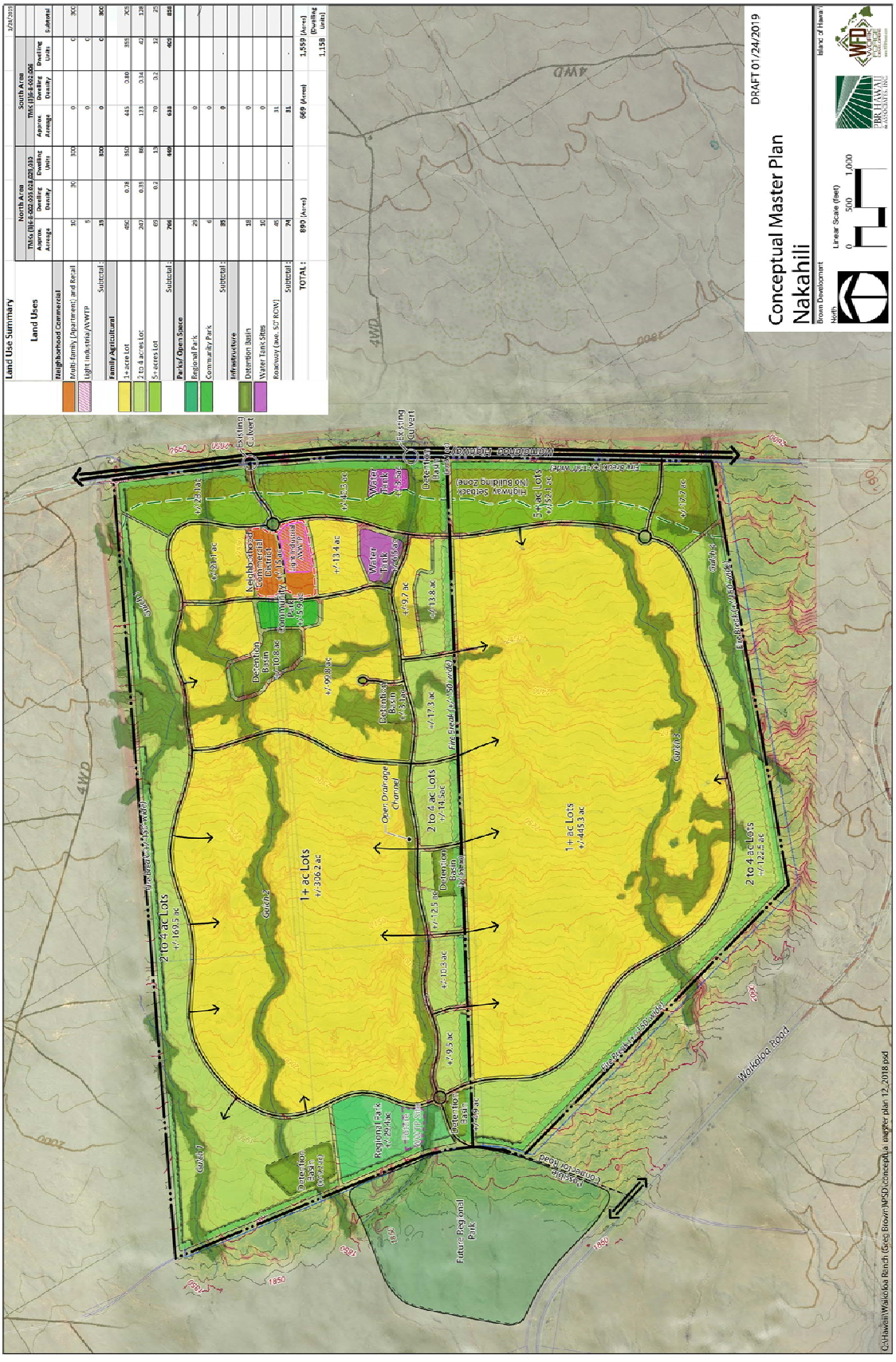

Figure 4. Conceptual Master Plan.

STUDY AREA DESCRIPTION

The Study Area encompasses roughly 1,559 acres and is located approximately 6.1 kilometers (3.79 miles) southeast of Waikōloa Village within Waikōloa Ahupua‘a, South Kohala District, Island of Hawai‘i (see Figure 1). The Study Area extends along the *makai* (west) edge of Māmalahoa Highway (Highway 190) and is identified as Lots 7 and 8 of the Waikōloa Ranch Subdivision, which was originally subdivided on December 19, 1969. It is situated on the western flank of Mauna Kea Volcano at elevations ranging from 1,921 to 2,678 feet (586 to 816 meters) above sea level, roughly 14 kilometers from the coast (see Figure 1). The undulating terrain is characterized by gentle to moderately westward-sloping hills and *mauka*/*makai* ridgelines, and is dissected by numerous intermittent, V-shaped drainages (Figures 5 and 6), some of which are highly eroded (Figure 7). There are no permanent streams present within the Study Area, however multiple non-perennial surface streams (none of which were flowing at the time of the current study) have incised fairly prominent channels through the subject property, and several meandering swales are present.

Soils within the Study Area are classified as belonging to the Waikoloa-Puu Pa complex on 2 to 10 and 10 to 20 degree slopes (Figure 8) (Soil Survey Staff 2018). These soils consist of a medial very fine sandy loam derived from weathered volcanic ash deposits overlying *‘a‘ā* lava flows that originated from Mauna Kea Volcano 250 to 65 thousand years ago during the Pleistocene epoch (Figure 9) (Wolfe and Morris 1996). Mean annual rainfall within the Study Area averages approximately 444.2 millimeters, with the majority of the rainfall occurring during the winter months of December and January, and the least occurring in August (Giambelluca et al. 2014). The climate is generally cool, with a mean annual temperature ranging from 59 to 72 degrees Fahrenheit (Giambelluca et al. 2014).

As a result of these arid conditions and nearly two centuries of cattle grazing, vegetation within the Study Area is sparse and dominated by introduced species. Ground cover consists primarily of fountain grass (*Cenchrus setaceus*) and buffelgrass (*Cenchrus ciliaris*) interspersed with *‘a‘ali‘i* (*Dodonaea viscosa*), apple of sodom (*Solanum linnaeanum*), and the occasional prickly pear (*pānini*) cactus (*Opuntia ficus-indica*) (Figures 10 and 11). Several pockets of eucalyptus (*Eucalyptus* sp.*)* and silky oak (*Grevillea robusta*) and the occasional lone *kiawe* (*Prosopis pallida*) are scattered throughout the Study Area (Figures 12 and 13). Within actively grazed paddocks, cattle aid in keeping the vegetation cover down (Figure 14). Charred branches and trunks of numerous trees indicate that the area is prone to periodic wildfires.

Grazing has also resulted in a number of modifications and constructed features on the landscape. Barbed wire boundary and cross fencing, often with welded pipe gates, divide the Study Area in to large grazing paddocks. Along the length of the northern and eastern Study Area boundaries, the Study Area is fenced with barbed wire (Figures 15 and 16), with the exception of a small, unfenced segment which allows access into the neighboring parcel to the north. Along its western study boundary, the Study Area is only fenced along Parcels 029 and 030 (Figure 17), and this fence terminates within Parcel 006 (where it is not coterminous with the Study Area boundary). The remainder of Parcel 006 as it extends towards the south is unfenced, as is the entire length of the Study Area’s southern boundary (Figures 18 and 19). In the eastern third of the Study Area, a barbed wire cross fence extends north to south through Parcels 005 and 028 (Figure 20), with a single ranching gate allowing access between those parcels and Parcels 029 and 030 to the south. The TMK parcels (005, 028, 029, and 030) that comprise the larger, northern half of the Study Area are separated from Parcel 006 to the south by a barbed wire fence that extends along the length of Parcels 006, 028, and 030 (Figure 21).

Modern ranching infrastructure also includes a corral (Figure 22) and a nearby dismantled water tank and associated steel piping (Figure 23) located in the northwestern corner, a wooden ranch field structure and corral (Figure 24), an abandoned plastic-lined earthen reservoir (Figure 25), several concrete, aluminum, and porcelain water troughs (Figure 26), and plastic waterlines (Figure 27). There are also two tanks from water tank vehicles, and a single plastic covered corrugated metal water tank (Figure 28) that is currently in use. Additionally, several piles of imported drain rock and unconsolidated asphalt (Figure 29) are present near the in-use water tank. Remnant sections of an abandoned asphalt and black cinder-paved roadway (Figure 30) extend northeast towards the fenced eastern Study Area boundary from the drain rock piles.

Several unimproved access roads (Figure 31) cross the Study Area, including two gated access roads that enter into the Study Area from Highway 190: a partially paved one at the central, northern portion of Parcel 028 (Figure 32), and another unimproved one near the northeastern corner of Parcel 006 (Figure 33). In addition to these roads, a network of old bulldozed road cuts, several of which appear to have been created as fire breaks and some of which are 4WD accessible, traverse the Study Area. Numerous bulldozer push piles are located within the Study Area, the majority of which are adjacent to unimproved 4WD roads and segments of unimproved roads (Figure 34). The mechanical disturbance that has occurred within the Study Area is largely the result of a combination of wildfire suppression and control activities and modern and Historic ranching endeavors.



Figure 5. Shallow drainage, view to the northwest.



Figure 6. Typical v-shaped drainage, view to the northwest.

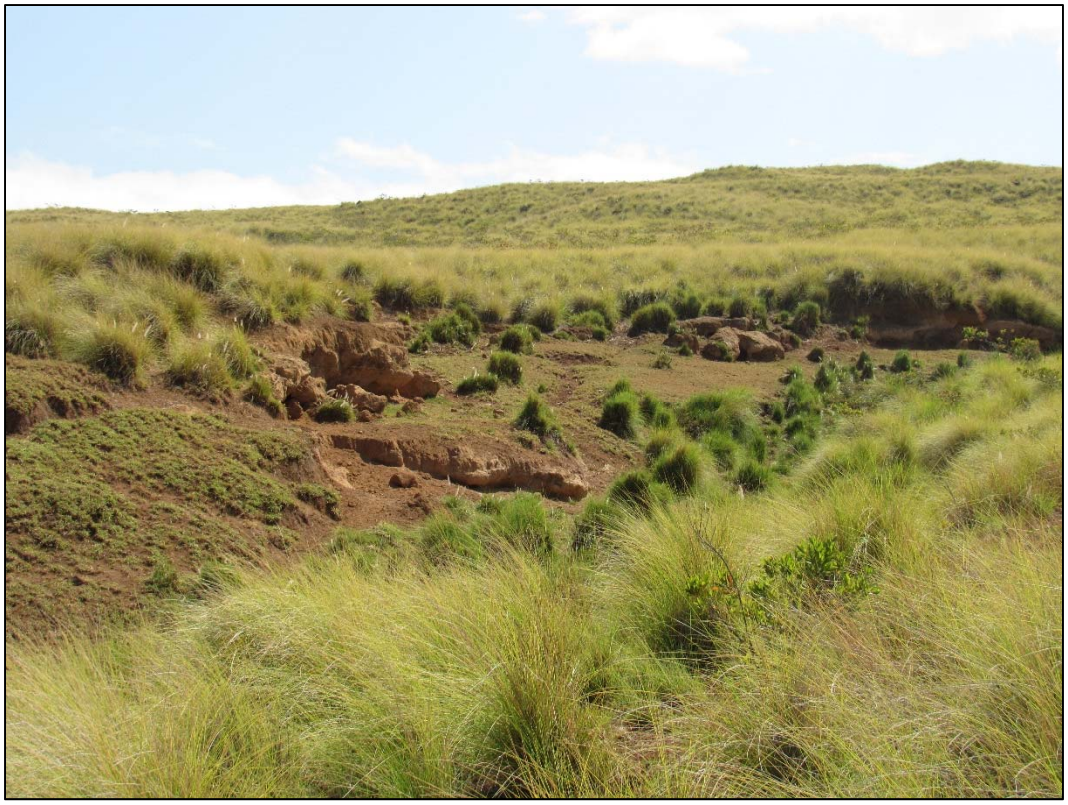

Figure 7. Partially eroded drainage channel, view to the north.

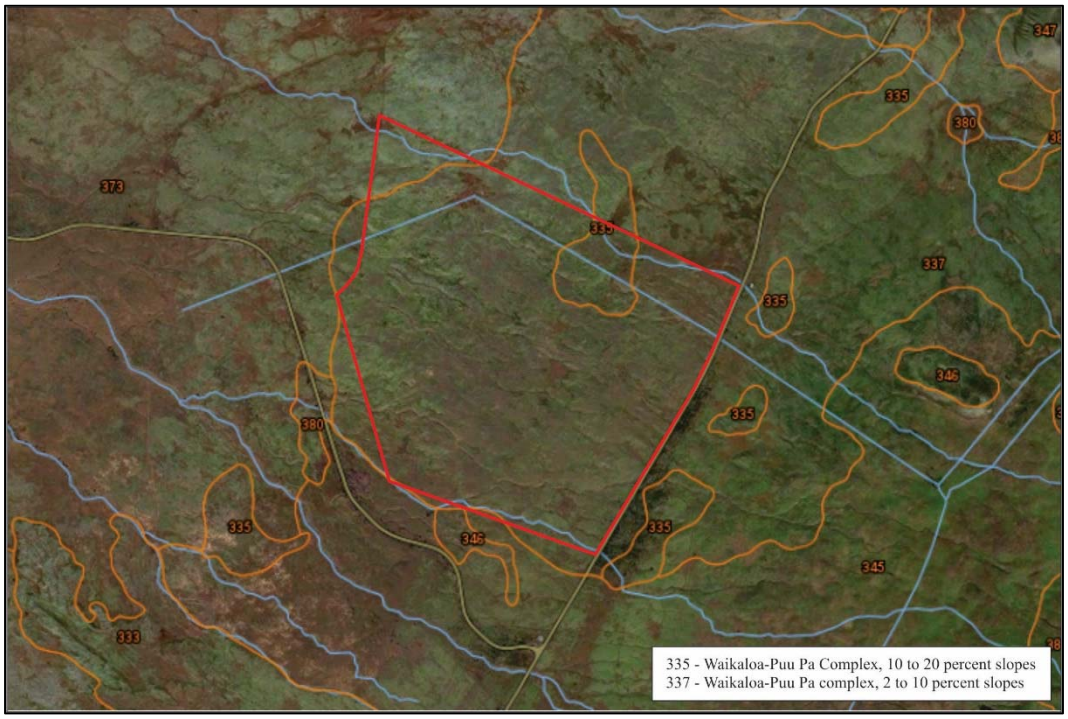

Figure 8. Map showing the classification of soils within the Study Area (USDA 2013).

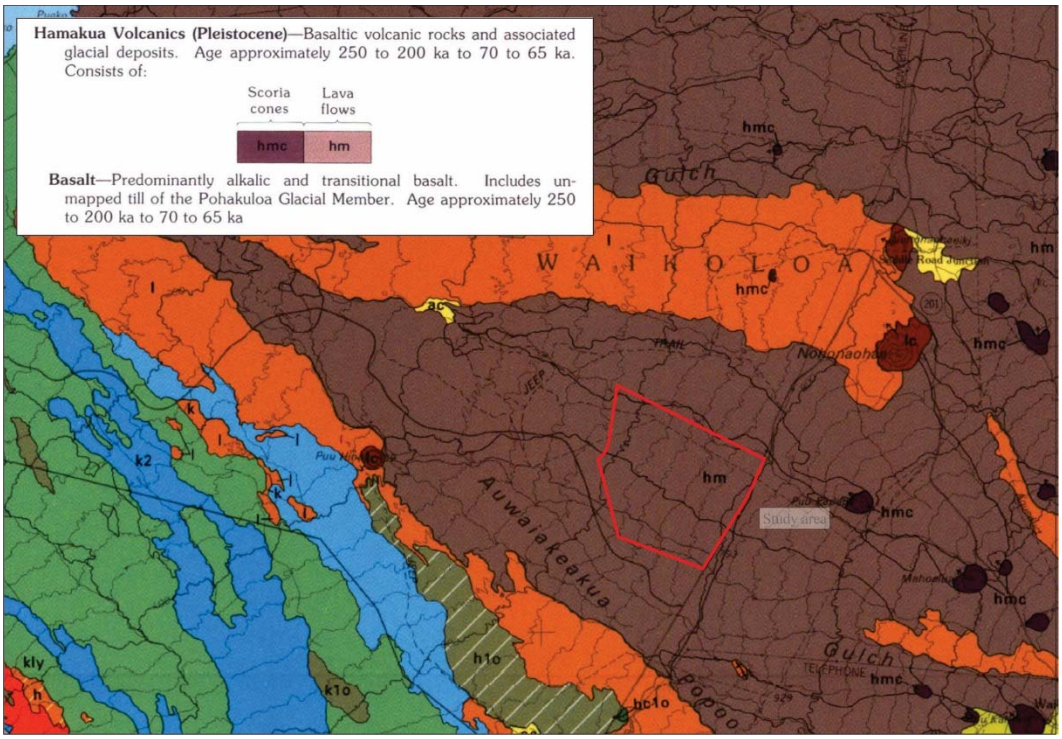

Figure 9. Map showing the Study Area lava flows (Wolfe and Morris 1996).


Figure 10. General Study Area terrain, view to the east.

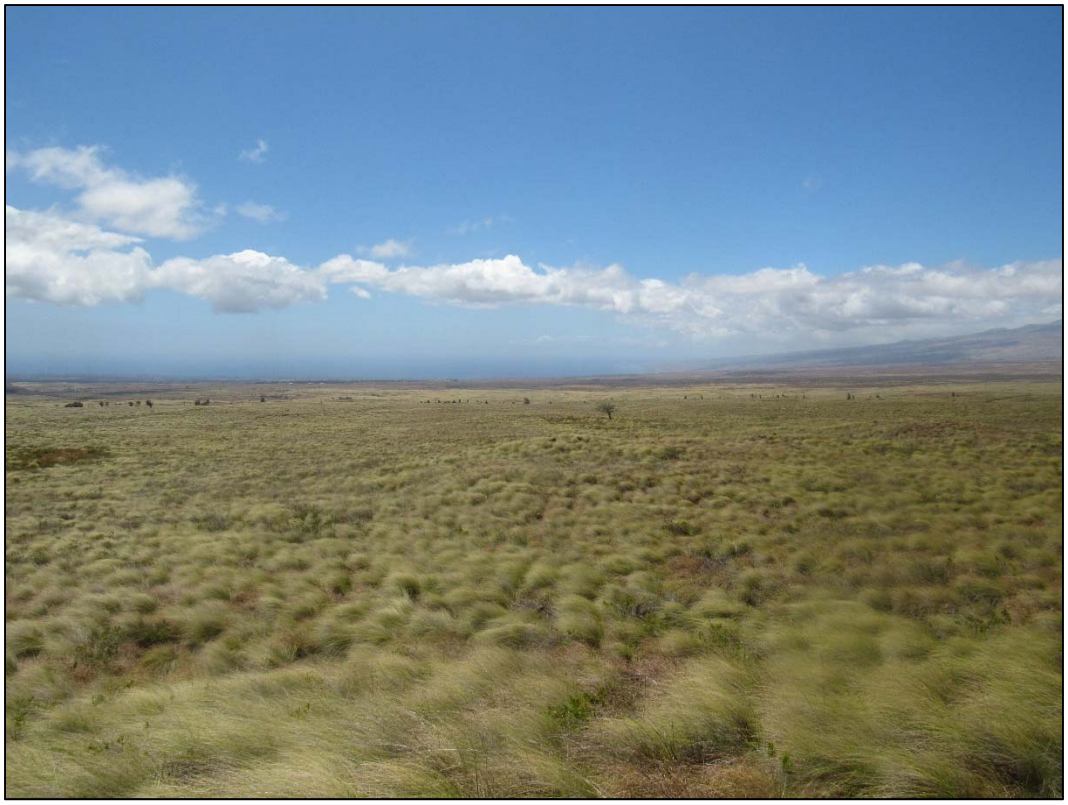

Figure 11. Typical vegetation within Study Area, view to the northwest.



Figure 12. Scattering of silky oak trees, view to the northwest.



Figure 13. Pocket of eucalyptus trees on elevated landform, view to the northeast.



Figure 14. Typical vegetation cover in grazed areas, view to the north.



Figure 15. Fenceline extending along the length of the northern boundary of the Study Area, view to the west.



Figure 16. Fenceline extending along the eastern boundary of the Study Area adjacent to Highway 190, view to the northeast.

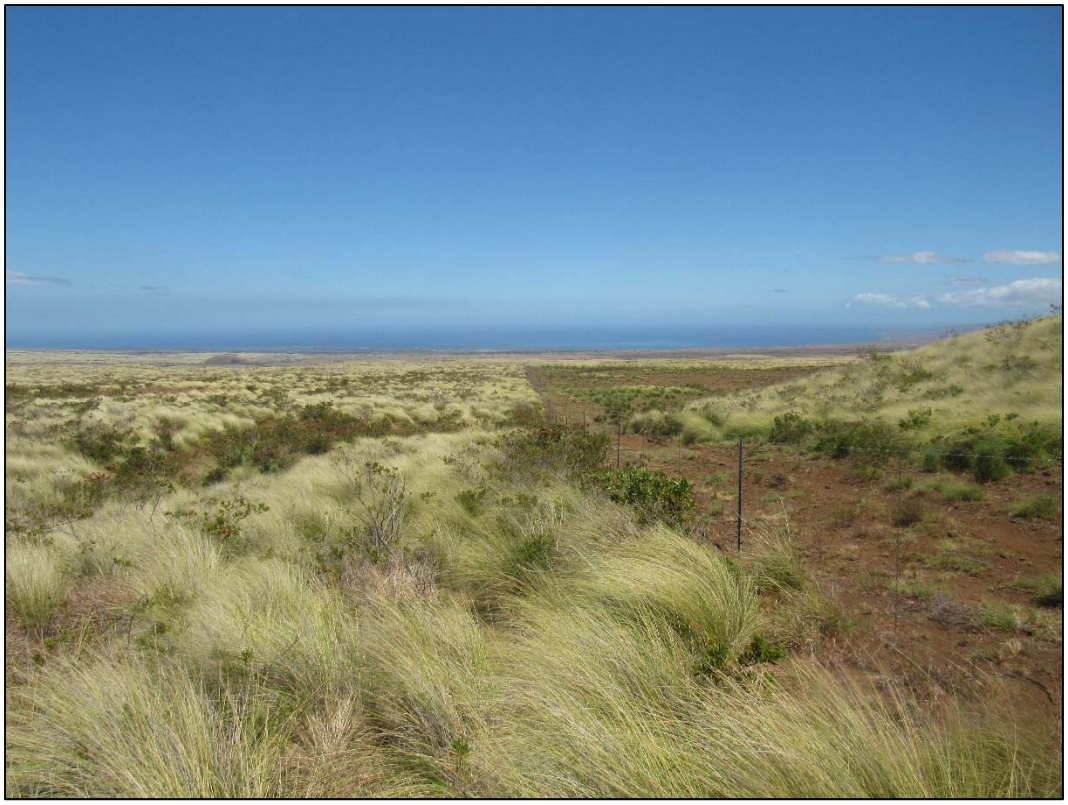

Figure 17. Fenceline extending along the length of Parcels 029 and 030, view to the west.



Figure 18. Southern unfenced boundary of Study Area view to the southwest.



Figure 19. Southwestern unfenced portion of Study Area, view to the southwest.



Figure 20. Barbed wire cross fence extending north/south across Parcels 005 and 028, view to the northeast.

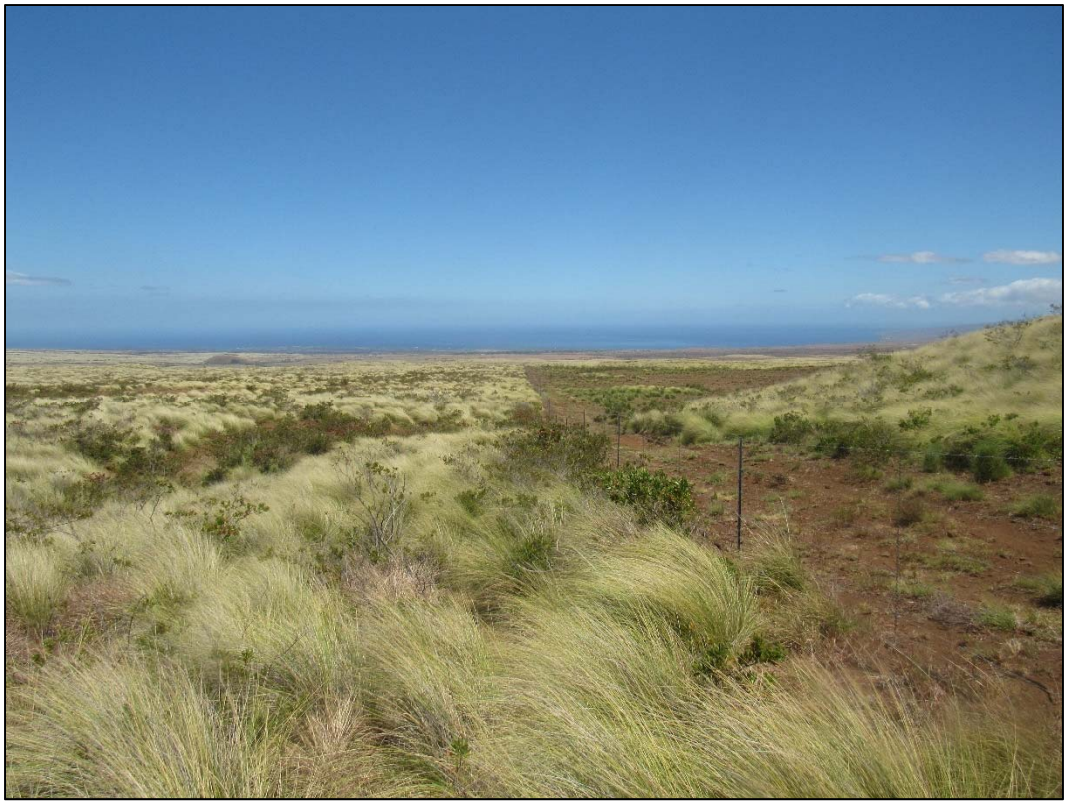

Figure 21. Barbed wire fence separating Parcel 006 to the south from Parcels 028, and 030 to the north, view to the west.



Figure 22. Corral in northwestern portion of Study Area, view to the northeast.



Figure 23. Remnants of an old water tank and pipe system, view to the southeast.



Figure 24. Modern ranching field structure and corral, view to the west.



Figure 25. Reservoir, view to the north.



Figure 26. Concrete trough, view to the north.



Figure 27. Modern plastic waterline extending above and across drainage, view to the northwest.



Figure 28. Dirt road adjacent to water truck tanks and water tank, view to the north.



Figure 29. Imported pile of drain rock, view to the northeast.



Figure 30. Intact section of asphalt and black cinder pavement, view to the northeast.



Figure 31. Unimproved 4WD road traversing Study Area, view to the northwest.



Figure 32. Partially paved access road in Parcel 028, view to the west.



Figure 33. Unimproved access road in Parcel 006, view to the west.



Figure 34. Bulldozer push pile, view to the north.

2. BACKGROUND

To generate a set of expectations regarding the nature of archaeological resources that might be encountered within the Study Area, and to establish an environment within which to assess the significance of any such resources, a general culture-historical background for the region is presented, and the results of previous archaeological studies conducted in the vicinity of the Study Area are summarized.

CULTURE-HISTORICAL CONTEXT

The Study Area is situated *mauka* of the northwestern coast of Hawai‘i Island, within the District of South Kohala, in what is today referred to as the *ahupua‘a* of Waikōloa (Figure 35). It is within this context that the following discussion of the history and culture of the Study Area is framed. The chronological summary presented below begins with the peopling of the Hawaiian Islands and includes the presentation of a generalized model of Hawaiian Prehistory containing specific references to Waikōloa and a discussion of the general settlement patterns for South Kohala. 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 South Kohala after contact. The summary includes a discussion of the changing lifeways and population decline of the early Historic Period, a review of land tenure in the study *ahupua‘a* during the *Māhele ‘Āina* of 1848, and documentation of the transition to the sugar and ranching industries from the last quarter of the nineteenth century into the twentieth century. A synthesis of the Precontact settlement patterns and the Historically documented land use, combined with a review of the findings of previously conducted archeological studies, provides a means for predicting the types of archaeological features that may be encountered within the study area, and forms a basis for assessing the function, age, and significance of any encountered archaeological sites.

A Generalized Model of Hawaiian Prehistory

The generalized cultural sequence that follows is based on Kirch’s (1985) model and amended to include recent revisions offered by Kirch (2011). The conventional wisdom has been that the first inhabitants of Hawai‘i Island arrived by at least A.D. 300, and focused habitation and subsistence activity on the windward side of the island (Burtchard 1995; Hommon 1986; Kirch 1985). Recent re-evaluation and syntheses of genealogical, oral historical, mythological, and radiometric data by Kirch (2011) and others (Athens et al. 2014; Duarte 2012; Wilmshurst et al. 2011) have convincingly argued that Polynesians may not have arrived in the Hawaiian Islands until at least A.D. 1000, but expanded rapidly thereafter. The implications of this on the currently accepted chronology would alter the timing of the Settlement, Developmental, and Expansion Periods, possibly shifting the Settlement Period to A.D. 1000 to 1100, the Developmental Period to A.D. 1100 to 1350, the Expansion Period to A.D. 1350 to 1650, and the Proto-Historic Period to A.D.1650-1795. It has been generally reported that the sources of the early Hawaiian population—the Hawaiian Kahiki—were the Marquesas and Society Islands (Emory in Tatar 1982:16-18).

The Settlement Period was a time of great exploitation and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order. Order was further assured by the conical clan principle of genealogical seniority (Kirch 1984, 2010). According to Fornander (1969), Hawaiians brought from their homeland certain universal Polynesian customs: the major gods Kāne, Kū, Kanaloa, and Lono; the *kapu* system of law and order; cities of refuge; the *‘aumakua* concept; various epiphenomenal beliefs; and the concept of *mana*. Conventional wisdom suggests that the first inhabitants of Hawai‘i Island focused habitation and subsistence activity on the windward side of the island (Burtchard 1995; Hommon 1986; Kirch 1985).

As time passed a uniquely Hawaiian culture developed. The portable artifacts found in archaeological sites of the Development Period of the Hawaiian prehistory reflect not only an evolution of the traditional tools, but some distinctly Hawaiian inventions. The adze (*ko‘i*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are ‘*ulu maika* stones and *lei niho palaoa*. The later were status items worn by individuals of high rank, which indicates recognition of status differentiation (Kirch 1985). As population expanded in the Hawaiian Islands so did social stratification, which was accompanied by major socioeconomic changes and intensive land modification. Once most of the ecologically favorable zones of the windward and coastal regions of the major islands were settled, the more marginal leeward areas were developed. Migrations to Hawai‘i from the Marquesas and Society Islands may have continued throughout the early Settlement and Development Periods (Kirch 1985, 2012).

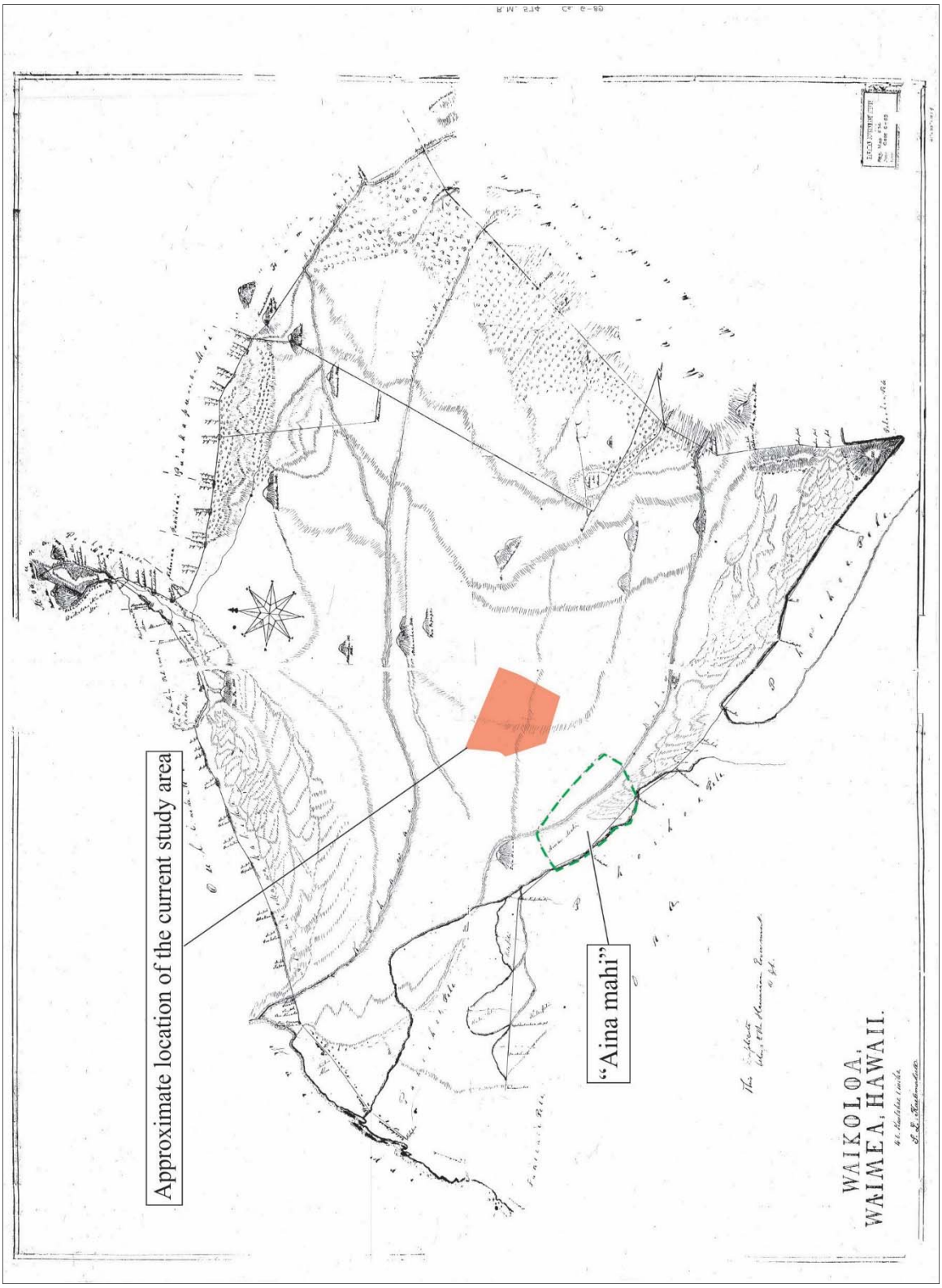

Figure 35. Hawai'i Registered Map No. 574 by Kaelemakule showing the approximate location of the Study Area (shaded red).

In the District of Kohala, the long ridge of the Kohala Mountains extends perpendicular to the predominant northeasterly trade winds, creating an orographic rainfall pattern that separates the district into two distinct environmental zones; a wetter windward zone on the eastern (Hāmākua) side, and a drier leeward zone on the western (Kona) side. The first settlers of this district likely established a few small communities near sheltered bays with access to fresh water primarily in the windward valleys and gulches. The communities would have shared extended familial relations and had an occupational focus on the collection of marine resources. Evidence for early occupation of leeward Kohala was speculated for Kapaʻanui, where Dunn and Rosendahl (1989) reported radiocarbon dates as early as A.D. 461, and from ʻAnaehoʻomalu where Barrera (1971) reported A.D. 900 as the initial date for settlement; however, these early dates should be viewed with suspicion (cf. Kirch 2011). Other early dates from windward Kohala were reported by Cordy (2000); these sites are believed to have been utilized in the early thirteenth century. Data recovered from Māhukona, along the leeward coast of North Kohala, suggest initial occupation taking place there by about A.D. 1280 (Burgett and Rosendahl 1993:36). Permanent settlement in Kohala has been reported as early as A.D. 1300 at Koaiʻe, a coastal settlement, where subsistence primarily derived from marine resources, but was probably supplemented by small-scale agriculture as well (Tomonari-Tuggle 1988).

The Expansion Period is characterized by the greatest social stratification, major socioeconomic changes, and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. The greatest population growth occurred during the Expansion Period, and it was during this time that a second major migration settled in Hawaiʻi, this time from Tahiti in the Society Islands. According to Kamakau (1976), the *kahuna* Pāʻao settled in the islands during the 13th century. Pāʻao was the keeper of the god Kūʻkāʻilimoku, who had fought bitterly with his older brother, the high priest Lonopele. After much tragedy on both sides, Pāʻao was expelled from his homeland in Tahiti by Lonopele. He prepared for a long voyage and set out across the ocean in search of a new land. On board Pāʻao's canoes were thirty-eight men (*kānaka*), two stewards (*kānaka ʻāʻīpuʻupuʻu*), the chief Pilikaʻaiea (Pili) and his wife Hinaʻaukekele, Nāmauʻu o Malaia, the sister of Pāʻao, and the prophet Makuakaʻūmana. Lonopele did not let Pāʻao leave peacefully, but instead called on the cold north winds to sink his canoes; one of the winds was named "Waikōloa" (Kamakau 1991:5). There are several versions of this story that are discussed by Beckwith (1976), including the version where Moʻokini and Kaluawilinau, two *kāhuna* of Moikeha, decide to stay on at Kohala. The bones of the *kahuna* Pāʻao are said to be deposited in a burial cave in Kohala in Puʻuwepa [possibly Puʻuepa?] (Kamakau 1964:41). The Pili line's initial ruling center was likely in Kohala too, but Cartwright (1933) suggests that Pili later resided in and ruled from Waipiʻo Valley in the Hāmākua District. Ethnohistorical traditions (Fornander 1969) indicate that Waipiʻo Valley was associated with at least nine successive Pili line rulers of Hawaiʻi Island, from Kahaʻimoeleʻa to ʻUmi (from roughly A.D. 1460 to 1620).

Heiau construction flourished during this period as religion became more complex and embedded in a sociopolitical climate of territorial competition. Monumental architecture, such as *heiau*, "played a key role as visual markers of chiefly dominance" (Kirch 1990:206). This pattern continued to intensify from A.D. 1500 to Contact (A.D. 1778), and evidence suggests that substantial changes were made to the political system as well. Within Kohala, for example, the Great Wall complex at Koaiʻe is organized with certain platforms in the complex physically separated from contemporaneous features. Griffin et al. (1971) interpret these separate spaces as symbolizing class stratification.

The period from A.D. 1300–1500 was characterized by population growth as well as expanded efforts to intensify upland agriculture. Rosendahl (1972) has proposed that settlement in leeward Kohala at this time was related to seasonal, recurrent occupation, and that coastal sites were occupied in the summer to exploit marine resources, while upland sites were being occupied during the winter months with a primary focus on agriculture. An increasing reliance on agricultural products may have caused a shift in social networks as well, according to Hommon (1976). Hommon argues that kinship links between coastal settlements disintegrated as those links within the *mauka-makai* settlements expanded to accommodate exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupuaʻa* system. The implications of this model include a shift in residential patterns from seasonal, temporary occupation, to permanent dispersed occupation of both coastal and upland areas.

According to Kirch's (1985) model, the concept of the *ahupuaʻa* was established sometime during the A.D. 1400s, adding another component to an already well-stratified society. This land unit became the equivalent of a local community, with its own social, economic, and political significance. *Ahupuaʻa* were ruled by *aliʻi ʻai ahupuaʻa* or lesser chiefs; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land, which was managed by a *konohiki*. *Ahupuaʻa* generally speaking, are wedge-shaped subdivisions of land that radiate out from the center of the island, typically extending from the mountain into the sea. Their boundaries are often defined by the topography of the land and its geological features. In these land units the native tenants tended fields and cultivated crops necessary to sustain their families, and the chiefly communities with which they were associated.

As long as sufficient tribute was offered and *kapu* (restrictions) were observed, the common people (*maka'āinana*), who lived in a given *ahupua'a* had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment, and supplying the needs of the *ali'i* (see Kamakau 1992; Malo 1951).

Entire *ahupua'a*, or smaller portions of the land called *'ili* were generally under the jurisdiction of appointed *konohiki* or lesser chief-landlords, who answered to an *ali'i-'ai-ahupua'a* (chief who controlled the *ahupua'a* resources). The *ali'i-'ai-ahupua'a* in turn answered to an *ali'i 'ai moku* (chief who claimed the abundance of the entire district). Thus, *ahupua'a* resources supported not only the *maka'āinana* and *'ohana* who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resource management planning. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources (Rechtman and Maly 2003). The *ahupua'a* were further divided into smaller sections such as the *'ili 'āina, mo'o 'āina, paukū 'āina, kīhāpai, kō'ele, hakuone*, and *kuakua* (Hommon 1986, Pogue 1978). The chiefs of these land units gave their allegiance to a territorial chief or *mō'ī* (king).

While Waikōloa is referred to today as an *ahupua'a*, traditionally it was an *'ili* of the *kalana* (or *'okana*) of Waimea. In ancient times a *kalana* was treated as a sub-district: smaller than a district (*moku o loko*), but composed of several other land divisions, such as *ahupua'a* and the more independent *'ili kūpono*, all of which contributed to its wealth (Maly and Maly 2002). The lands subject to the *kalana* of Waimea were those that form the southern limits of the present-day South Kohala District including ʻŌuli, Waiʻaka, Lālāmilo, Puakō, Kalāhuipuaʻa, ʻAnaehoʻomalu, Kanakanaka, Alaʻōhiʻa, Paulama, Puʻukalani (Pukalani), Puʻukapu, and Waikōloa (Figure 36). In ancient times, Waikōloa was referred to as Waikōloa Nui, and the neighboring area of Lālāmilo was referred to as Waikōloa Iki (Maly 1999).

Most of the *kalo* (taro) and *'uala* (sweet potato) fields of this part of the island were located in the rainier uplands near the present-day town of Waimea, where there was a sizable permanent population as well. Boundary commission testimonies from the latter part of the nineteenth century relate the presence of a cultivated plot of land on the northeastern side of Puʻu Hīnaʻi which was formerly cultivated in *'uala*, *ipu* (gourds), pumpkins, and melons. Oral histories indicate that another dry land planting area referred to as Makahonu was present in Waikōloa, "which was still used through the turn of the [twentieth] century" (Maly 1999:153). Makahonu was located near the intersection of Waikōloa Road and Queen Kaʻahumanu Highway, well *makai* of the Study Area. There is no information in the oral histories of what was specifically cultivated in that planting area although ʻAnaehoʻomalu and other proximal locations were favorable areas for growing *'uala* (Handy and Handy 1991). Coastal residents in South Kohala, however, relied primarily on the ocean for sustenance, and they augmented their diet with produce procured through trade with the upland areas. Marine resources were brought ashore in the small bays with sandy shores found in the coastal section of Waimea (now called South Kohala), where, as Handy and Handy (1991:532) relate, fishermen lived and probably cultivated potatoes in small patches."

By the seventeenth century, large areas of Hawaiʻi Island (*moku āina* – districts) were controlled by a few powerful *ali'i 'ai moku*. There is island-wide evidence to suggest that growing conflicts between independent chiefdoms were resolved through warfare, culminating in a unified political structure at the district level. It has been suggested that the unification of the island resulted in a partial abandonment of portions of leeward Hawaiʻi, with people moving to more favorable agricultural areas (Barrera 1971; Schilt and Sinoto 1980). ʻUmi a Līloa, a renowned *ali'i* of the Pili line who ruled from Waipiʻo Valley, is often credited with uniting the island of Hawaiʻi under one rule (Cordy 1994). According to Kamakau (1992) ʻUmi was a skilled fisherman, and fishing for *aku*, his favorite fish, often brought him to the beaches of South Kohala from Kalāhuipuaʻa to Makaula, where he also fished for *'ahi* and *kala* with many other famed fishermen and all the chiefs of the kingdom. ʻUmiʻs reign lasted until around a.d. 1620, and was followed by the rule of his son, Keawenui a ʻUmi, and then his grandson, Lonoikamakahiki (Cordy 1994).

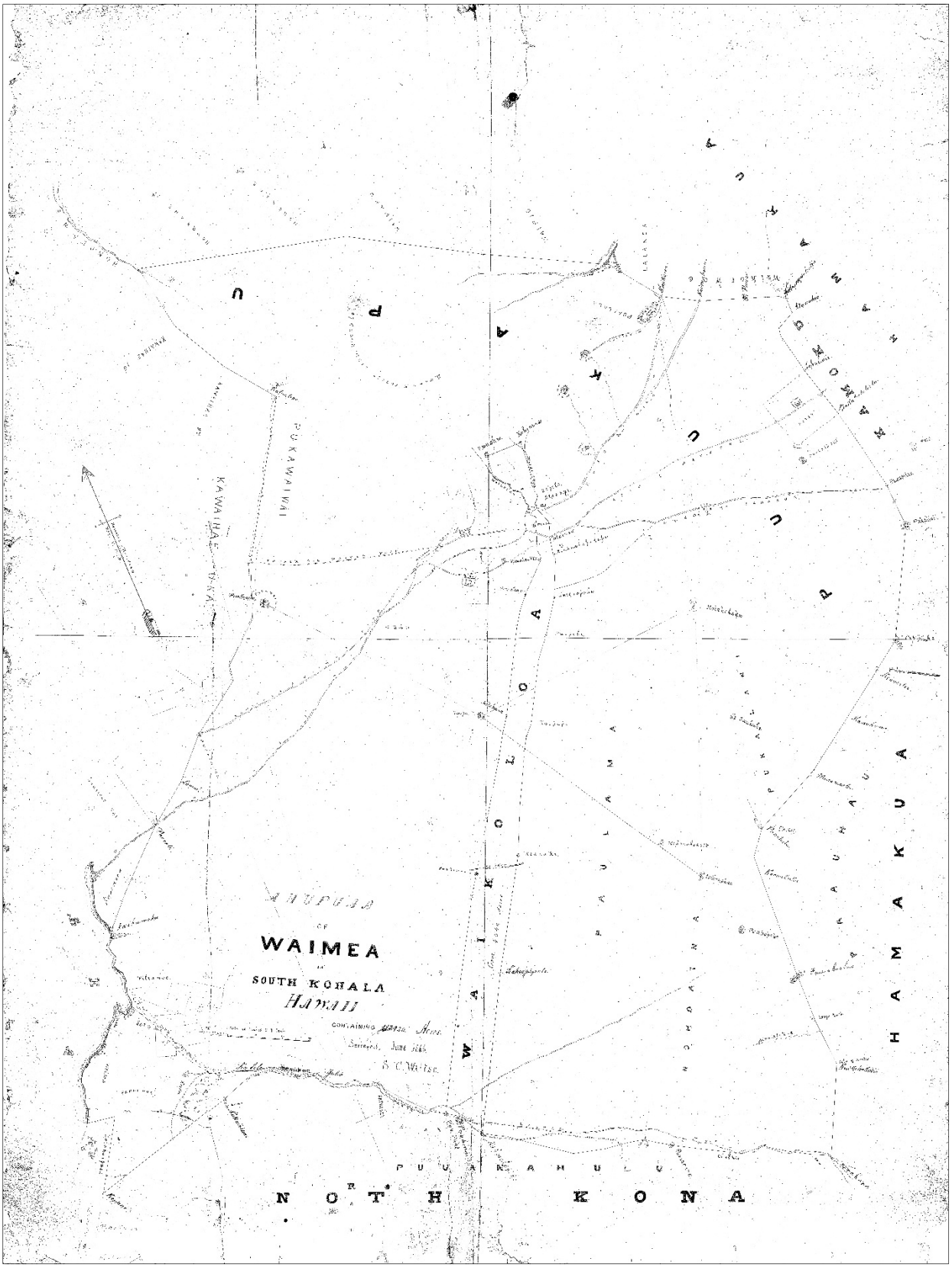

Figure 36. Hawai‘i Registered Map No. 712 showing the *kalana* of Waimea and associated *ahupua‘*a, prepared by S.C. Wiltse, June 1866.

Kirch (1985) places the beginning of the Proto-Historic Period (A.D. 1650–1795) during the rule of Lonoikamakahiki. This period was marked by both political intensification and competition among the reigning *aliʻi*. Wars occurred regularly between intra-island and inter-island polities and included battles that transpired in the vicinity of the Study Area. According to Fornander (1996:120-121), one such battle was fought between Lonoikamakahiki (Lono) and his older brother, Kanaloakuaʻana near the coast at a place called Wailea. Later, Lono battled the forces of Maui led by Kamālālawalu on the plain of Waikōloa below Puʻu ʻŌāʻoaka, in which the Maui *aliʻi* was killed on the grassy plain of Puakō (Kamakau 1991; Maly and Maly 2002). By the 1700s, rule of Hawaiʻi Island was divided among the chiefs of Kona and Hilo (Kamakau 1992). Keawe, a Pili line ruler and the son of Kanaloakapulehu, was the chief of Kohala, Kona, and Kaʻū. When Keawe died, he split the rule of his lands between two of his sons, further dividing the island's chiefdoms; Kalaninuiʻiamamao became the ruling chief of Kaʻū, and Keʻeaumoku became the ruling chief of Kona and Kohala (Kamakau 1992). Wars between the *aliʻi* continued unabated through this transition. Alapaʻinui, the son of former Kona war chief Kauauanui a Mahi, desired to take control of Hawaiʻi Island (Kamakau 1992), and successfully waged war against the chiefs of Kona and Kohala, and eventually took control of Kaʻū and Hilo as well. Alapaʻinui ruled for many years, and appointed his son Keaweʻōpala ruler of the island upon his death in 1754 (Kamakau 1992). It was during this time of warfare that Kamehameha was born in the North Kohala District in the *ahupuaʻa* of Kokoiki, near the *heiau* of Moʻokini (Kamakau 1992).

Many of the chiefs who had been deprived of their lands by Alapaʻinui battled against Keaweʻōpala, and he was soon defeated in South Kona by Kalaniʻōpuʻu, who then became the ruler of Hawaiʻi Island (Kamakau 1992). Kalaniʻōpuʻu's reign was marked by near-constant warfare as he invadedMaui and defended himself from rebellions by Maui and Hawaiʻi *aliʻi* (Kamakau 1992). In A.D. 1775 Kalaniʻōpuʻu and his forces from Hāna, Maui, raided and destroyed the neighboring district of Kaupō, and then launched several more raids on Molokaʻi, Lānaʻi, Kahoʻolawe, and parts of West Maui. It was at the battle of Kalaeokaʻilio that Kamehameha, a favorite of Kalaniʻōpuʻu, was first recognized as a great warrior and given the name of Paiʻea (hard-shelled crab) by the Maui chiefs and warriors (Kamakau 1992). During the battles between Kalaniʻōpuʻu and Kahekili (1777–1779), Kaʻahumanu and her parents left Maui to live on the island of Hawaiʻi (Kamakau 1992). Kalaniʻōpuʻu was fighting on Maui when the British explorer Captain James Cook first arrived in the islands.

History After Contact

The arrival of foreigners in Hawaiʻi marks the beginning of the Historic Period. Demographic trends during the later Proto-Historic Period indicate population reduction in some areas, due to war and disease, yet increases in others, with relatively little change in material culture. There was a continued trend toward craft and status specialization, intensification of agriculture, *aliʻi* controlled aquaculture, the establishment of upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although western influence was already altering the cultural fabric of the Islands (Kirch 1985; Kent 1983). Foreigners very quickly introduced the concept of trade for profit, and by the time Kamehameha I had conquered Oʻahu, Maui and Molokaʻi, in 1795, Hawaiʻi saw the beginnings of a market system economy (Kent 1983). This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture.

The Arrival of Captain James Cook and the End of Kalaniʻōpuʻu's Reign (1778-1782)

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 Kaʻawaloa along the north shore of 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. It has been suggested that Captain Cook was understood to be the god Lono himself returned, as men would not normally be allowed to paddle out during the *Makahiki* without breaking the *kapu* and forfeiting all of their possessions (Kamakau 1992). Kalaniʻōpuʻu, the reigning chief of Hawaiʻi Island, left a battle with Kahekili on Maui, and after arriving at Kealakekua Bay, visited Cook on board the *H.M.S. Resolution*, where they exchanged gifts. Kamehameha, the future ruler of all of Hawaiʻi, was present at this meeting (Jarves 1847). On February 4th, Cook set sail, 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 Bay to make repairs. With Cook's return many of the inhabitants of Kealakekua began to doubt that he actually was the physical manifestation of Lono (Kamakau 1992). Ten days later, a dispute over stolen nails escalated and after one of Cook's boats was stolen, the captain set ashore at Kaʻawaloa with six marines to ask Kalaniʻōpuʻu for its return. When Kalaniʻōpuʻu denied any knowledge of the theft, Cook tried to take him captive (Kamakau 1992). A fight ensued, and Cook was killed along with four of his men and several natives. Kalaniʻōpuʻu and his retinue retreated inland. After offering the body of Cook as a sacrifice to the *akua*, some of his bones were returned to the British aboard *Resolution* (Kamakau 1992), who shortly thereafter returned to sea.

After the death of Captain Cook and the departure of *H.M.S. Resolution* and *Discovery*, Kalani‘ōpu‘u moved to Kona, where he surfed and amused himself with the pleasures of dance (Kamakau 1992). While he was living in Kona, famine struck the district. Kalani‘ōpu‘u ordered that all the cultivated products of that district be seized, and then he set out on a circuit of the island. While in Kohala, Kalani‘ōpu‘u proclaimed that his son Kiwala‘ō would be his successor, and he gave the guardianship of the war god Kūka‘ilimoku to Kamehameha. However, Kamehameha and a few other chiefs were concerned about their land claims, which Kiwala‘ō did not seem to honor (Fornander 1996; Kamakau 1992). The *heiau* of Moa‘ula was erected in Waipi‘o at this time (ca. A.D. 1781), and after its dedication Kalani‘ōpu‘u set out for Hilo to quell a rebellion by a Puna chief named Imakakolo‘a.

Imakakolo‘a was defeated in Puna by Kalani‘ōpu‘u’s superior forces, but he managed to avoid capture and hide from detection for the better part of a year. While the rebel chief was sought, Kalani‘ōpu‘u went to Ka‘ū and erected a *heiau* called Pākini (Kamakau 1992). Imakakolo‘a was eventually captured and brought to the *heiau*, where Kiwala‘ō 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 Kiwala‘ō could finish the first offerings, Kamehameha, “grasped the body of Imakakolo‘a 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 Hawai‘i. After usurping Kiwalao’s authority with a sacrificial ritual in Ka‘ū, Kamehameha retreated to his home district of Kohala. While in Kohala, Kamehameha farmed the land, growing taro and sweet potatoes (Handy and Handy 1972). Kalani‘ōpu‘u died in April of 1782 and was succeeded by his son Kiwala‘ō.

The Rule of Kamehameha I (1782-1819)

After Kalani‘ōpu‘u died, several chiefs were unhappy with Kiwala‘ō’s division of the island’s lands, and civil war broke out. Kiwala‘ō, Kalani‘ōpu‘u’s son and appointed heir, was killed at the battle of Moku‘ōhai, South Kona in July of 1782. Supporters of Kiwala‘ō, including his half-brother Keōua and his uncle Keawemauhili, escaped the and laid claim to the Hilo, Puna, and Ka‘ū Districts. According to ‘I‘i (1963), nearly ten years of almost continuous warfare followed, as Kamehameha endeavored to unite the island of Hawai‘i under his rule and conquer the islands of Maui and O‘ahu. Keōua became Kamehameha’s main rival on the island of Hawai‘i, and he proved difficult to defeat (Kamakau 1992). Around 1790, in an effort to secure his rule, Kamehameha began building the *heiau* of Pu‘ukoholā at Kawaihae, which was to be dedicated to the war god Kūka‘ilimoku (Fornander 1996). When Pu‘ukoholā 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 Pu‘ukoholā Heiau by this ruse and when he arrived at Kawaihae he and his party were sacrificed to complete the dedication (Kamakau 1992). The assassination of Keōua gave Kamehameha undisputed control of Hawai‘i Island (Greene 1993). Between 1792 and 1796, after the dedication of Pu‘ukoholā, Kamehameha mostly resided at Kawaihae and worked the lands of the Waikōloa-Waimea region (Maly and Maly 2002). By 1796, Kamehameha had conquered all the island kingdoms except for Kaua‘i. It wasn’t until 1810, when Kaumuali‘i of Kaua‘i gave his allegiance to Kamehameha, that the Hawaiian Islands were unified under one ruler (Kuykendall and Day 1976).

In the twelve years following the death of Captain Cook, sixteen foreign ships (all British and American) called in Hawaiian waters (Restarick 1927). In 1790, two sister ships, the *Eleanora* and the *Fair American*, were trading in Hawaiian waters when a skiff was stolen from the *Eleanora* and one of its sailors was murdered. The crew of the *Eleanora* proceeded to slaughter more than 100 natives at Olowalu [Maui]. After leaving Maui, the *Eleanora* sailed to Hawai‘i Island, where one of its crew, John Young, went ashore and was detained by Kamehameha’s men. The other vessel, the *Fair American,* was captured by the forces of Kamehameha off the coast of North Kona, and in an act of retribution for the Olowalu massacre, they slaughtered all but one crew member, Isaac Davis. Guns and a cannon (later named “Lopaka”) were recovered from the Fair American and were kept by Kamehameha as part of his fleet (Kamakau 1992). Kamehameha made John Young and Isaac Davis his advisors.

In 1792, Captain George Vancouver, who had sailed with Cook during his 1778-1779 voyages, arrived in Kealakekua Bay with a small fleet of British ships, where he met with Kamehameha. Vancouver stayed only a few days on this first visit but returned again in 1793 and 1794 to take on supplies. Vancouver introduced cattle to the Island of Hawai‘i during his 1793 and 1794 visits, giving them as gifts to Kamehameha I, who immediately made them *kapu*, thus preventing them from being killed (Kamakau 1992). Waikōloa Nui would eventually become a favored pasture for the cattle given by Vancouver to Kamehameha. The *kapu* cattle quickly multiplied in the region, becoming a scourge for the native planters of the area, so much so that sometime between 1813 and 1819 their numbers necessitated that a wall be built from the northern boundary of Waikōloa Nui to near Pu‘u Huluhulu (Barrere 1983). The wall was designed to keep wild cattle in Waikōloa Nui, and out of the more agriculturally productive areas on the

Waimea side. The wall was called the Pā of Kauliokamoa after the *konohiki* who oversaw its construction (Wolforth 2000).

During one of his visits Vancouver anchored at Kawaihae and a member of his crew, Archibald Menzies, a surgeon and naturalist, trekked inland towards Waimea. Menzies' journal records the journey and describes the land in the vicinity of the current project area as follows:

> I travelled a few miles back…through the most barren, scorching country I have ever walked over, composed of scorious dregs and black porous rock, interspersed with dreary caverns and deep ravines…The herbs and grasses which the soil produced in the rainy seasons were now mostly in the shriveled state, thinly scattered and by no means sufficient to cover the surface from the sun's powerful heat, so that I met with few plants in flower in this excursion. (Menzies 1920:55)

Around the turn of the century, Kamehameha gave control of Waikōloa Nui Ahupuaʻa (excluding the coastal *ʻili* of ʻAnaehoʻomalu and Kalāhuipuaʻa) to Isaac Davis (Rosendahl 2000). Although the land of Waikōloa encompassed a large area, it lacked extensive resources, and was primarily a place for catching birds and gathering *pili* grass. When Davis died in 1810 without naming an heir, John Young took control of the land and protected it for Davis' children, who were at that time too young to take on the responsibility (Rosendahl 2000).

During the first part of the nineteenth century, Hawaiʻi's culture and economy continued to change drastically as capitalism and industry established a firm foothold in the islands. The sandalwood (*Santalum ellipticum*) trade, established by Euro-Americans in 1790 and turned into a viable commercial enterprise by 1805 (Oliver 1961), was flourishing by 1810. This added to the breakdown of the traditional subsistence system, as farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to a population decline. Kamehameha, who resided on the Island of Oʻahu at this time, did manage to maintain some control over the trade on Hawaiʻi Island (Kuykendall and Day 1976; Kent 1983).

Upon returning to Kailua in 1812, Kamehameha resided at Kamakahonu, from whence he continued to rule the islands for another nine years. While in Kailua, He and his high chiefs participated in foreign trade, but also continued to enforce the rigid *kapu* system. He ordered men into the mountains of Kona to cut sandalwood and carry it to the coast, paying them in cloth, *kapa* material, food and fish (Kamakau 1992). This new burden added to the breakdown of the traditional subsistence system. Farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to a population decline. Kamakau indicates that, "this rush of labor to the mountains brought about a scarcity of cultivated food . . . The people were forced to eat herbs and tree ferns, thus the famine [was] called Hi-laulele, Haha-pilau, Laulele, Pualele, ʻAmaʻu, or Hapuʻu, from the wild plants resorted to" (1992:204). Once Kamehemeha realized that his people were suffering, he "declared all the sandalwood the property of the government and ordered the people to devote only part of their time to its cutting and return to the cultivation of the land" (Kamakau 1992:204).

The Death of Kamehameha I and the Abolition of the Kapu System (1819-1820)

Kamehameha I died on May 8, 1819 at Kamakahonu, and the changes that had been affecting the Hawaiian culture since the arrival of Captain Cook in the Islands began to accelerate. Following the death of a prominent chief, it was customary to eliminate all of the regular *kapu* that maintained social order and the separation of men and women, elite and commoner. Thus, following Kamehameha's death, a period of *ʻai noa* (free eating) was observed along with the relaxation of other traditional *kapu*. It was the responsibility of the new ruler and *kahuna* to re-establish *kapu* and restore social order, but at this point in history traditional customs were altered (Kamakau 1992). Immediately upon the death of Kamehameha I, Liholiho (his son and to be successor) was sent away to Kawaihae to keep him safe from the impurities of Kamakahonu brought about from the death of Kamehameha. After purification ceremonies Liholiho returned to Kamakahonu. Instead of re-instating the traditional *kapu*, Liholiho ate the dog meat *kapu* to the women *aliʻi*, entered the women's *lauhala* house, and did whatever he desired. While he may have done so during a time when he had not yet reinstituted the eating *kapu,* other chiefs present appear to have thought otherwise, and word spread that the *kapu* had been abandoned. Kekuaokalani, caretaker of the war god *Kūkaʻilimoku*, was dismayed by his cousin's (Liholiho) actions and revolted against him, but was defeated.

With an indefinite period of free-eating and the lack of the reinstatement of other *kapu* extending from Hawaiʻi to Kauaʻi, and the arrival of the Christian missionaries shortly thereafter, the traditional religion had been officially replaced by Christianity within a year following the death of Kamehameha I. By December of 1819, Kamehameha II had sent edicts throughout the kingdom renouncing the ancient state religion, ordering the destruction of the *heiau* images, and ordering that the *heiau* structures be destroyed or abandoned and left to deteriorate. He did, however, allow the personal family religion, the ʻ*aumakua* worship, to continue (Oliver 1961; Kamakau 1992).

With the end of the *kapu* system, changes in the social and economic patterns began to affect the lives of the common people. Liholiho moved his court to O‘ahu, lessening the burden of resource procurement for the chiefly class on the residents of Hawai‘i Island. Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early Western visitors. Introduced foods often grown for trade included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845).

Kohala 1820-1848: A Land in Transition

In October of 1819, seventeen Protestant missionaries set sail from Boston to Hawai‘i. They arrived in Kailua-Kona on March 30, 1820 to a society with a religious void to fill. Many of the *ali‘i*, who were already exposed to western material culture, welcomed the opportunity to become educated in a western style and adopted their dress and religion. Soon they were rewarding their teachers with land and positions in the Hawaiian government. During this period, the sandalwood trade wrought havoc on the lives of the commoners, as they weakened from the heavy production, exposure, and famine just to fill the coffers of the *ali‘i*, who were no longer under any traditional constraints (Oliver 1961; Kuykendall and Day 1976). The lack of control of the sandalwood trade was to soon lead to the first Hawaiian national debt as promissory notes and levies were initiated by American traders and enforced by American warships (Oliver 1961). The Hawaiian culture was well on its way towards Western assimilation as industry in Hawai‘i went from the sandalwood trade, to a short-lived whaling industry, to the more lucrative, but environmentally destructive sugar industry.

Some of the earliest written descriptions of Kohala come from the accounts of the first Protestant Missionaries to visit the island. In 1823 the Reverend William Ellis wrote regarding the sandalwood trade in Kohala:

> About eleven at night we reached Towaihae [Kawaihae], where we were kindly received by Mr. Young. . . Before daylight on the 22nd, we were roused by vast multitudes of people passing through the district from Waimea with sandal-wood, which had been cut in the adjacent mountains for Karaimoku, by the people of Waimea, and which the people of Kohala, as far as the north point, had been ordered to bring down to his storehouse on the beach, for the purpose of its being shipped to Oahu. There were between two and three thousand men, carrying each from one to six pieces of sandal-wood, according to their size and weight. It was generally tied on their backs by bands of ti leaves, passed over the shoulders and under the arms, and fastened across their breasts. (Ellis 2004:405-406)

Much of the population of South Kohala at this time resided near the shore or in the uplands of Waimea. Lorenzo Lyons, a minister in Waimea, visited the coastal fishing village of Puakō in 1835 (Doyle 1953). A trail from the uplands of Waimea followed the boundary between Waikōloa and Lālāmilo to the shore at Puakō (Lyons 1875). Hawai‘i Registered Map Nos. 574 (prepared by Kaelemakule – no date; see Figure 35) and 1080 (prepared by C. J. Lyons and W.A. Wall in 1885; Figure 37) depict an “old trail” following the boundary between the two *ahupua‘a*, well to the north of the Study Area. The trail passed through barren land, which

> … consists of a gradual descent of about 10 miles to the seaside. It is entirely composed of an uneven rocky waste, covered with long grass. This barren tract is untenanted and uncultivated. Rain seldom falls here and, besides the grass, nothing is seen to vary the monotony until you approach the coast, when the eye is relieved by the yellow blossoms of the Nohu [*Tribulus cistoides*]. (*Sandwich Island Gazette* September 10, 1836)

The population of the district also declined rapidly during this time as native populations were decimated by disease and a depressed birth rate. Epidemics in 1848 and 1849 killed more than 10,000 people in twelve months throughout the Hawaiian Islands (Tomonari-Tuggle 1988). In 1848 in North Kohala, Rev. Bond reported that 100 people had died within a three-week period, and in October of that year he reported that a measles epidemic had nearly every resident of the district in the hospital (Damon 1927). Following these epidemics, the population of the district had been reduced to nearly half of the more than 6,000 people reported in the 1835 census (Schmitt 1977).

By the mid-nineteenth century, leeward settlement shifted to the windward side of Kohala as the leeward, agriculturally marginal areas were abandoned in favor of more productive and wetter sugarcane lands. According to Tomonari-Tuggle (1988), the remnant leeward population nucleated into a few small coastal communities and dispersed upland settlements. These settlements were no longer based on traditional subsistence patterns, largely because of the loss of access to the full range of necessary resources. The wetter windward slopes of North Kohala and the Waimea plain were the focus of the shifting settlement pattern and they eventually became the population centers for the district.

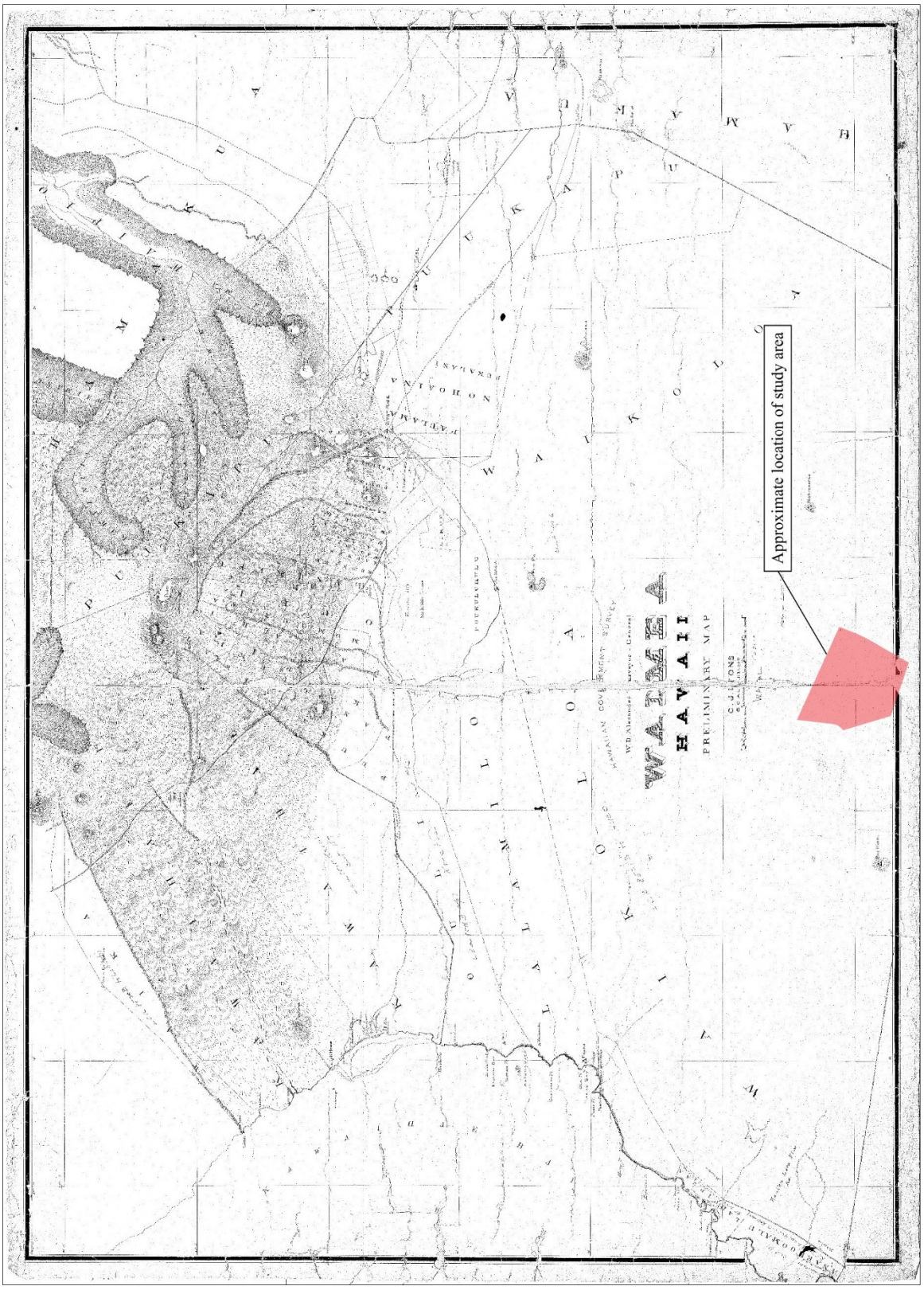

Figure 37. Hawai'i Registered Map No. 1080 showing approximate location of the Study Area (shaded red), prepared by S.C. Wiltse.

The Legacy of the *Māhele ʻĀina* 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 Hawaiʻi: the King, the chiefs and *konohiki*, and their tenants (the *makaʻāinana* or common people). In 1845 the legislature created the "Board of Commissioners to Quiet Land Titles" (more commonly known as the Land Commission. All land claims, whether by chiefs for entire *ahupuaʻa* or by tenants for their house lots and gardens, had to be filed with the Land Commission within two years of the February 14, 1846, but the deadline was extended several times for chiefs and *konohiki* (Soehren 2005)

The King and some 245 chiefs (Kuykendall 1938) spent nearly two years trying unsuccessfully to divide all the lands of Hawaiʻi 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 ʻĀina* (Land Division) was completed in just forty days (on March 7, 1848), and the names of all of the *ahupuaʻa* and *ʻili kūpono* (nearly independent *ʻili* land division within an *ahupuaʻa*, that paid tribute to the ruling chief and not to the chief of the *ahupuaʻa*) 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 Hawaiʻi, 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.

During the *Māhele*, native tenants of the lands that were divided up among the Crown, *Konohiki*, and Government could claim, 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). T

As a result of the *Māhele,* Waikōloa Nui (originally an *ʻili* of Waimea *kalana*) was awarded to George Davis Hūʻeu as an *ahupuaʻa* based on Kamehameha I's gift of the land to Hūʻeu's father Isaac Davis. This award (LCAw. 8521-B:1) did not include the coastal areas of ʻAnaehoʻomalu and Kalāhuipuaʻa, which were retained by the crown. The Davis Hūʻeu award was primarily restricted to the non-agricultural *pili* lands south of the agriculturally-productive Lālāmilo area and *mauka* of the rich coastal resource area. There were nine small residential *kuleana* awarded in the uplands of Waikōloa near the town of Waimea (Maly 1999), however no *kuleana* were awarded within or near the Study Area.

Boundary Commission Testimony for Waikōloa Nui

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawai‘i 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*. Or 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 small-scale surveys aided in establishing the boundaries, they lack the detailed knowledge of the land that is found in the Boundary Commission hearings.

In 1859, Hū‘eu and John Palmer Parker began a dispute over the boundary between Hū‘eu’s *ahupua‘a* of Waikōloa and Parker’s holdings in Pā‘auhau, which included lands in the Hāmākua District located southeast of the subject parcels. The boundary issue was quickly resolved, but the dispute lead Lot Kamehameha, Minister of the Interior, to recommended to W. S. Spencer, Interior Department Clerk, that boundary testimony for all *ahupua‘a* be collected (Maly and Maly 2002). Disputes over the boundaries of Waikōloa and the neighboring Crown lands of Waimea also soon arose. On August 8 and 9, 1865 the boundaries for Waikōloa Nui were brought before the Boundary Commission and certified a day later on August 10, 1865. Several individuals knowledgeable about the boundaries testified at the hearing (Boundary Commission, Volume A, No. 1 pp. 6-12). The Study Area is located well within the boundaries described in the testimonies.

Numerous localities in Waikōloa in the general vicinity of the Study Area are mentioned in the testimonies, including several named caves (Hānaiali‘i, Kapukaiki, Wawaekea), resting places (He‘ewai Gulch, Kikiha, Palioka‘aka‘a), a burial ground (Kanakaola), sacrificial grounds (Huikaula), roads (Kiikii, Liuliu, Palioka‘aka‘a, Puuokowai), and prominent gulches (He‘ewai, Palihai, Poopoo, Waiki‘i). While the lands of Waikōloa are generally known for being covered in *pili* grass, several of the testimonies reveal that they traveled over the country in search of sandalwood, perhaps in the more *mauka* areas of Waikōloa. Additionally, several testimonies indicate the presence of an area two informants refer to as within “Kapanaolona” near Pu‘u Hīna‘i (slightly to the southwest of the Study Area) as being cultivated in *‘uala*, pumpkins, melons, and gourds.

RANCHING AND OTHER HISTORIC INDUSTRIES IN THE WAIKŌLOA AREA

By the mid-1860s the Waimea Grazing and Agricultural Company (WGAC), founded by Robert C. Janion and William H. Green in 1861, and joined by F. Spencer and Company soon thereafter, had acquired considerable strategic assets around Waimea in an attempt to monopolize the livestock industry in the region (Bergin 2004). From the outset, Spencer, Janion, and Green maintained an adversarial relationship with Parker Ranch, and land disputes and allegations cattle rustling were common occurrences between these two competing entities. During the early 1860s Parker successfully thwarted Janion’s men from harvesting unbranded cattle on his lands, but attacks by Frank Spencer contesting Parker’s claim to more than 17,800 acres in other parts of the island more difficult to resolve, and were still ongoing when John Palmer Parker, the founder of Parker Ranch, died on August 20, 1868 (Bergin 2004). At the time Parker Ranch controlled about 47,000 acres of land in the region. The ranch lands were divided evenly between John Parker II and his adopted son and nephew, Sam Parker Sr. (Bergin 2004).

On July 2nd, 1868, G. D. Hū‘eu leased his remaining lands in Waikōloa Nui to the WGAC for a twenty year period (Maly and Maly 2002). With the acquisition of this land, the WGAC became the largest ranching operation on the island. Under the terms of the lease the Hū‘eu family was allowed to continue grazing their 1,000 head of cattle, 1,000 head of sheep, and 100 horses on the Waikōloa lands (Escott 2008).

Despite the growth of the ranching industry, Lorenzo Lyons estimated that by 1867 the population of Waimea was only four hundred people; during the 1870s the town of Waimea contained five stores and a hotel (Doyle 1953). An 1877 *Report of the Royal Commissioners on Development of Resources* documents the effects of cattle ranching on the environment of the Kohala-Waimea region, and the resultant outmigration of the native population during this period:

> The forests on the Kohala mountains are dying rapidly. The land is mostly for grazing purposes, though on the mountain potatoes of fine quality can be raised in large quantities. In sheltered places, coffee would doubtless grow, but owning to the sparseness of the population and the superior attractions to other parts of the district, this part will hardly soon be settled. The once fertile and populous plain of Waimea looked sterile and desolate when visited by the Commission - a painful contrast to Kohala loko on the other side of the mountain.
>
> The complaint of the people is well founded. The water they use is fouled in many places by cattle, horses and other animals, and as the stream is sluggish it has no chance to free itself of impurities, and the water used by the people in their houses must be a cause of disease and death, especially to the children . . . It is little wonder that with his crops trodden out by the sheep or cattle of his stronger neighbors, his family sickened perhaps to death by the polluted waters, that the small holder should yield to despair, and abandoning his homestead seek employment in some other district, usually without making another home . . .
>
> The plains of Pukapu [Puʻukapu] and Waimea·are subject to high winds, aggravated by the loss of the sheltering forests of former days. The soil however is very good in many places for sugar cane and other products. To develop its best resources, efforts must be made to restore the forests and husband the supply of water at their sources to furnish a supply for agricultural purposes. At present the lands are used almost exclusively for grazing purposes. Although the proprietors and lessors are probably not averse to the establishment of agricultural enterprises, it is to be feared that the denudation of the neighboring mountains and plains of the forests will render the climatic conditions unfavorable to success.
>
> It would seem that a wise appreciation of the best interests of this district, even of the grazing interests themselves, would lead to the decrease of the immense herds which threaten not only Waimea but even Hamakua with almost irreparable disaster. It is to be feared that they will in time render a large part of the land of little value even for grazing purposes. Owing to the increasing frequency and severity of droughts and consequent failure of springs. Some thousands of cattle are said to have died this last winter from want of water, and the works erected in Waimea for the purpose of trying out cattle have been idle for months for want of water.
>
> The commission do not propose here to discuss fully the vexed Questions of the causes of the diminution of the forests, but in view of the fact that they are diminishing and the streams and springs diminishing a corresponding rations, also that with the cattle running upon the lands as at present, any effort to restore them must be futile and any hopes of their recuperation vain, the Government, if it would wish to preserve that part of the island of Hawaii from serious injury, must take some steps for reclaiming the forests.
>
> In this connection we would say that it is unfortunate that large tracts of Crown and Government lands have been lately leased on long terms for grazing purposes, without conditions as to their protection from permanent injury, at rates much lower than their value even as preserves for Government purposes or public protection. The commission deem (sic) this a matter of grave importance, challenging the earnest attention of the Government, and involving the prosperity of two important districts (in Maly and Maly 2002:58-59).

By the late-1870s, largely due to persistent drought conditions within its grazing lands, the Waimea Grazing and Agricultural Company went out of business, and its herd was purchased by Parker Ranch (Parker Ranch would also eventually acquire the lease of Waikōloa Ahupuaʻa; Bergin 2004). Francis Spencer formed Puʻuloa Sheep and Stock Company, and continued to raise sheep in Waikōloa and neighboring lands. In October of 1876 Spencer sold his interest in the sheep ranch to George W. Macfarlane; included in this transaction were the Waikoloa Nui lands lease from G. D. Hūʻeu (Maly and Maly 2002). George Bowser, the editor of *The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide*, visited Waimea in 1880 and stayed at Spencer's house. Browser writes:

> . . . Waimea has always been a place of some considerable importance, and there are around it several pretty homesteads, notably the residences of Mr. F. Spencer and the Reverend Lyons. From Mr. Spencer's veranda there is a striking view of Maunakea, the summit of which was at this time of the year still in its winter robe of snow. The snow never leaves this mountain top entirely, but the position of the snow-line varies considerably with the season of the year, and also from one year to

> another, according to the weather which characterizes them. The country all round is chiefly suitable for grazing, and, besides innumerable wild cattle, descended, no doubt, from those which Vancouver gave to Kamehameha I, there are some 20,000 head depastured in the neighborhood, the property of Mr. Parker, who has, besides, some large droves of horses, probably numbering a thousand head in all. Mr. Spencer has turned his attention chiefly to sheep farming, and occupies a large tract of country with his flock of 15,000 sheep and 15,000 goats. Waimea itself, although of immemorial age, and once populous, is now only a scattered village, with but two stores and a boarding and lodging house and coffee saloon. (Bowser 1880:540)

Parker Ranch continued to expand their operations in the Waimea area throughout the 1870s and 1880s. The ranch eventually acquired the lease to roughly 95,000 acres in Waikōloa still held by G.D. Hū‘eu that had formerly been leased to the Waimea Agricultural and Grazing Company. By the mid-1880s Sam Parker’s poor business dealings had led to a rapidly degenerating financial situation for Parker Ranch, and in 1887 the entire ranching operation was entrusted to Charles R. Bishop and Co. for a fee of $200,000 (Bergin 2004). With the move to trusteeship new managers were brought in to oversee the day to day operations at the ranch.

By the early 1900s, Parker Ranch was under the direction of Alfred W. Carter, chosen as the guardian and trustee for Thelma Parker, John Parker III’s daughter, upon his death at the age of nineteen. Early on in his tenure as ranch manager, Carter concentrated on acquiring and converting more of the ranch’s lands from lease to fee. In 1903, with only a short period left on its lease, Carter acquired nine-tenths interest in the Waikōloa Nui lands from Ms. Lucy Peabody for $112,000, securing important grazing lands for the ranch (Bergin 2004). Soon thereafter, Carter purchased the adjacent lands of ‘Ōuli and the Pu‘uloa Sheep and Stock Company, encompassing over 3,700 acres and including the Ke‘āmuku Sheep station in Waikōloa, which he converted to cattle ranching over the next decade. Much of these grazed lands were divided into paddocks, and transportation and water conveyance infrastructure projects were undertaken to increase the productivity of the Waikōloa rangelands. In 1906, on behalf of Thelma Parker, Carter bought out Sam Parker’s half-interest in Parker Ranch for a sum of $600,000. Other important purchases made by Carter during the first dozen or so years of his trusteeship included Humu‘ula, Ka‘ohe, Waipunalei, and Kahuku Ranch (Bergin 2004). During his time as ranch manager, Alfred W. Carter obtained water rights at the headwaters in the Kohala watershed, which he used to create a large high-pressure water pipe that brought water up to nearby Waiki‘i (which had no consistent water source). This water line ran from the head waters in the Kohala Mountains down through the current day Waimea Town. From the town, the pipeline expanded into a network of pipes that continued across the Waimea-Waikōloa plains, through the Study Area, and on to Waiki‘i. This system was quite controversial on the ranch and contributed to the on-going conflict between Carter and Sam Parker, Jr. (Bergin 2004). After Carter’s initial pipeline proved successful, however, other pipes and pump stations were added to this water conveyance system.

The expansion of Parker Ranch’s land- and lease holdings throughout the late nineteenth and early twentieth centuries allowed the ranch to raise cattle and sheep in paddocks around the island. Once ready for the market, these animals would be brought back to Waimea for sorting before being driven down to Kawaihae to be shipped. During these drives the cowboys followed a well-used network of trails that connected the distant stations at Waiki‘i, Kalai‘ehā, and Ke‘āmuku with the town of Waimea and shipping harbors on the Kohala coast (Maly and Maly 2002). One segment of this network, the -Ke‘āmuku trail, is located in close proximity to the Study Area.

The earliest published depiction of a trail through Waikōloa from Waimea Town was published in the *Pacific Commercial Advertiser* on February 17, 1859 (Figure 38). The route appears as a dashed line between Waimea and the saddle between Mauna Kea and Mauna Loa. The scale of the map, which was drawn to show the progress of the lava flow from the Mauna Loa eruption, does not allow for any detailed information about the route. The general route indicated in the 1859 map proceeds in a southerly direction from Waimea, across Waikōloa, and around Mauna Kea into the saddle. While the position of the trail is shown in very general terms, the basic route across Waikōloa appears to have persisted at least until the turn of the 20th century, when the Waimea-Kona highway redirected traffic across the Waikōloa plain.

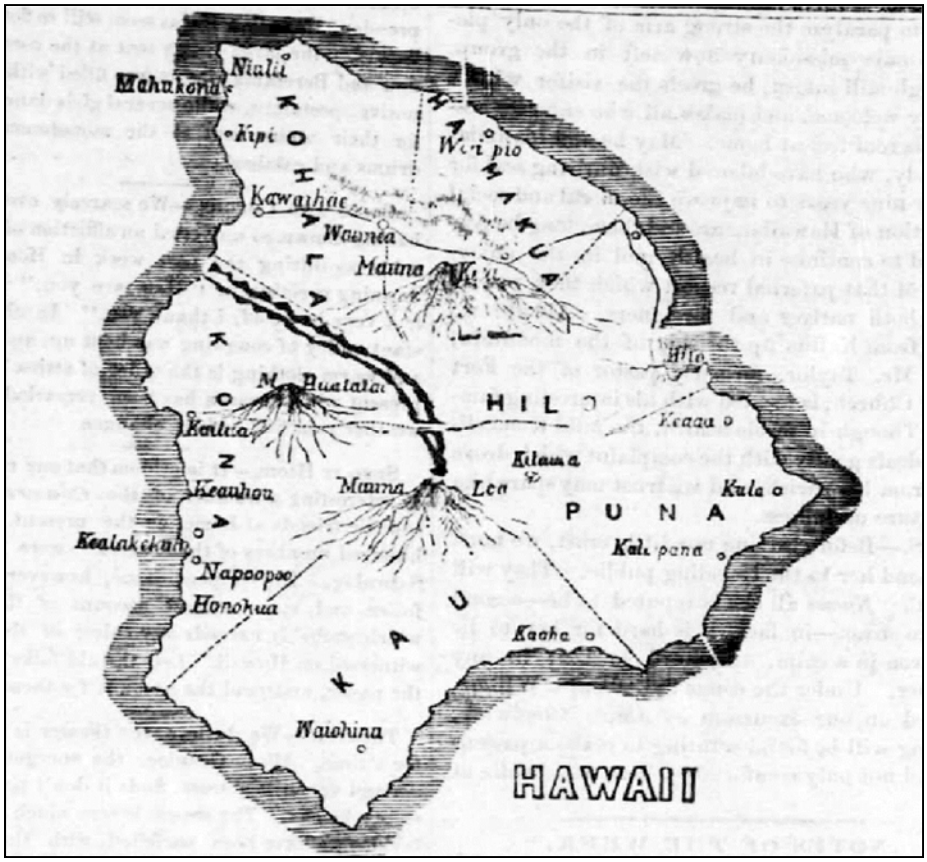

Figure 38. Map of Hawai'i Island published in the *Pacific Commercial* Advertiser on February17, 1859, showing a trail across Waikōloa connecting Waimea and Hilo.

Three years after the 1859 map was published, surveying work began on a "Mountain Road" between Waimea and Hilo that crossed through Waikōloa. S. C. Wiltse was contracted to survey a route that would connect Waimea with Hilo *via* Waiki'i and Kalai'ehā (Maly and Maly 2003:118). The map produced by Wiltse during his survey was submitted in a draft form (S.C. Wiltse to F. W. Hutchinson, August 2, 1869, reproduced in Maly and Maly 2002:120) and this draft became Registered Map 528 (Figure 39). Although Wiltse's map shows the landmarks used to triangulate his route (and therefore the route itself), it cannot be used to determine precisely whether the proposed route passed through the Study Area. The map does, however, show the position of the route relative to specific landmarks, and passes *makai* of Pu'u Heihei before it reaches Pu'u Papapa. This characteristic of Wiltse's route differs from later depictions of the Waimea-Ke'āmuku Trail.

During the period between Wiltse's contract for the Mountain Road and the completion of his map, the Waimea Grazing and Agricultural Company (WGAC) had begun to expand into Waikōloa by leasing G.D. Hū'eu's lands for cattle grazing. The trails connecting the WGAC's and other ranching stations appear in maps drawn by J. Perryman in J.S. Emerson's Field Note Books from 1882 (Book 251:109, reproduced in Maly and Maly 2003:102). As seen from the top of Ahumoa *pu'u* (Figure 40), the route surveyed by Wiltse appears more or less as it is suggested on Registered Map 528, but with one critical difference. In the lower right quadrant of the map, a trail leading from Waimea passes *mauka* of a small unnamed *pu'u* (probably Pu'u Heihei) and Pu'u Nohonanae. At Nohonanae, the trail forks into *mauka* and *makai* branches. The *mauka* branch follows the base of Mauna Kea toward Waiki'i Gulch and Kalai'ehā. The *makai* branch of the trail leaves Nohonanae, passes *makai* of Pu'u Papapa, passes east of the Study Area (in an area labeled "Grazing Land") eventually terminating at Ke'āmuku.

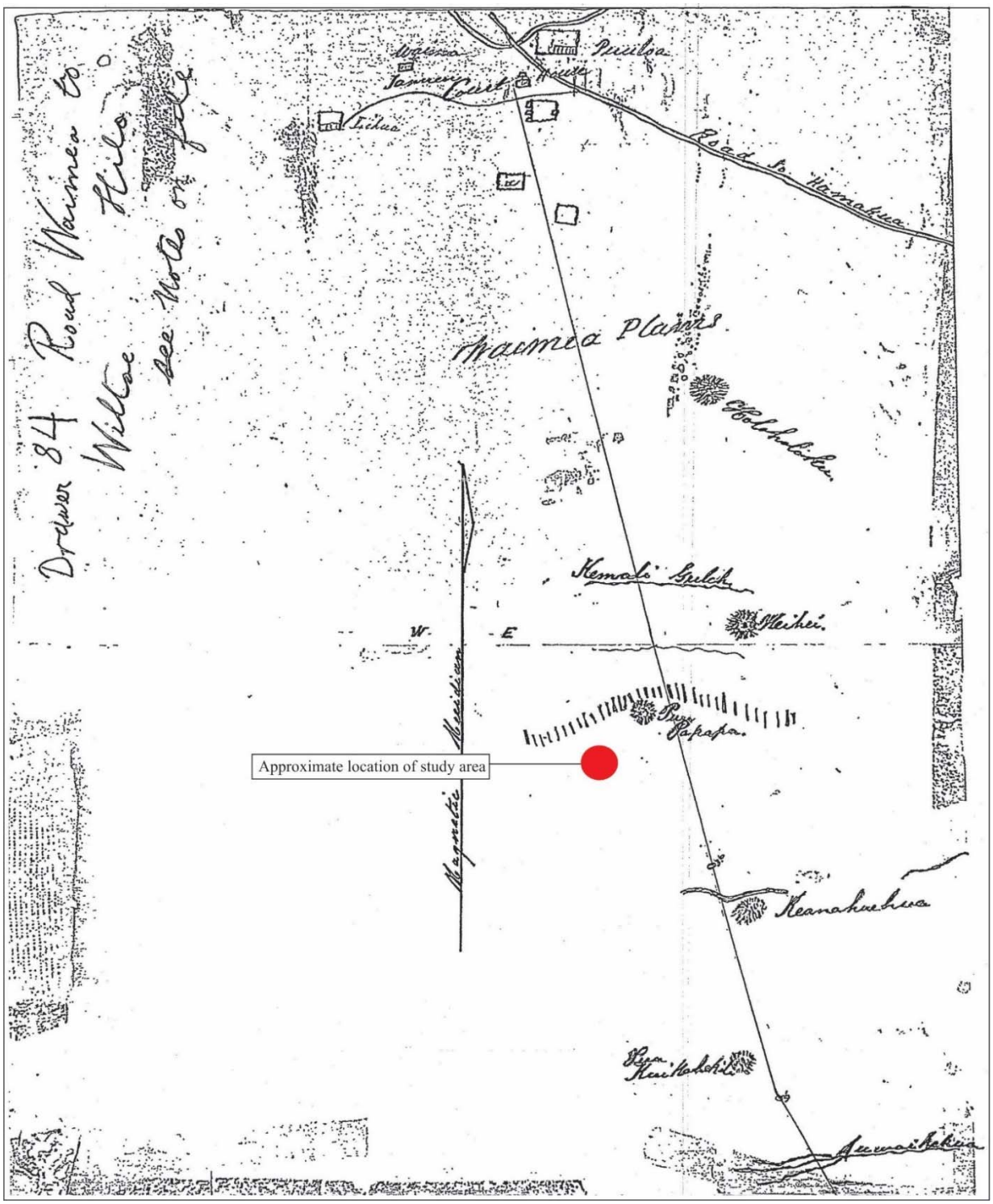

Figure 39. Detail of Registered Map 528 showing a portion S.C. Wiltse's of surveyed route from Waimea to Hilo passing *makai* of Pu'u Papapa.

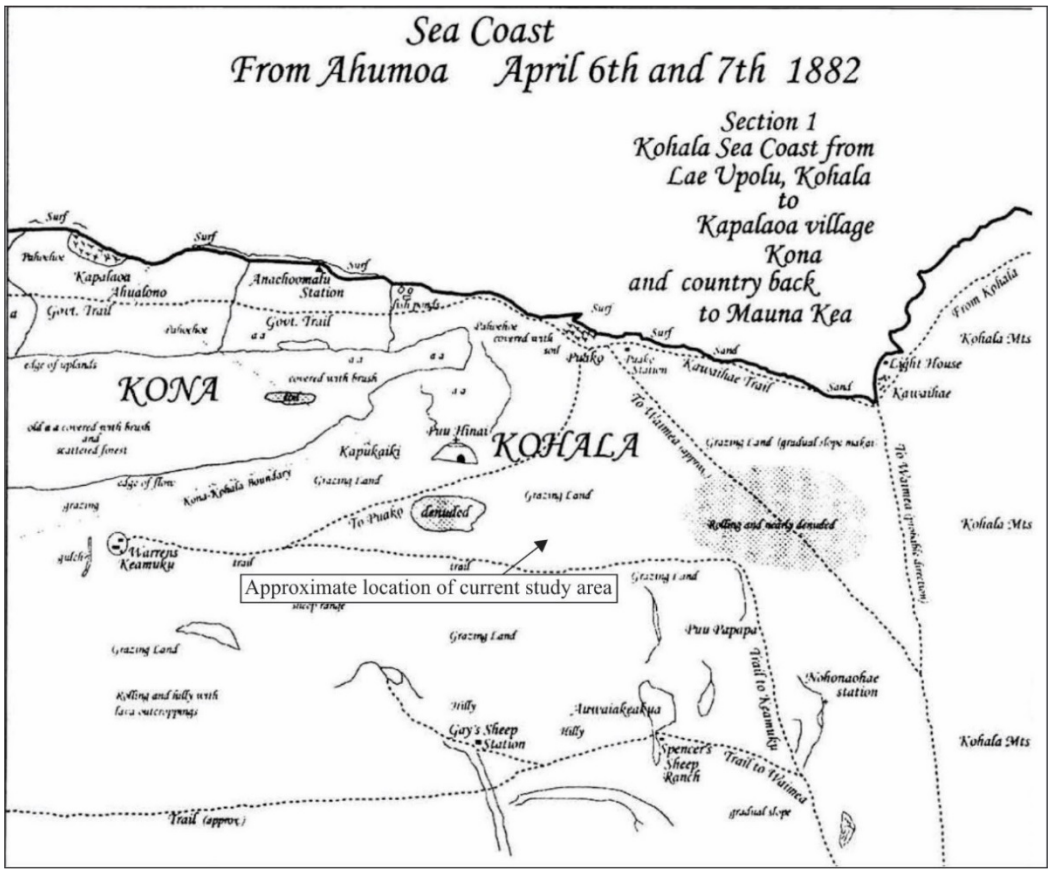

Figure 40. Portion of a sketch map of the sea coast viewed from Ahumoa (Emerson's Sketch Book No. 259:109).

The trail network from Waimea through Waikōloa in the general vicinity of the Study Area is more precisely depicted on Hawai'i Registered Map No. 2786 completed in 1917 by G.F. Wright for the Parker Ranch (see Figure 50). The transportation infrastructure shown on the maps include several recently completed roads and trails. The trail from Waimea towards Waikōloa appears to follow a similar route as the one shown in Perryman's map, and passes east of Pu'u Nohonaohae and Pu'u Papapa (and thus east of the Study Area). Later maps and aerial imagery document the changes in the use of the route from Waimea to the Waikōloa stations, particularly the Waimea-Ke'āmuku trail. A 1926 Territory of Hawai'i Survey map (Figure 41) shows the Waimea-Ke'āmuku trail passing near Nohonaohae and following the pipeline south, essentially as it appears on Registered Map 2786. Several of Maly and Maly's (2003) interviewees stated that this trail was used during the 20th century to move livestock from Waiki'i to Waimea. However, to the north of Nohonaohae, a trail labeled "Keamuku Trail" extends southwest along the eastern edge of the *pu'u* from "Waiki Road", and curves around the *makai* side of Pu'u Papapa to the east of the Study Area (see Figure 41). According to several *paniolo* who worked in Waikōloa, Parker Ranch's Waimea-Ke'āmuku trail followed the pipeline south from Nohonaohae into the ranch station (Maly and Maly 2003).

Another segment of this ranching transportation network, the Puakō-Ke'āmuku trail, appears to not have crossed the Study Area either, but rather extended south of it. The Puakō-Ke'āmuku trail departs from "Warren's Keamuku," which is located near the left-hand edge of Perryman's sketch (see Figure 40). The trail proceeds northerly, then diverges from the Waimea-Ke'āmuku Trail that passes east of the Study Area leading to Waimea. As it travels *makai*, the Puakō-Ke'āmuku trail is shown passing around the northern side of Pu'u Hīna'i, and then curves westerly toward Puakō. Almost no other details are provided about the terrain or conditions along this trail. Route changes to the trail are documented in more recent maps and aerial images and consist primarily of the addition of new road segments. The 1928 USGS Puako Quadrangle map (Figure 42) depicts the Puakō-Ke'āmuku trail beginning at a road (the former sugar mill railroad) near Puakō Harbor and ascending toward Pu'u Hīna'i, passing along its western side and continuing *mauka* until it intersects with the upper road (present-day Highway 190). The route of the trail appears to have then followed the upper road to an unpaved road leading to the Ke'āmuku Station. By the 1950s, portions of the trail mapped in 1928 took on the form of unimproved dirt roads, a result of increased motor vehicles and the use of the Waikōloa area for military training during World War II.

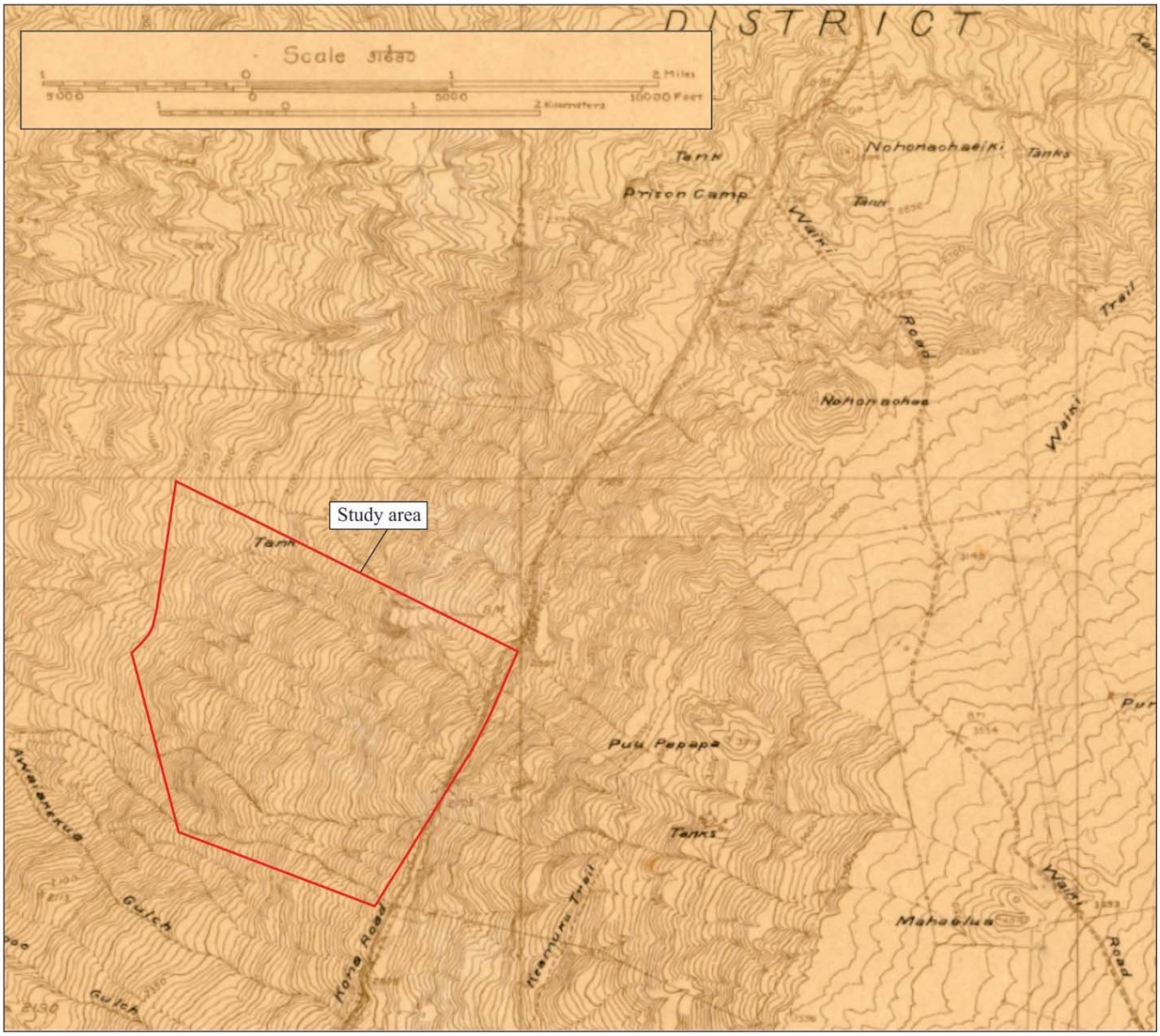

Figure 41. 1926 Territory of Hawai‘i Survey map showing the “Keamuku Trail” (Waimea-Ke‘āmuku Trail]) crossing directly east of the Study Area (outlined in red).

Parker Ranch’s program of paddock and water improvements that were developed in the early part of the twentieth century prompted the creation of Hawai‘i Registered Map No. 2786 in 1917 by G.F. Wright (see Figure 50). The transportation infrastructure shown includes several recently completed roads and trails, but, unlike other trails used by Parker Ranch during the early at the time, the Puakō-Ke‘āmuku Trail does not appear on this map. However, ranching infrastructure appears including a branch from Parker Ranch’s water pipeline network that extends into “Puu Hinai” paddock, and thus into the Study Area. The pipeline route extends southeast to northwest until reaching a water tank in the northwestern portion of the Study Area (Site 30923), then continues southwest outside of the Study Area where it terminates at another water tank situated near the confluence of a light duty (unimproved) road and an unimproved dirt road, both of which are partially situated within the Study Area (Figure 43). Additionally, a fenceline is depicted extending adjacent to the southern boundary of the Study Area south of the light duty road. Aerial photography from 1954 (Figure 44) clearly shows both the light duty and unimproved roads and the water tank within the Study Area, however it does not clearly depict the pipeline or the fenceline. It appears that somewhere between 1956 and 1982 the pipeline fell into disuse and is no longer pictured on any subsequent topographic maps of the area (Figure 45).

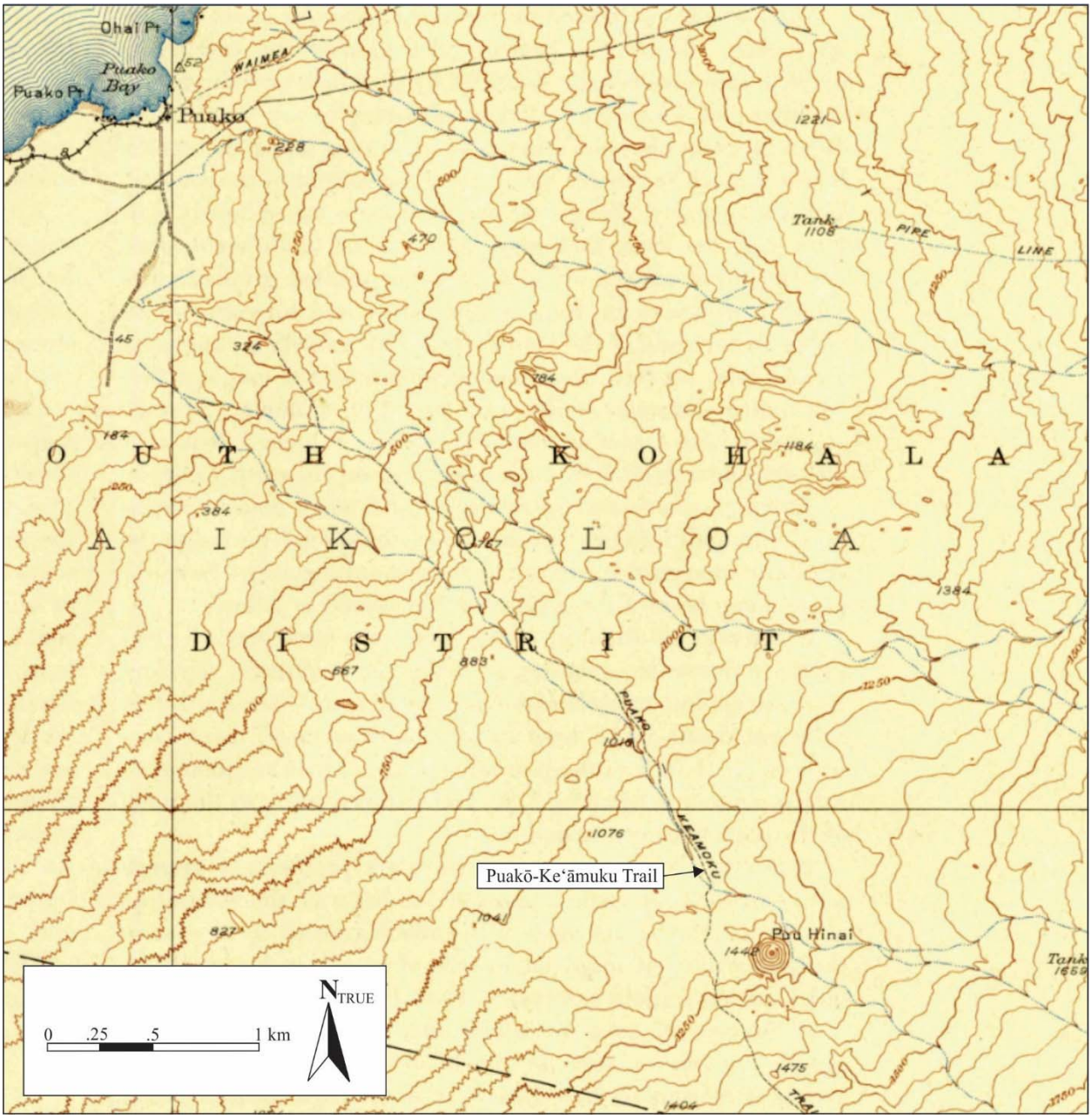

Figure 42. Portion of 1928 Puako USGS quadrangle map depicting the Puakō-Ke'āmuku Trail passing on the southern side of Pu'u Hīna'i.

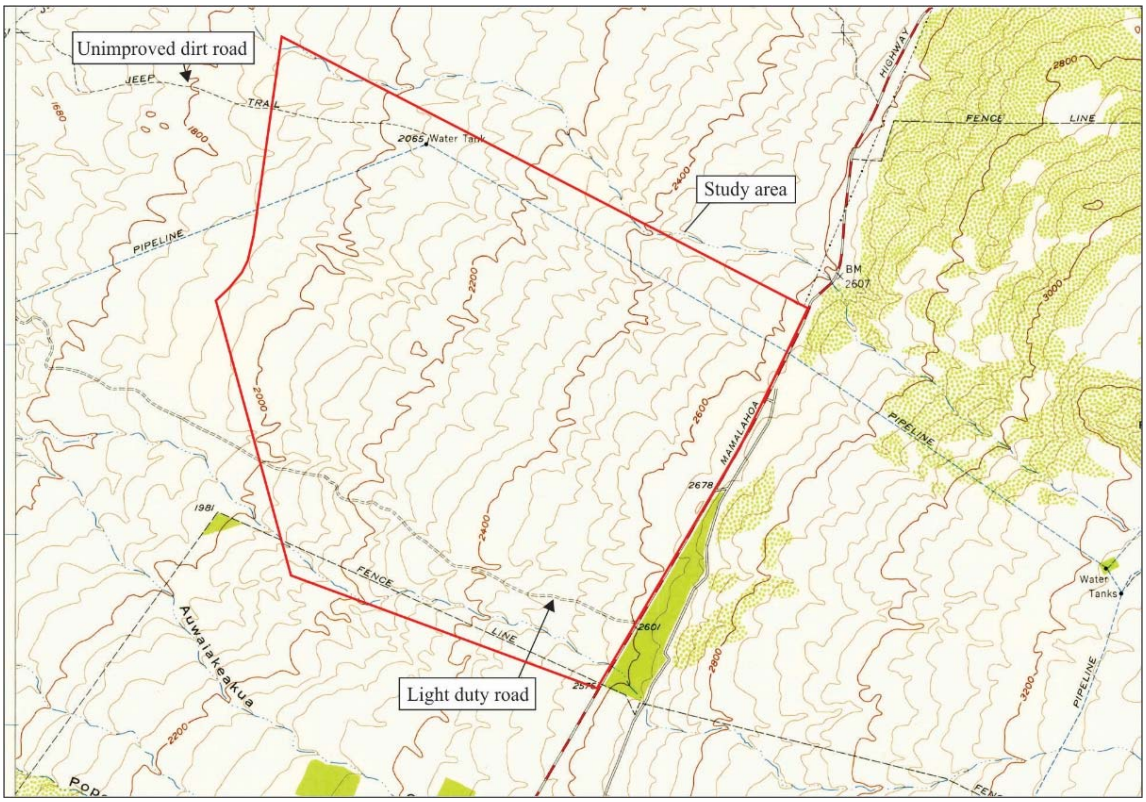

Figure 43. Portion of 1956 Nohonaohae USGS quadrangle map showing pipeline route and roads within the current Study Area (outlined in red.)

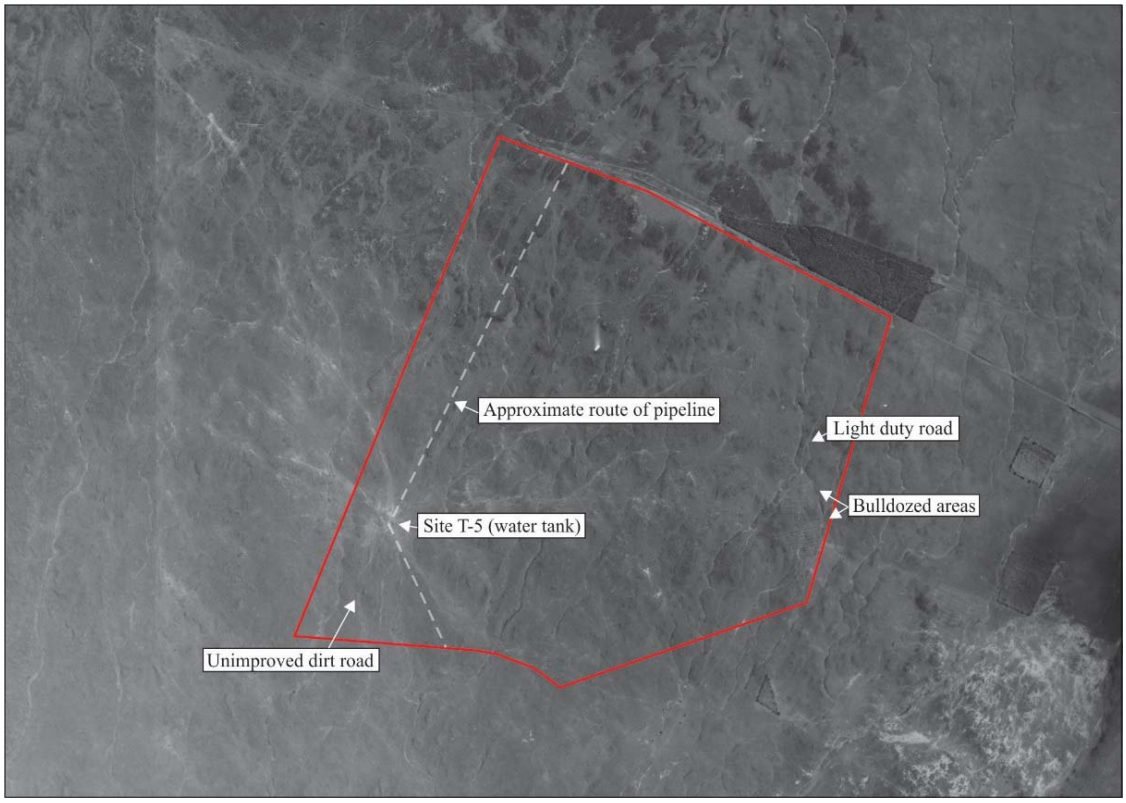

Figure 44. October 14, 1954 USGS aerial photograph of the Study Area (outlined in red).

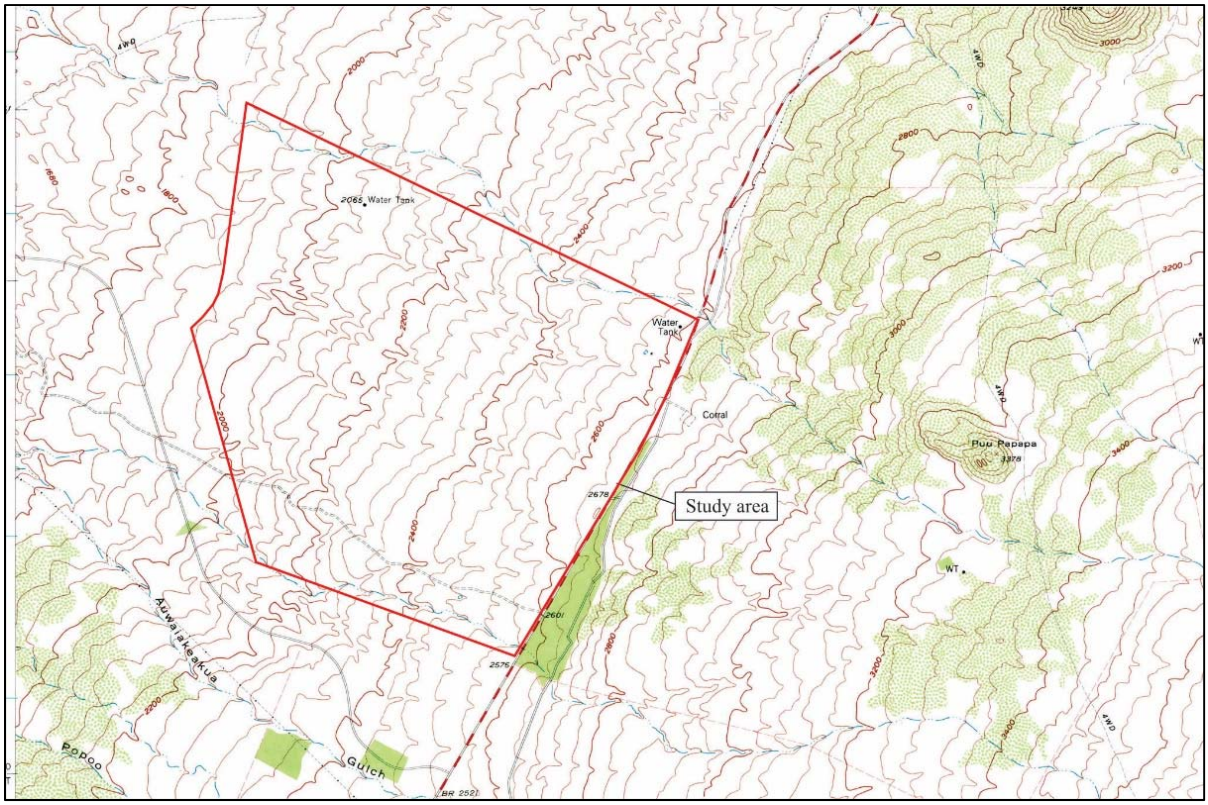

Figure 45. Portion of 1982 Nohonaohae USGS quadrangle map showing absence of pipeline within the Study Area (outlined in red.)

Substantial changes to the area surrounding the study parcels began in the first quarter of the twentieth century with the development of the Old Waimea-Kona Belt Road, which was constructed between 1916 and 1922 and served as the main Kona-Waimea connector for 11 years (Escott 2009). Due to the tough road conditions on the driver and automobile, the use of the Old Waimea-Kona Belt Road was short lived, and the Government decided to begin construction on a wider, more improved road. The new belt road (Highway 190) was finished in 1933 and extends along the eastern boundary of the Study Area. A description of the new belt road is provided in an article in the July 1933 edition of *The Friend* newspaper, below is an excerpt from the article about the road finishing ceremony:

> "The formal opening of the new belt road on the island of Hawaii, July 22, 1933, was an important occasion, attended by the Governor and his party from Honolulu and many excursionists.
>
> The proposal has been made that the new road be named "Mamalahoe," commemorating the famous edict by King Kamehameha I, "the Law of the Splintered Paddle" making Hawaii's highways safe for the traveler.
>
> A colorful celebration on Saturday was followed by a unique service of worship in the historic Kailua Church the following day. A sermon by the Rev H. P. Judd, broadcast by radio throughout the islands, was a feature of this service. . ." (*The Friend* Vol. CIII, No. 7, July 1933:147)

The construction of a main thoroughfare connecting Waimea to Kona was not only beneficial for mere transportation purposes, but also facilitated urbanization in Waikōloa. In 1969, just a year before major development activities began across Waikōloa Road which resulted in the creation of a resort and residential subdivision, approximately 8,309 acres of land situated on the west side of Highway 190 was subdivided into ten lots ranging in size from 350 to over 1,300 acres by the Boise Cascade Home and Land Corp. Trust for the proposed Waikoloa Ranch Lots subdivision (Figure 46). The Study Area is identified as Lots 7 and 8 of this subdivision, which was originally slated for agricultural land use and construction of a single-family dwelling and additional farm building development (FHWA 2017). Despite the formal subdivision of these lands, the entirety of the Waikoloa Ranch Lots subdivision has remained undeveloped.

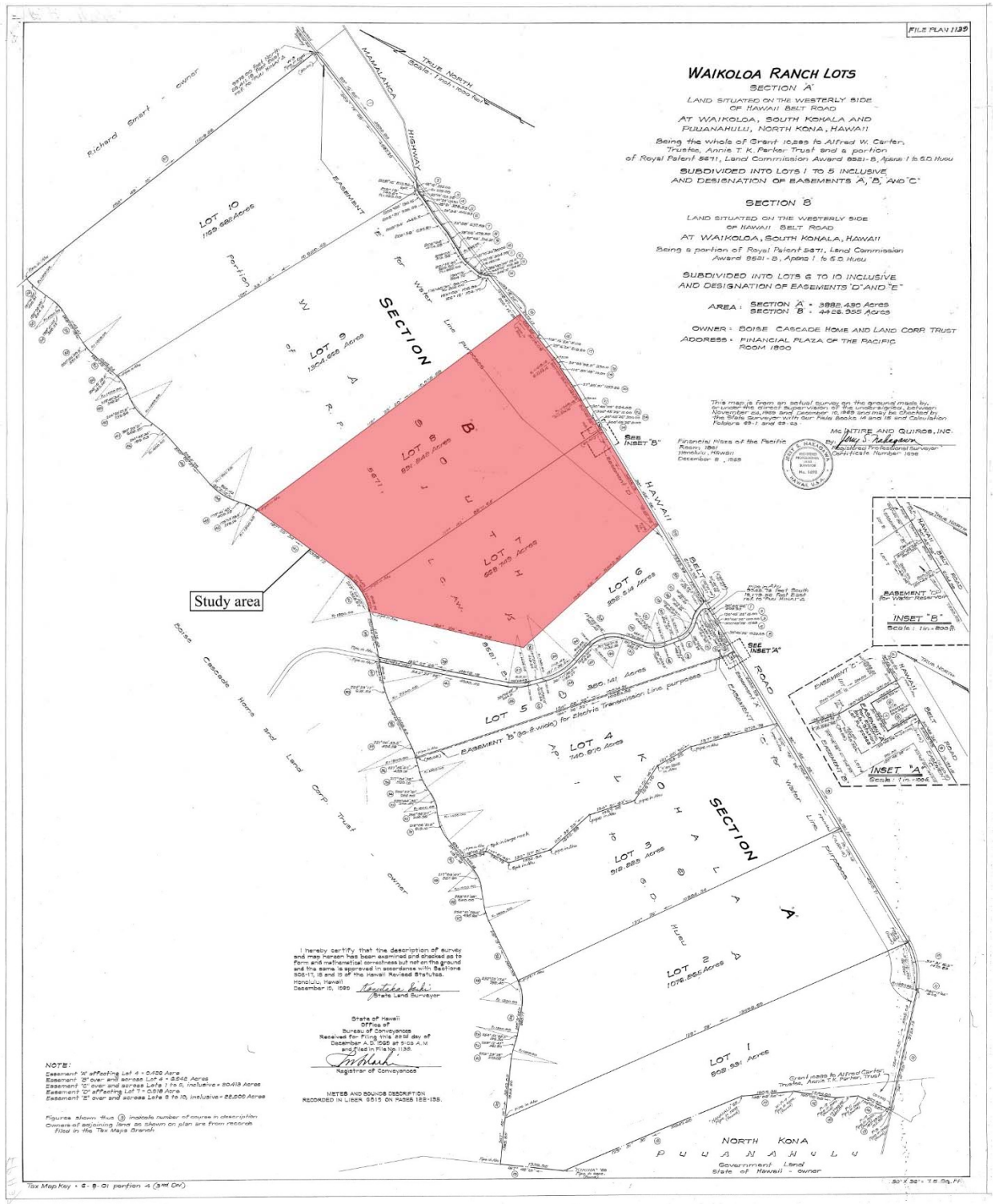

Figure 46. File Plan 1139 dated December 22, 1969 showing the "Waikoloa Ranch Lots" subdivision.

PREVIOUS ARCHAEOLOGICAL STUDIES

Archaeological studies in Waikōloa and the neighboring *ahupua'a* of Lālāmilo have largely concentrated on the coastal areas in the vicinity of the large resort developments *makai* of Queen Ka'ahumanu Highway. Collectively, the archaeological investigations conducted in the coastal areas (Ching 1971; Kirch 1979; Rosendahl 1972, 2000) have identified a wide range of Precontact and Historic archaeological site types including caves (lava tubes), petroglyphs, cairns, trails, rock and cave shelters, refuge caves, burials, a *hōlua* slide, and a large number of features associated with both temporary and permanent habitation such as house platforms, overhangs, terraces, modified outcrops, paved areas, U-shape enclosures, sinkholes, walls, and rubble excavation areas. Coastal and inland (*mauka*/*makai*) trail networks have also been documented throughout the South Kohala District. These trails were used for coastal travel between *ahupua'a* and for resource exchange between the coastal areas and the upland agricultural fields.

Fewer studies have been conducted *mauka* of Queen Ka'ahumanu Highway in the arid, intermediate inland area in which the Study Area is situated, and none are known to have been conducted within the Study Area. The studies near the highway that have been conducted and near present-day Waikōloa Village have generally included large land areas but have documented none or few archaeological sites. The most common feature types recorded *mauka* of the highway have been C-shaped shelters and cairns, along with Historic military and ranching features. The findings of the previous studies agree that the dry, intermediate inland areas of Waikōloa Ahupua'a were not extensively utilized during Precontact times, but were an area where small scale resource procurement was conducted on a limited basis. ten of the most proximate and relevant archaeological studies conducted within the intermediate *pili* lands of Waikōloa near the Study Area that have identified findings are discussed in detail below, and their locations are shown in Figure 47.

Table 1. Previous archaeological studies conducted in the vicinity of the Study Area.

Year	*Author(s)*	*Type of Study*
1972	Bevacqua	Reconnaissance
1987	Kennedy	Reconnaissance
1988	Bonk	Reconnaissance
1990	Jensen	Inventory Survey
1991	Jensen and Burgett	Inventory Survey
1992a, b	Rosendahl	Inventory Survey and Research
2002	Moore et al.	Inventory Survey
2003	Rechtman	Assessment
2004	Roberts et al.	Archaeological Investigation
2004	Sinoto and Dashiell	Inventory Survey Addendum
2005	Clark and Rechtman	Inventory Survey
2005	Rechtman	Inventory Survey
2006	Rechtman	Field Inspection
2006	Hammatt and Shideler	Field Check and Literature Review
2007	Hammatt and Shideler	Addendum Inventory Survey
2007	Rechtman	Inventory Survey
2008	Corbin	Inventory Survey
2008a	Rechtman	Field Inspection
2008b	Rechtman	Field Inspection
2010	Haun et al.	Assessment
2011	Clark et al.	Inventory Survey
2014	Clark et al.	Inventory Survey

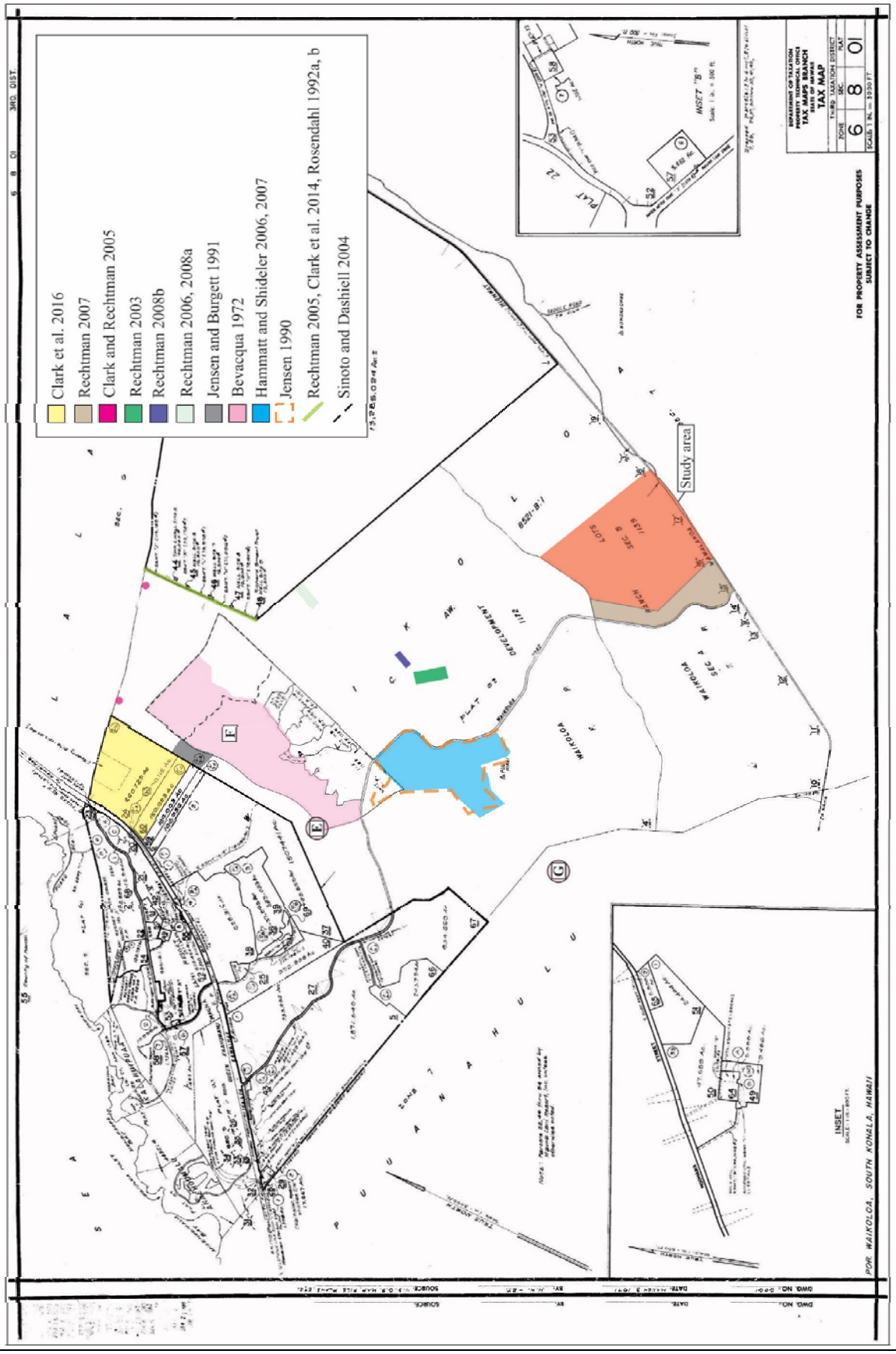

Figure 48. Previous archaeological studies in the vicinity of the Study Area.

The B. P. Bishop Museum conducted an archaeological study (Bevacqua 1972) of portions of Waikōloa Ahupua'a in order to determine the nature and distributions of archaeological sites within areas that were slated for development at that time. Seven large areas dispersed throughout the *ahupua'a* were examined (Areas A-G), the most proximate being Areas E, F, and G, all located to the west/southwest of the Study Area (see Figure 47).

An inspection of the roughly 100 by 150-meter area identified as Survey Area E located to the west of the Study Area (see Figure 47) resulted in no findings. Bevacqua (1972) indicated that the majority of the survey area exhibited signs of bulldozer disturbance, however, undisturbed pockets of land were investigated but no sites were identified. As such, no further work was the recommended treatment for this survey area. Survey Area F is adjacent to Survey Area E to the east and located directly west of the Study Area (see Figure 47). Bevacqua (1972:11) relates that this area is composed of a roughly 1.6 by 5-kilometer area of "rolling hills with occasional gullies and lava outcroppings." There were five sites identified within Survey Area F (Sites 17 through 21):

> **Site 17**—a roughly circular stone enclosure, 2.4 meters in diameter
>
> **Site 18**—a C-shaped shelter measuring 1.5 meters across and 1.2 meters deep, with walls 0.6 meter[s] high and 0.5 meters wide; 10 meters NE of the shelter is a cairn, 0.7 meter[s] high and 1.2 meters in base diameter.
>
> **Site 19**—a cairn, 0.8 meter[s] high and 2.0 meters in base diameter
>
> **Site 20**—a cairn, 0.9 meter[s] high and 1.75 meters in base diameter
>
> **Site 21**—a small, badly deteriorated cluster of four C-shaped shelters, a rectangular enclosure, four walls, and a cairn.

In addition to the five aforementioned sites, Bevacqua (1972:12) also noted the presence of "a large number of modern stone walls used as blinds in the hunting of game birds." All of the recorded sites within Survey Area F were evaluated for their significance and no further work was the recommended treatment. Bevacqua's (1972) study also concentrated on a 300-acre area (Survey Area G) situated to the southwest of the current study parcels (see Figure 47) and is likely coincident with Jensen's (1990) later survey area. As a result of fieldwork, Bevacqua (1972:12) identified a single archaeological site dubbed Site 22, which is described in detail below:

> Survey Area G is situated slightly N of Puu Hinai, a prominent cinder cone in the center of Waikoloa. The exact location and configuration of this 300-acre parcel of land has not yet been determined by the developers; thus the survey encompasses only the approximate area of the parcel.
>
> The terrain consists of gently rolling, grass-covered hills cut by several dry stream beds. The banks of the streambeds are crowded with *kiawe* trees; there are occasional *wiliwili* and castor-bean trees (*Ricinus communis*).
>
> Only one site (22), located on the S bank of a dry stream bed NE of Puu Hinai was found during the survey. This site had been noted previously by William Barrera and others, but had never been formally reported. The vast majority of the site has been completely inundated by stream-deposited soil, approximately 1.3 meters deep, thus making identification and description exceptionally difficult.
>
> Site 22 consists of a complex of walls, portions of which protrude above the flood plain. The dominant feature is a well-built bifaced wall, 45 meters long, running E-W. At the stream bank, the E end of the wall corners and extends N another 7.1 meters; the W end of the main wall corners and extends N 5.5 meters. East of the main wall an 11-meter long, bifaced wall runs N-S and stands clearly above ground surface.

Bevacqua (1972) indicated that Site 22 possessed excavation potential and therefore recommended subsurface testing of the Site and the general area surrounding it.

In 1990, Paul H. Rosendahl, Ph.D., Inc. (PHRI; Jensen 1990) conducted an Archaeological Inventory Survey (AIS) of approximately 600 acres situated to the west of the Study Area and south of Waikōloa Road (see Figure 47). Fieldwork for Jensen's study consisted of an initial reconnaissance by helicopter, followed by a pedestrian survey of twenty percent of the Study Area at interval spacing of forty meters. Bevaqua's (1972) Site 22 was not encountered during Jensen's (1990) fieldwork; however, Jensen did identify a low stone wall segment built of poorly stacked *pāhoehoe* cobbles and boulders located near 'Auwaiakeakua Gulch that was designated with a temporary site number T-1. Jensen evaluated Site T-1 to be historically significant under Criterion d and recommended no further work for the site.

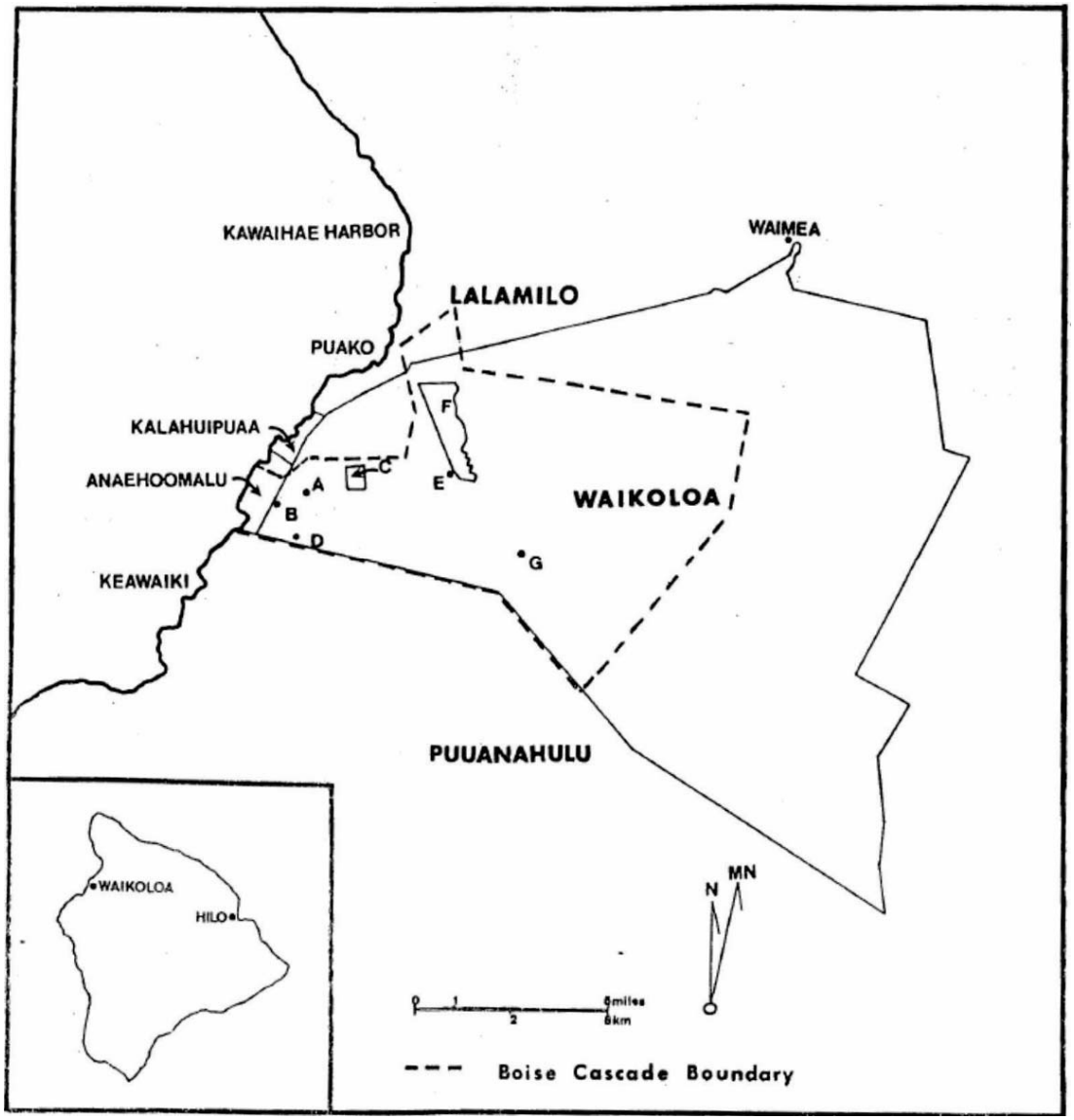

Figure 49. Map showing Survey Areas A through G (Bevacqua 1972:2).

In 1991, PHRI (Jensen and Burgett 1991) conducted an AIS of an approximately 80-acre portion of TMK: (3) 6-8-002:019 located in Waikōloa Ahupua‘a to the northwest of the Study Area (see Figure 47). As a result of the fieldwork, Jensen and Burgett (1991) identified five archaeological sites (State Inventory of Historic Places [SIHP] Sites 15066-15070) containing twenty-two features. The recorded features included three boulder alignments (possible check dams) that span Kamakoa Gulch, terraces on the northwestern bank of Kamakoa Gulch, a wall, and seventeen hunting blinds. Jensen and Burgett (1991) interpret the boulder alignments and terraces within the Kamakoa Gulch drainage channel (Sites 15066, 15067, and 15068) as potential Precontact Period features, suggesting that intermittent water flow within the drainage may have been channeled and stored to provide water for agricultural pursuits along the gulch edges. The low wall (Site 15069), which extended along a meandering course across a flat area between two knolls to the south of Kamakoa Gulch, is described as being similar to the Feature 801 wall excavated previously by Rosendahl (1972) during a different study in the lower portion of Waikōloa Ahupua‘a, and was also interpreted as having a possible agricultural function. The seventeen hunting blinds (Site 15070) consisted of crudely constructed stacked stone structures located within a 150 by 50-meter area to the south of Site 15069. Expended shotgun shells (pre-dating 1965) were found at all of the blinds. The hunting blinds were interpreted as modern features by Jensen and Burgett (1991), who did not consider Site 15070 a historic property requiring further evaluation

Rosendahl (1992a) conducted an AIS of a roughly 2,800-meter-long by 40-meter-wide corridor across a portion of TMK: (3) 6-8-001:001 (see Figure 47). According to Rosendahl (1992a:5), the “area had been extensively disturbed

historically", and as such, no significant cultural resources were identified within the corridor, although he did note the presence of a cattle wall along with "bulldozer berms, and recent trash." Don Hibbard of DLNR-SHPD, cited an earlier correspondence that indicated that the proposed wells were "adjacent to a long historic boundary wall (Site 9012) that divides Waikōloa and has been determined to be significant under criterion 'a' or for its association with events important to broad patterns in Hawaii's history" (Hibbard Letter dated July 1, 1991 on file at SHPD), and did not concur with Rosendahl's findings. In response to the letter, Rosendahl (1992b) conducted additional historical research on the well sites, and as a result construction was allowed to proceed on two of the proposed well (Parker wells No. 1 and 2) and the paved roadway along the *mauka* edge of the Site 9012 wall (Hibbard Letter dated August 26, 1994 on file at SHPD).

In 2005, Rechtman Consulting, LLC (Clark and Rechtman 2005) conducted an AIS of two proposed water tank locations to the northwest of the Study Area in a portion of TMK: (3) 6-8-002:019. As a result of the study, a single archaeological site (Site 24396) consisting of a C-shaped enclosure (Feature A) and small rock pile (Feature B), were identified. A test unit was excavated within Feature A which yielded no cultural material. It was determined that this feature may have functioned as a temporary habitation shelter during Precontact times. Nearby Feature B was interpreted as a cairn that may have been associated with Feature A, but also potentially may have served as an *ahupua'a* boundary or trail marker. Site 24396 were evaluated as significant under Criterion d by Rechtman (2005), and no further work was the recommended treatment for the site.

In 2006, in support of a HRS Chapter 343 environmental impact statement prepared for the Waikōloa Highlands development project, Cultural Surveys Hawai'i, Inc. (Hammatt and Shideler 2006) conducted a review of Jensen's (1990) study and a preliminary evaluation of archaeological potential for a 702.28-acre parcel nearly coterminous with the Jensen (1990) Study Area excepting several areas (see Figure 47). Hammatt and Shideler's (2006:12) field check appears to have been limited to a reconnaissance along the edges of 'Auwaiakeakua Gulch that focused on finding the two sites previously reported in their Study Area:

> The project area was approached from the main Waikoloa Village Road connecting Queen Ka'ahumanu Highway and the upper belt road. It was possible to drive in on an access road supporting the on-going quarry operations at Pu'u Hīna'i. The field inspection began by following 'Auwaiakeakua Gulch from the access road to the base of Pu'u Hīna'i. It was thought that the margins of this gulch were particularly likely locales for archaeological sites including Bevaqua's "Site 22" wall feature. The field crew then ascended to the summit of Pu'u Hīna'i to better view the landscape of the project area in hopes of observing indications of archaeological sites…Then both sides of the margins of 'Awuaiakeakua Gulch were explored to the southeast edge of the present Study Area and some distance beyond in search of the Bevacqua Site 22 or any other archaeological features. No archaeological sites were observed in this initial fieldwork.

Hammatt and Schideler (2006) identified Jensen's (1990) Site T-1, approximately 450 meters northeast of Pu'u Hīna'i. Concurring with Jensen's assessment of the site and evaluated the site as significant under Criterion d for its information content only and recommended a treatment of no further work. Hammatt and Schideler (2006) interpreted Jensen's Site T-1 as a marker for travelers traversing from the 'Auwaiakeakua Gulch to the Waimea area. At the time of the survey, Hammatt and Schideler (2006) were unable to locate Bevacqua's Site 22.

One year later in 2007, Cultural Surveys Hawai'i, Inc. (Hammatt and Shideler 2007) conducted a field inspection of their previous Study Area (see Figure 47) following a wildfire which burned through much of the landscape. During their fieldwork, a site initially identified by Bevacqua within Survey Area G was identified, having been exposed by the fire. This site was not encountered during the Hammatt and Shideler's (2006) previous investigation of the area, and based upon its location north of Pu'u Hīna'i and south of 'Auwaiakeakua Gulch, it was positively identified to be Site 22. The description for Site 22 was updated by Hammatt and Shideler (2007:6-7) as follows:

> The site basically consists of a soil terrace defined by two bi-faced core-filled walls lying at approximately a right angle to each other designated herein as Features A and B. The shorter but more visible north/south trending Feature A wall forms the western edge of a somewhat pentagon-shaped, relatively-level, soil terrace. The longer but partially buried wall designated Feature B forms the north side of the soil terrace. The southwest portion of the soil terrace is formed by a NW to SE trending *pāhoehoe* ridge. The eastern margin of the soil terrace is less well defined by rising bedrock outcrops and a bulldozed jeep road and fence line.
>
> Designated Feature A is an almost exactly 10 m long, 1.57 cm [sic- meter] wide north/south trending wall. The wall is bi-faced, and constructed of 1 to 3 visible courses of boulders and is core filled with somewhat jumbled angular boulders and cobbles but with a relatively level surface. The

> workmanship appears particularly good and the wall appears anomalously wide. The north end of the wall appears to be finished or constructed as an end and is separated by a gap of 1.7 m from a small hillock or pu‘u approximately 2.5 m high and 10 m in diameter. The south end of the wall abuts jumbled bedrock at the northwest end of a linear bedrock ridge or small bluff. Both of the long sides of this Feature A wall have piled up against them a fine silt loam sand slope deposited by wind and water. This effectively makes the wall appear quite low measuring only 30 cm high on the west side and 30 to 50 cm high on the east side. These natural low sand ramps and the low aspect of the wall feature make it difficult to discern even at a distance of 10 m. Undoubtedly the grasses that were clearly thick in the vicinity before the recent range fire obscured the feature significantly. On the other hand, from the proper vantage the construction is quite formal.
>
> Designated Feature B is an almost exactly 50 m (164 long) wall that runs west from Waiakeakua [‘Auwaiakeakua] Gulch. At Waiakeakua Gulch the wall appears to have been damaged by erosion as it turns to the ESE slightly following the south bank of the arroyo. What appears to have happened is that the facing has been stripped away by the force of flash floods leaving an exposure of the jumbled core fill on the arroyo bank. The Feature B wall appears to continue quite straight, almost to the north end of the Feature A wall but for much of this length the Feature B wall has been entirely covered by sediment and at no point was the south side of this core filled wall visible. The most discernable portion of this Feature B wall prior to testing was near the center where test unit 2 was excavated where one to two courses of facing were visible with a height of 0 to 20 cm.

In an effort to better determine the nature and extent of Site 22, Hammatt and Shideler (2007) excavated three test units adjacent to the walls of both features. Although no cultural material was observed during excavation, Hammatt and Shideler (2007) were able to expose the base of the wall and better assess the construction methods. While a definitive function for the site could not be determined, Hammatt and Shideler (ibid.:17) indicated that it “clearly serves to retain water and sediment” and opined that it most likely served as an artificially constructed cattle-watering basin. However, it was recommended that further testing in the form of backhoe trenching occur in order to derive a clearer vision of site function.

In 2011, ASM Affiliates (Clark et al. 2016) conducted an AIS of roughly 811 acres within TMKs: (3) 6-8-001:024, 060, and 063 located in the coastal portion of Waikōloa to the northwest of the Study Area (see Figure 47). A total of twenty-one archaeological sites and 158 associated features were identified as a result of the study, eight of which were previously recorded (Clark and Rechtman 2011; Rosendahl 2000; Spear and Chaffee 1994). These sites consisted of two marine shell scatters (Sites 19777 and 19778), the eastern continuation of a linear path (Site 21976), a portion of the old Puakō Sugar Plantation’s wooden flume (Site 28682), a series of rock piles that mark the former route of a World War II-era communications line (Site 28683), a Historic dike complex constructed for flood-control purposes (Site 28684), a circular enclosure containing a rock pile that may have functioned as a Historic hunting blind or skeet shooting area (Site 28685), a C-shape that might have functioned as a Precontact shelter (Site 28686), and a Historic cart road originally identified by Rosendahl (2000) that was reevaluated as a bulldozed road during the Clark et al. (2016) study. Sites newly identified by Clark et al. (2016) (Sites 30071 to 30083) included two C-shaped enclosures interpreted as Precontact Period shelters, three Precontact Period habitation complexes, two modified outcrops interpreted as Precontact Period shelters, a rock pile and modified outcrop that appear to have functioned as a Historic survey station, a short wall interpreted as a Precontact Period shelter, a surface scatter of marine shell, a rock pile with an associated trail segment that may have been a rest area along an old trail route, a complex of features used for Historic Period habitation and agricultural purposes, and a complex of eighty-nine twentieth century hunting blinds built by bird hunters. The Precontact Period sites, mostly indicative of short-term or recurrent habitation, were concentrated in the northern portion of the project area near the Lālāmilo boundary. Clark et al. (2016) suggest, like Chaffee and Spear (1994) before them, the presence of these site types in that area is evidence of the route of an old trail that once extended along *ahupua‘a* boundary.

In 2014, ASM Affiliates (Clark et al. 2014) conducted an AIS for the proposed Lālāmilo Wind Farm Repowering Project in TMKs: (3) 6-6-001:002 (por.), 071, and (3) 6-8-001:001 (por.) located to the northwest of the Study Area (see Figure 47). As a result of the study, three archaeological sites were identified: Site 9012, a late nineteenth/early twentieth century dry-stacked rock wall attributed to Parker Ranch; Site 30109, a World War II military encampment with a possible earlier Historic and/or Precontact component associated with the Camp Tarawa Waikōloa Maneuver Area; and Site 30110, a complex of cairns marking the *ahupua‘a* boundary between Waikōloa and Lālāmilo. All of the sites identified during the Clark et al. (2014) study were determined to be significant under Criterion d, and no further work was the recommended treatment.

3. STUDY AREA EXPECTATATIONS

Given the results of previous archaeological research coupled with the culture-historical context presented above, a formulation of a fairly detailed set of Study Area expectations is possible. The location and the specific history of the Study Area land use, the results of the background research, and a review of archaeological work previously conducted in the general vicinity of the Study Area, which is located in a dry intermediate zone of Waikōloa *ahupua'a* between the more intensively utilized coastal and upland resource/habitation areas, suggests that archaeological features will be related primarily to the collection of specific resources (such as *pili* grass and birds such as *'uwa'u* and *nēnē*) and travel between the coastal and upland areas during the Precontact to early Historic Periods, as well as ranching use during the later Historic Period.

Within the Study Area, Historic features are expected to be more numerous and widespread than Precontact features, as the Study Area was actively used as pasture beginning in the late nineteenth century until the present. As the Study Area once comprised a portion of the Parker Ranch "Pu'u Hīna'i" paddock and contained Historic ranching infrastructure (Figure 50), sites deriving from this period are expected to be present and to have significantly impacted and/or obliterated much of the Precontact archaeological landscape. Furthermore, the development of this area of Waikōloa, particularly relating to the construction of later Historic and modern transportation routes (e.g. Highway 190 and nearby Waikōloa Road) are expected to have further diminished the likelihood of encountering intact sites. Thus, the expectations for encountering Precontact features within the Study Area are extremely limited.

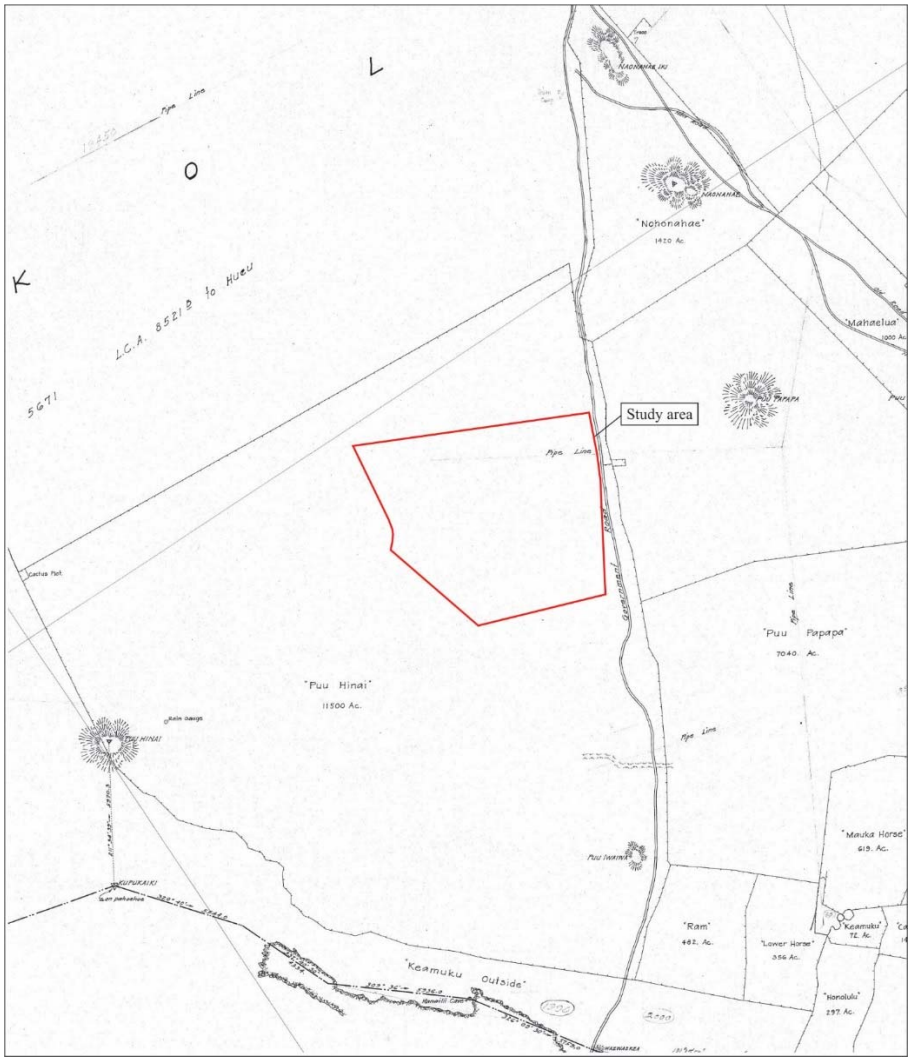

Figure 50. Detail of 1917 Hawai'i Registered Map No. 2786 by G.F. Wright showing Parker Ranch paddocks and infrastructure (e.g. pipelines).

4. FIELDWORK

Fieldwork for the current study was conducted between June 12-14, June 18 and 19, June 26-28, and on July 2, 2018 by Matthew R. Clark, M.A., Lauren M. U. K. Tam Sing, Ivana Hall, B.A., Johnny Dudoit, B.A., and Robynn Namnama, B.A., under the direction of Robert B. Rechtman, Ph.D.

FIELD METHODS

During the archaeological field survey, the entire (100%) ground surface of Study Area was visually inspected by field technicians walking transects oriented north-south, spaced no more than 30 meters apart. When archaeological features were encountered, their positions were plotted on a map of the Study Area using a Garmin handheld GPS unit (set to the NAD 83 Zone 5 North), along with areas of previous disturbance, and conspicuous landforms. Identified features located within the Study Area were then cleared of vegetation, photographed (both with and without a meter stick for scale), depicted on a scaled drafted plan map, and described using standardized feature record forms.

FINDINGS

As a result of the fieldwork, seven sites were recorded within the Study Area (Table 2 and Figure 51). Four of the sites are located in Parcel 005, two are in Parcel 006, and one is in Parcel 029. In addition to these sites, numerous discrete rock piles were observed throughout the Study Area. The majority of these are situated on prominent landforms and are adjacent to 4WD roads/segments of roads, and seem to mark those routes and places. Some of the rock piles are situated on or very near to modern TMK boundaries and are marked either with white spray paint or are supporting a steel pipe from their center. It appears that these ubiquitous features are visual markers associated with past (modern) land use related to traversing and surveying of the property. As such, the rock piles identified during the fieldwork, given their uncertain ages and functions, and lack of any clear associations with other archaeological sites, were not assigned an SIHP site number, but were simply plotted on the Study Area map (see Figure 51) and their GPS locations recorded. Two small concentrations of bottles and numerous isolated bottles ranging from modern to the first quarter of the twentieth century are present along the eastern Study Area boundary in the vicinity of Site 30924, immediately adjacent to Highway 190 (Figures 58 and 59). Their presence alongside the roadway illustrates not only the transformation of bottle morphology over time, but also demonstrates the fairly common habitual human characteristic of improperly discarding waste products from vehicles, in this case from the current highway and the Old Waimea-Kona Belt Road, which preceded it. During the course of the fieldwork, no evidence of Precontact *mauka-makai* trail systems or later Historic trails were identified within the Study Area, which according to Historic maps, is situated east of known trails (e.g. Waimea-Keʻāmuku and Puakō-Keʻāmuku trails) and well north of the study area (e.g. "old trail" along boundary of Waikōloa and Lālāmilo).

Detailed descriptions of the seven archaeological sites (Sites 50-10-12-30919 through 30925) identified within the Study Area are presented below.

Table 2. Archaeological sites recorded during the current study.

SIHP Site Number	*Features*	*Type*	*Function*	*Age*
50-10-12-30919	1	C-shape	Windbreak shelter	Precontact/Historic
50-10-12-30920	1	Modified outcrop	Hunting blind	Historic
50-10-12-30921	1	Rectangular enclosure	Hunting blind	Historic
50-10-12-30922	1	Wall	Possible hunting blind	Historic
50-10-12-30923	2	Water tank foundation and trough	Ranching	Historic
50-10-12-30924	1	Modified depression	Unknown	Historic
50-10-12-30925	1	Modified outcrop	Windbreak shelter	Historic

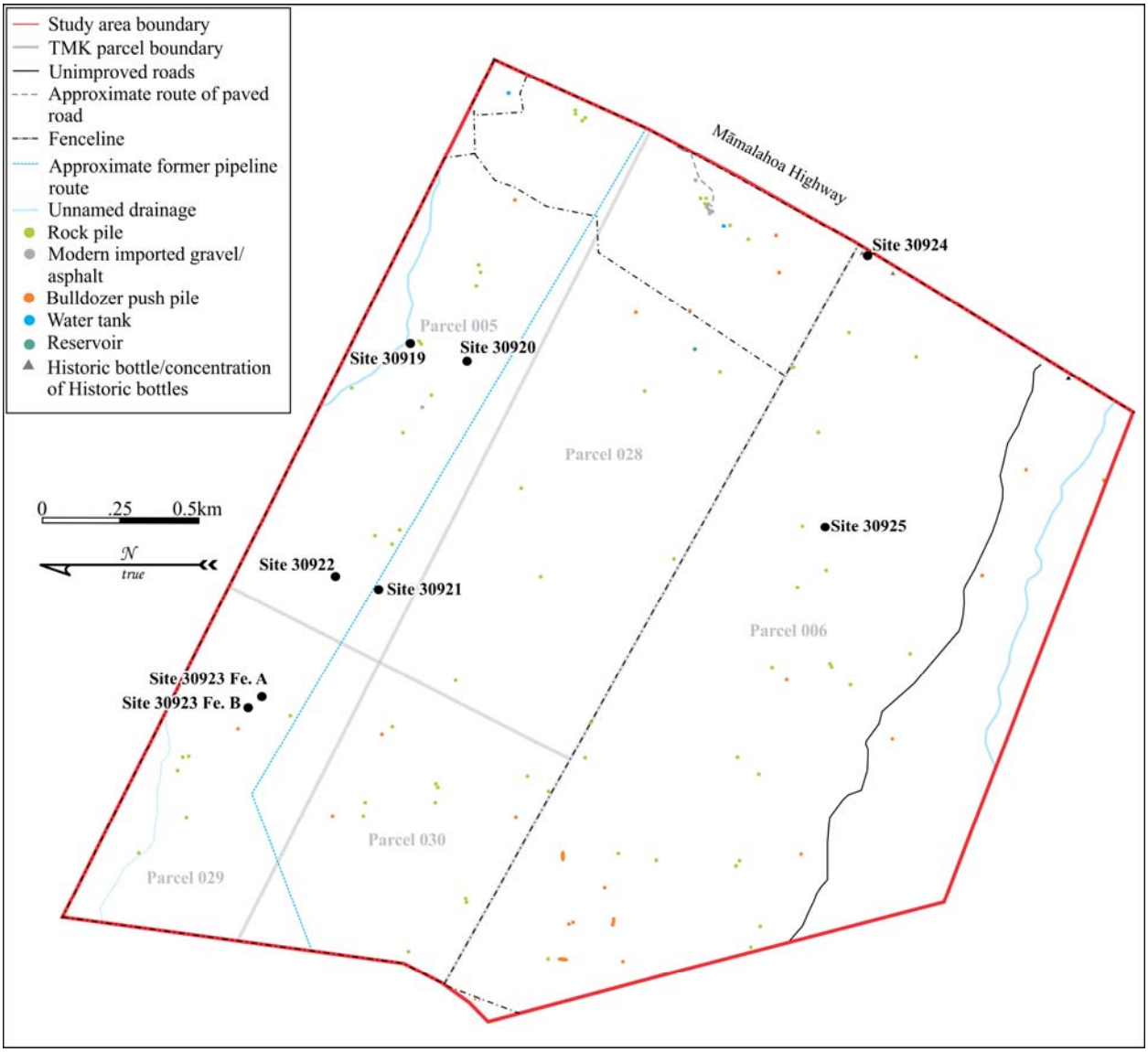

Figure 51. Study Area map.



Figure 52. Typical rock pile consisting of one cobble stacked on a bedrock outcrop, view to the northwest.



Figure 53. Typical rock pile consisting of two cobbles stacked on a bedrock outcrop, view to the east.



Figure 54. Multi-stone rock pile, view to the southwest.



Figure 55. Multi-stone rock pile, view to the southwest.



Figure 56. Example of rock pile marked with white paint.

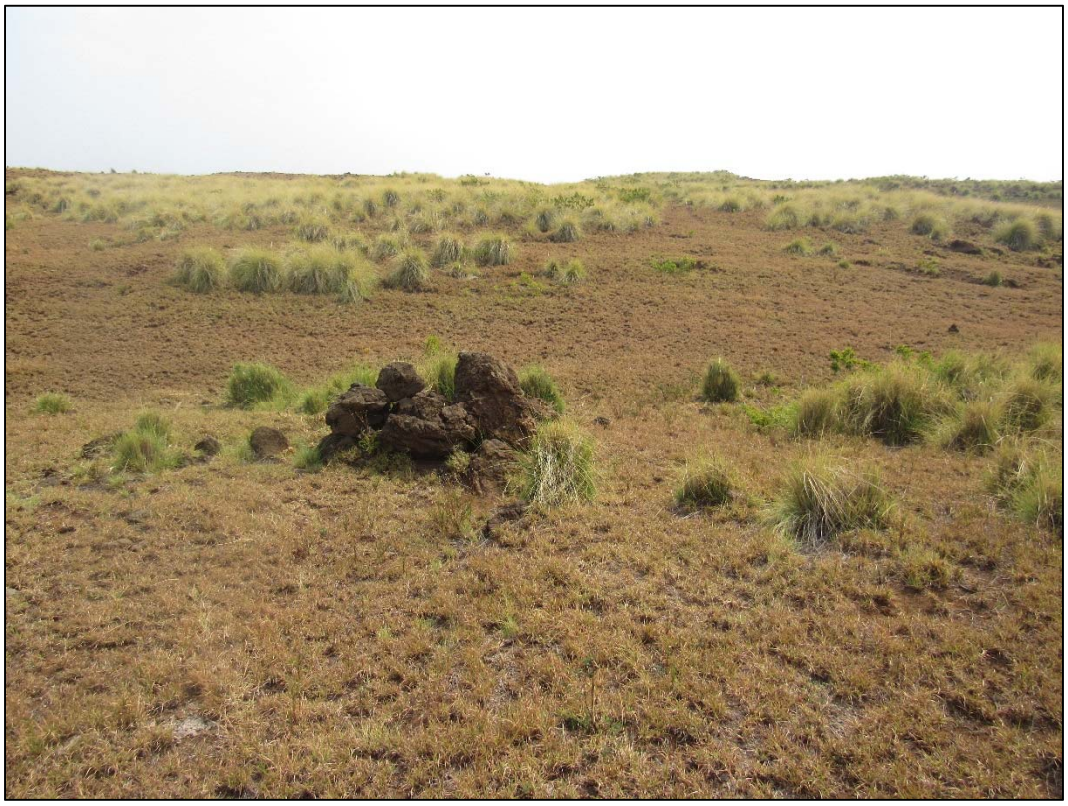

Figure 57. Rock pile in cleared, grazed area, view to the north.



Figure 58. Small concentration of amber glass beer bottles adjacent to Highway 190.



Figure 59. Isolated bottle near eastern Study Area boundary adjacent to Highway 190.

Site 30919

Site 30919 is a C-shaped enclosure situated on a fairly level area on top of a gently sloping *mauka*/*makai* ridgeline, roughly 10 meters southwest of a steep gully and dry streambed near the western boundary of the Study Area within Parcel 005 (see Figure 51; Figure 61). This site is constructed of small to large dry-stacked, subangular *pāhoehoe* cobbles and incorporates underlying, exposed bedrock outcrop into its construction along its northeastern edge (Figures 60 and 62). Site 30919 measures approximately 2.8 meters square, with heights ranging between 0.25 and 1.3 meters. The enclosure is open on its *makai* (northwest) side, and the interior space measures approximately 1.8 meters in length by 1.2 meters in width. The enclosure walls range in height from 0.25 to 0.60 meters. The interior of the interior of the enclosure has a thin layer of soil overlying bedrock. The northern interior and exterior wall of 30919 retains some stacking and overall the site is in relatively good condition, however the interior portion of the site and exterior eastern wall are somewhat collapsed. Based upon formal characteristics, construction method, and location, Site 30919 is interpreted as a Precontact Period windbreak shelter. No cultural material was observed at Site 30919.



Figure 60. Site 30919, C-shape, view to the east.

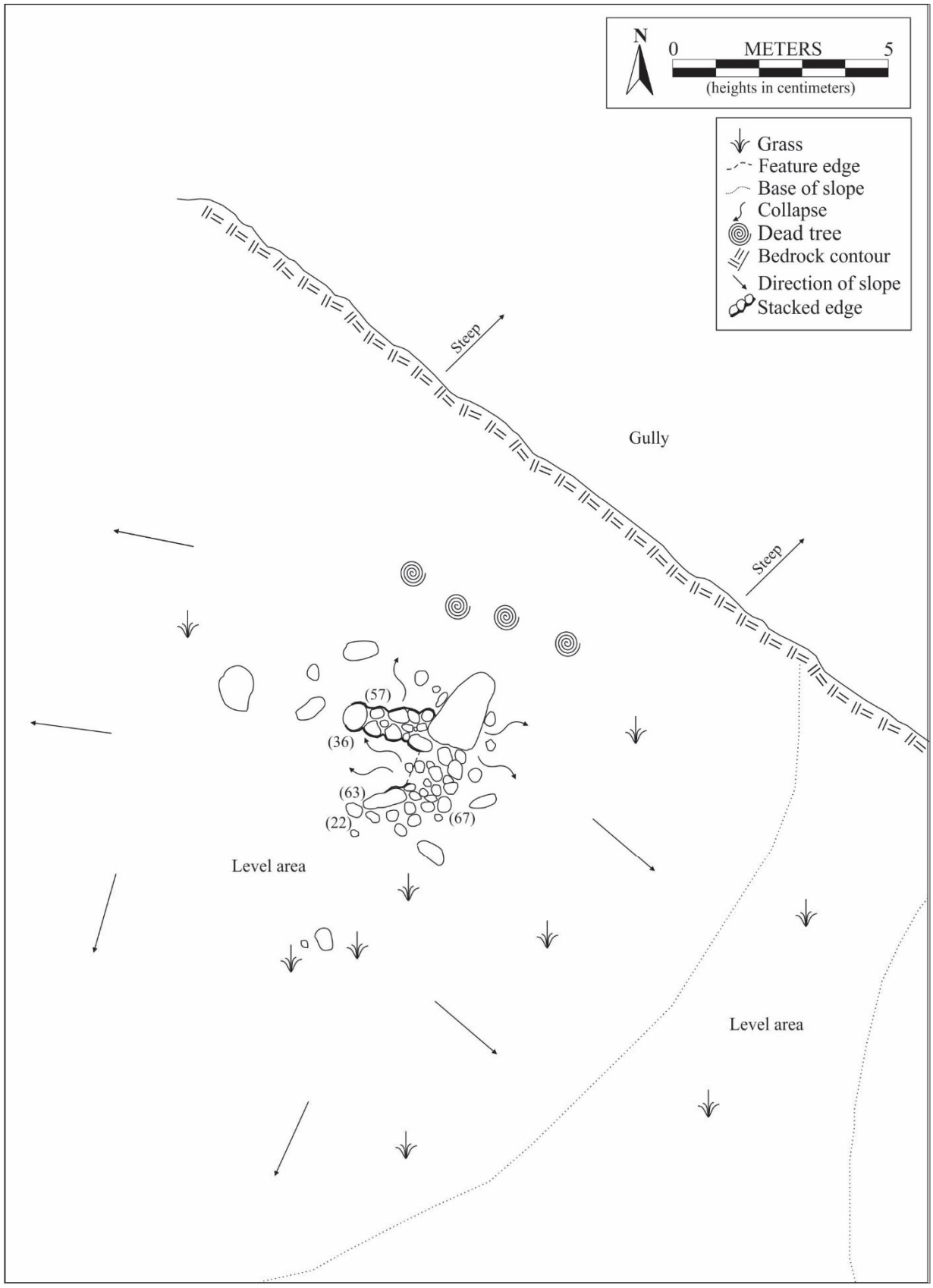

Figure 61. Site 30919 plan view.



Figure 62. Site 30919, C-shape, view to the north with gully extending along northern side.

Site 30920

Site 30920 consists of a modified outcrop situated on a fairly level area along the southwestern edge of a gently sloping *mauka*/*makai* ridgeline near the western boundary of the Study Area within Parcel 005 (see Figure 51; Figure 63). It is constructed of ten medium to large sized subangular *pāhoehoe* cobbles placed atop the southeastern corner of the underlying, exposed bedrock outcrop, and measures approximately 2.6 meters in length by 2.4 meters in width, with heights ranging between 0.59 and 1.06 meters (Figure 64).

Several aquamarine glass bottle fragments were identified near the southern edge of the site, with one small fragment wedged between the underlying bedrock and *pāhoehoe* cobbles (Figure 65). Aqua-hued bottles were commonly produced in the early part of the nineteenth century and remained common up until around the 1920s when, for the most part, they were replaced with bottles made of colorless glass (Schulz et al. 2016). The glass fragments appear to come from one bottle that was cylindrical in form with a round base, with a two-piece, tooled straight brandy finish which typically would have sealed an alcoholic beverage in with a cork. Based on these attributes, particularly the finish, this bottle was most likely manufactured sometime between the late nineteenth century and the early 1920s.

Additionally, a puncture mark (impact from a bullet) was observed in one of the stacked cobbles immediately adjacent to the bottle glass fragment that is wedged between the rocks (Figure 66). This suggests that the bottle was used for target practice. Based upon its location, construction, and evidence of past activity, Site 30920 appears to have been an informal hunting blind used during historic times.

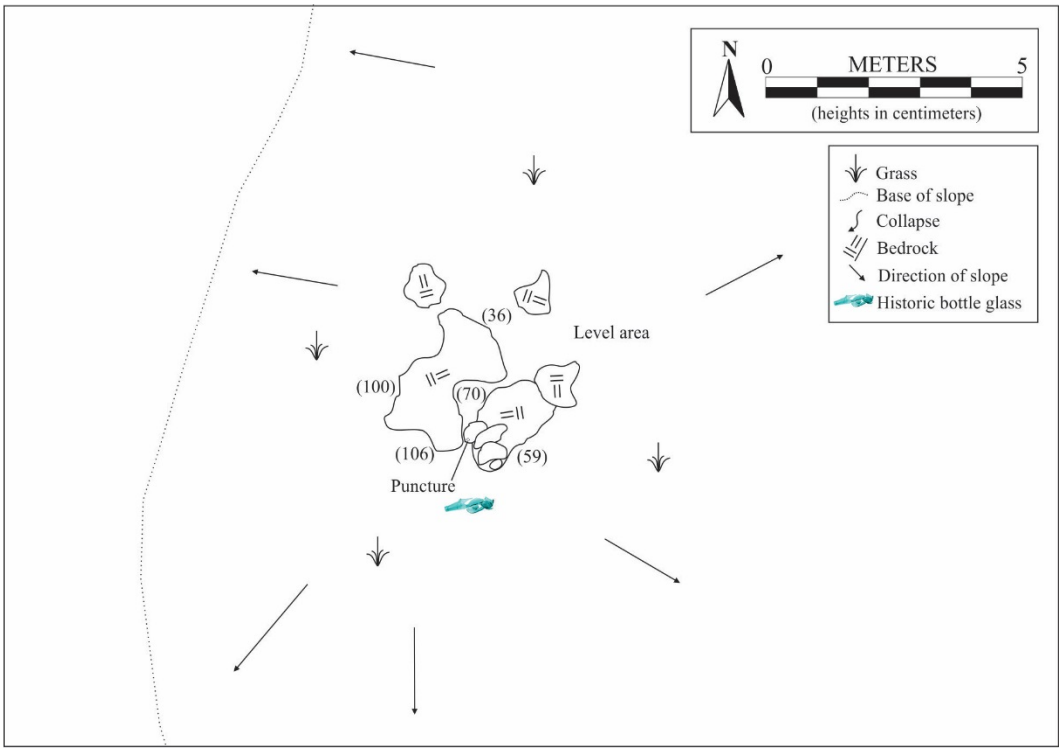

Figure 63. Site 30920 plan view.



Figure 64. Site 30920, modified outcrop, view to the north.



Figure 65. Historic bottle glass fragments located near southern edge of Site 30920.



Figure 66. Puncture in cobble.

Site 30921

Site 30921 consists of a rectangular-shaped enclosure (Figure 67) situated on a fairly level area on top of a gentle to moderately sloping *mauka*/*makai* ridgeline, roughly 40 meters south of a gully and dry stream bed within Parcel 005 (see Figure 51). It is constructed of 10 medium to large sized subangular *pāhoehoe* cobbles, and incorporates the underlying bedrock outcrop into its construction along the western edge of the site (Figure 68). Site 30921 is rectangular and quite narrow and measures 2.5 meters in length by 1.5 meters in width on the exterior with heights ranging between 0.4 to 0.7 meters. The interior of the site is level and consists of grass in a layer of thin soil overlying bedrock and opens to the southwest. Based upon its construction method and optimal location overlooking a drainage channel to the west and level grasslands downslope, it is likely that Site 30921 functioned as a hunting blind during historic or modern times. No cultural material was observed at Site 30921.

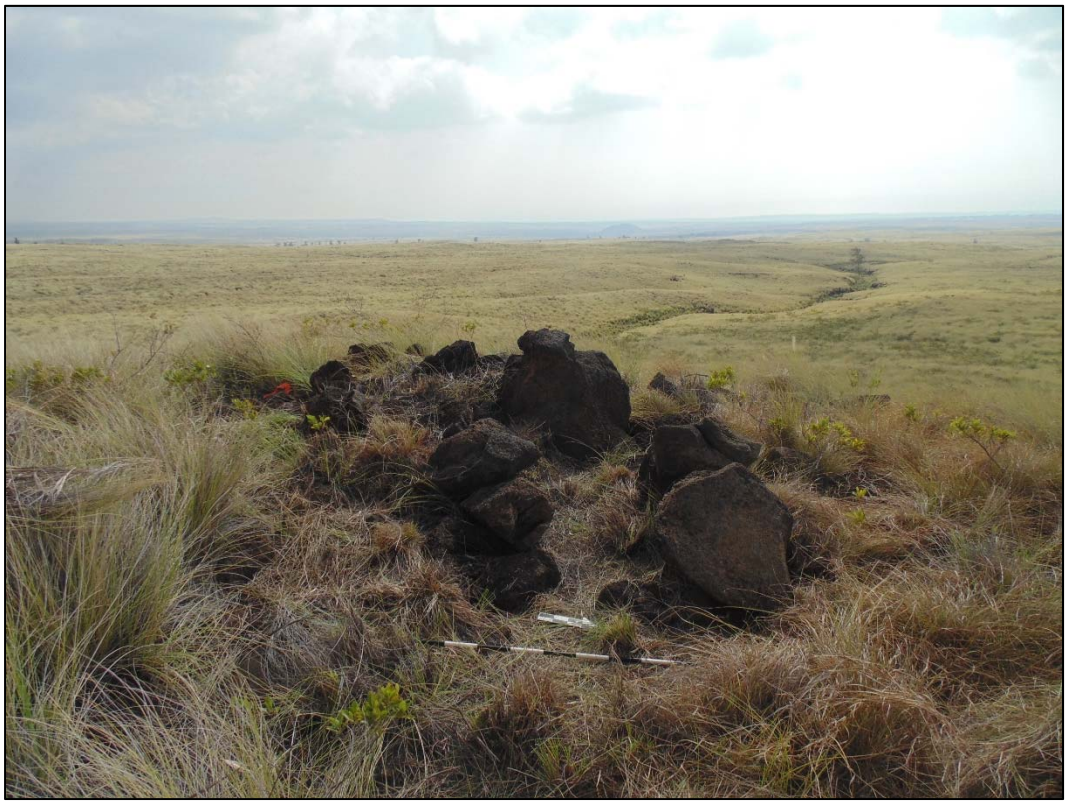

Figure 67. Site 30921, view to the west.

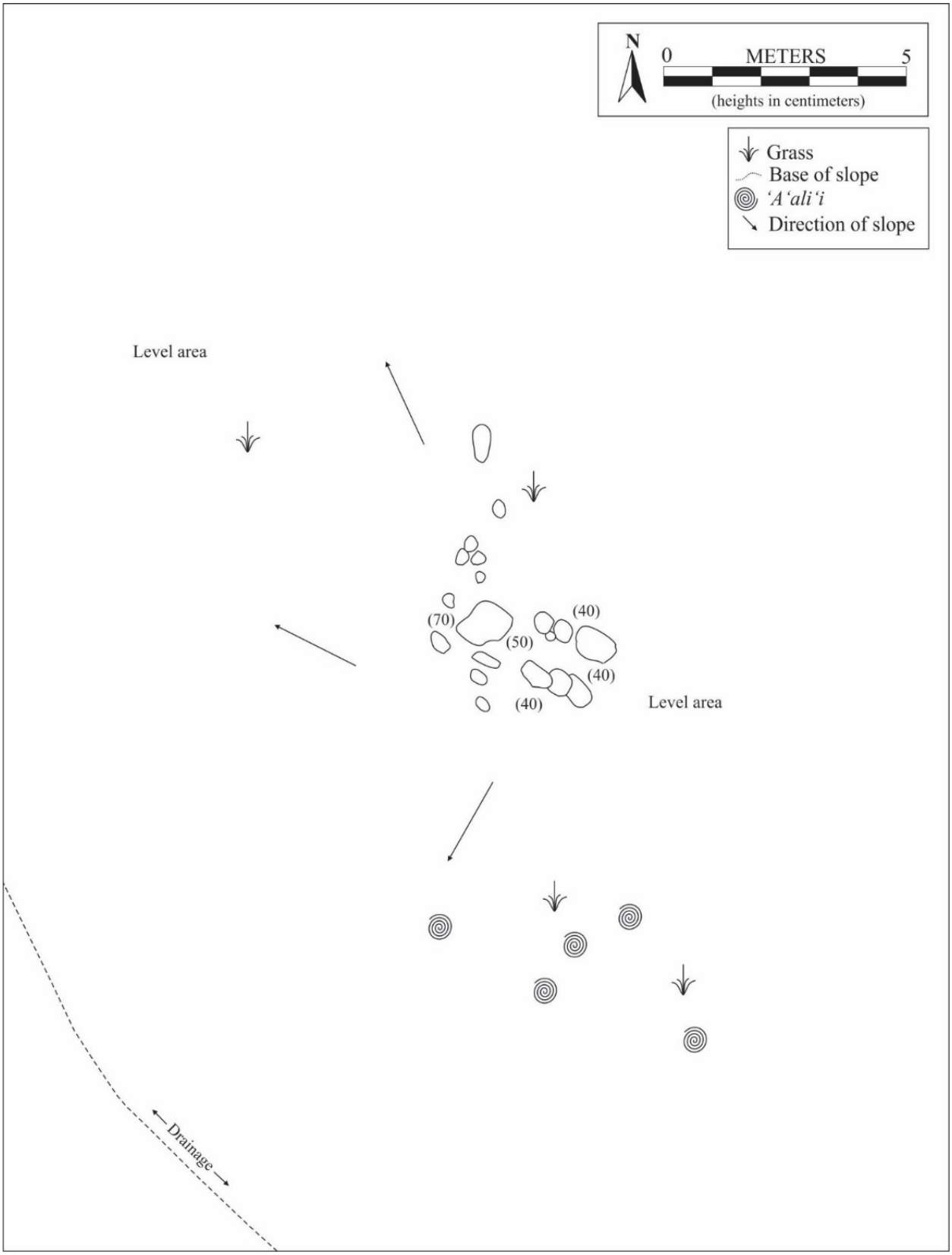

Figure 68. Site 30921 plan view.

Site 30922

Site 30922 consists of a dry-stacked, low linear wall constructed along the northeastern edge of a *mauka*/*makai* ridgeline near the western boundary of the Study Area, approximately 140 meters northwest of Site 30921 within Parcel 005 (see Figure 51; Figure 69). This site is constructed of medium to large subangular *pāhoehoe* cobbles and measures approximately 18.7 meters in length southeast to northwest, averages 0.7 meters in width, and ranges in height between 0.2 to 0.6 meters (Figures 70 and 71). It is situated at the top of the ridgeline which affords excellent views in all directions. Its function is indeterminable, but based upon its location on a prominent landform, it possibly functioned as a hunting blind. An old piece of small plastic green flagging tape was observed near the northwestern termination of the site. This site is mostly intact, with some collapse along its north-facing side. There was no cultural material was observed at Site 30922.

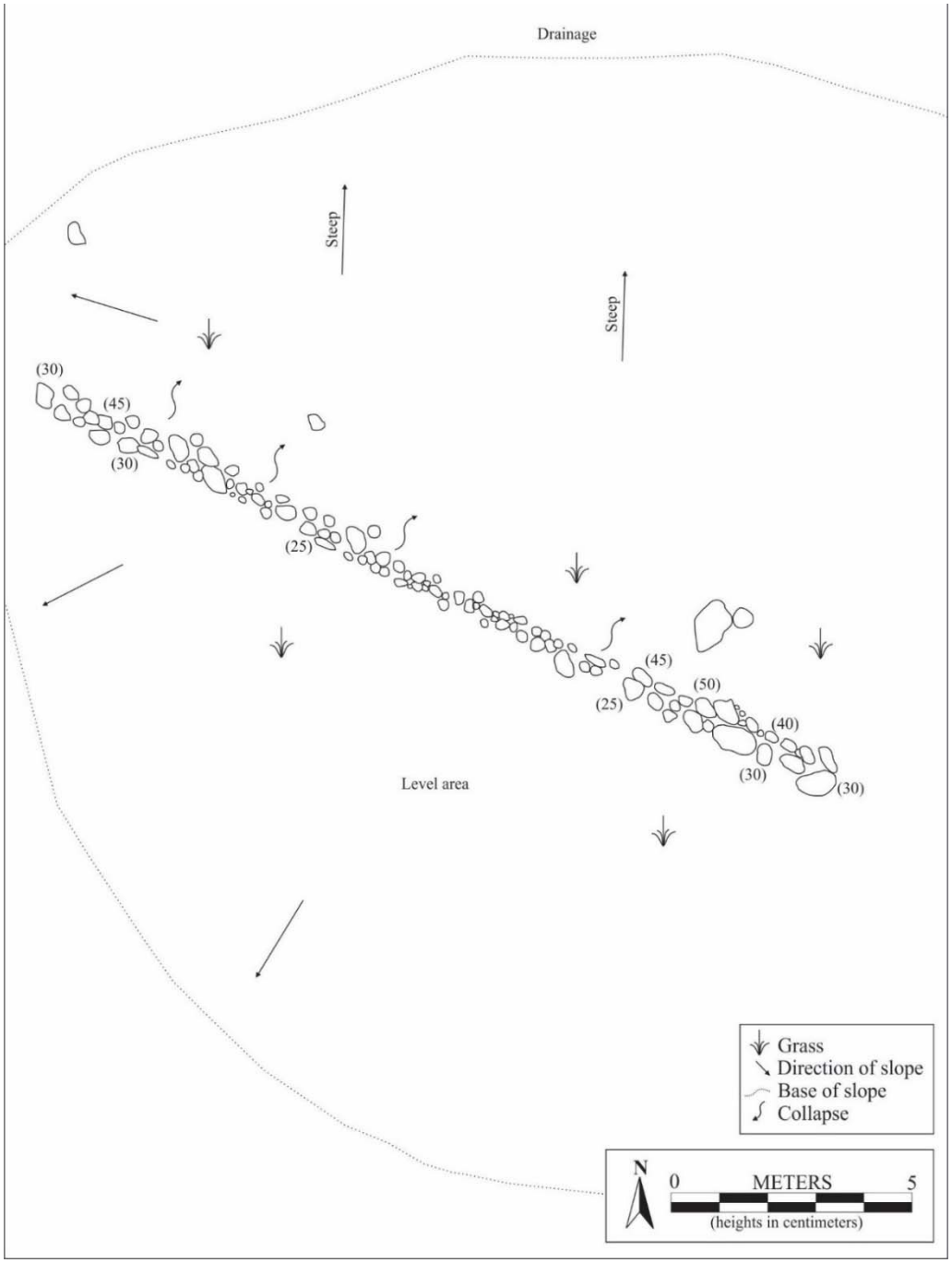

Figure 69. Site 30922 plan view.



Figure 70. Site 30922, wall, view to the west, orange flagging tape from current fieldwork pictured in foreground.



Figure 71. Site 30922, wall, view to the northwest, orange flagging tape from current fieldwork pictured in foreground.

Site 30923

Site 30923 is a concrete water tank foundation (Feature A) and a rectangular concrete water trough and slab (Feature B) situated in the northwest portion of the Study Area within Parcel 029 (see Figure 51; Figure 72). Feature A is situated at the summit of a small, flat-topped hill, 52.3 meters southeast of Feature B (Figure 73). This foundation is constructed from six laterally-spaced segmented precast concrete beams that measure 5.35 meters long by 5.15 wide overall (Figure 74). The individual beams range in length from 2.65 meters to 5.4 meters in length and have an average width of 0.21 meters. Heights range between 0.28 meters and 0.55 meters. The exterior-facing edges of each beam angles to form a circular base for the no longer extant water tank that it would have previously supported. The interior sections between the beams consist of grass overlying a thin layer of soil. Within these interior areas and scattered about the surrounding area are fragments of old milled wood, rusted steel straps, wire, and nails: remnants of water tank infrastructure. A weathered piece of green plastic flagging tape was observed near the central interior section of the foundation.

Feature B consists of a gravity-fed, rectangular concrete water trough on a concrete slab located in a level area of grazed grass below Feature A (see Figure 73). The slab underlying the trough appears to have been cast in four distinct sections and is level with the current ground surface. It measures 7.4 meters in length east/west by nearly 5 meters in width north/south. The trough, which was cast in place on the slab, is set into the central portion of the slab equidistant from its edges, measures 4.59 meters in length east/west by 1.22 meters north/south on the exterior and is approximately 0.56 meters in height (Figure 75). A small section of crude, crosshatch designs are etched into the weathered concrete surface on the southern edge of the trough (Figure 76). A segment of an inlet pipe is set into the concrete immediately adjacent to the southeastern corner of the trough which contains an overflow drain hole. A segment of metal pipe is present on the ground surface of the slab's southern edge, and adjacent to the slab's southeastern corner is a short segment of a partially buried metal waterline extending in the direction of the water tank (Figure 77).

Site 30923 Feature A initially appears on a 1926 Territory of Hawai‘i Survey map and is shown in relation to the water pipeline that extends southeast to northwest to the water tank in Figure 41. Although the water tank is evident in a 1954 aerial photograph of the Study Area (see Figure 44), the pipeline alignment is barely discernable, but an unimproved dirt road leading west from the water tank remains evident and appears to still have been utilized. Despite the nearly indistinguishable alignment of the water tank and the road in the aerial photograph, all the aforementioned features are clearly depicted on a 1956 USGS quadrangle map indicating their continued utilization until at least that year (see Figure 43). The pipeline appears to have fallen into disuse somewhere between 1956 and 1982, as a 1982 topographic map no longer shows its alignment (see Figure 45).

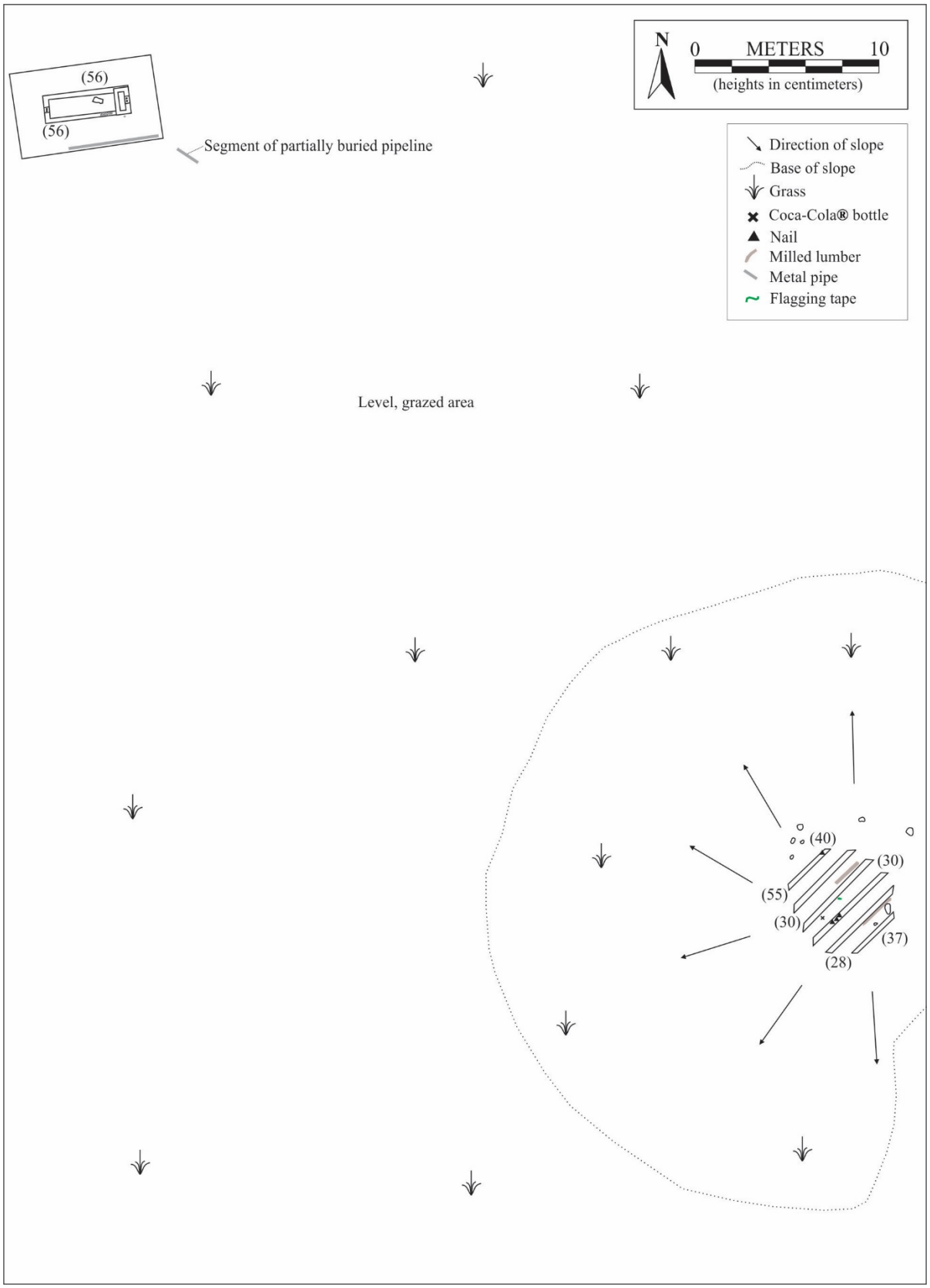

Figure 72. Site 30923 plan view.



Figure 73. Site 30923 Feature A, concrete water tank pad with trough in the background, view to the northwest.



Figure 74. Site 30923 Feature A, concrete water tank foundation, view to the north.



Figure 75. Site 30923 Feature B, concrete trough, view to the north.



Figure 76. Western end of trough, note crosshatch etching into the weathered portion of the concrete, view to the south.



Figure 77. Overview of remnant steel water pipe situated between Site 30923 Features A and B.

Site 30924

Site 30924 consists of a modified depression situated approximately 10 meters west of Māmalahoa Highway and adjacent to the western boundary of the Study Area (see Figure 51; Figure 78). 30924 measures approximately 7.8 meters in length northeast to southwest by 6 meters in width at its widest points and it ranges in depth from 1.3 to 1.82 meters (Figure 79). This site has been partially excavated into the eastern end of a natural, low, west-sloping *pu'u*, and the site's eastern edge excavated into fairly level ground surface adjacent to the alignment of an old 4WD road. The eastern, interior edge of the site consists of *pāhoehoe* overlying an *'a'ā* substrate, and the western interior edge consists of soil and small to large *pāhoehoe* cobbles overlying a layer of decomposing *pāhoehoe* bedrock.

The northern end of Site 30924 slopes to the northeast on the exterior, and the southern exterior edge is nearly flush with the existing ground surface. The interior southern edge of the site is modified with small to medium cobbles neatly stacked to a height of approximately 1.82 meters and a width of approximately 2.5 meters (Figure 80). Colorless glass fragments from a Nesbitt's of California soda bottle (ca. 1938) was identified embedded into the wall at the eastern end of the stacked section. A pile of excavated small to medium cobbles is present on the western exterior of the site (Figure 81) immediately adjacent to a large boulder with boreholes and remnant detonation cord utilized for industrial rock blasting with blasting agents and/or explosives (Figure 82).

The interior of 30924 consists of a thin layer of soil and grass overlying bedrock (Figure 83). The western edge of the site has collapsed slightly into the interior of the depression. The location of Site 30924 adjacent to Highway 190 coupled with the presence of blasting boreholes in the boulder at the northeastern corner may indicate an association with either the current or former alignment of the Kona-Waimea Belt Road (Site 50-10-21-20855), which was constructed between 1916 and 1922.

While the precise function of Site 30924 is indeterminate, there are two possibilities for its existence, the first being that the depression is the result of rock blasting and subsequent quarrying activities conducted to supply construction material for either the former or current roadway. The second possibility is that the alignment for the Kona-Waimea Belt Road was originally slated to extend farther to the south than where it currently is located and that Site 30924 represents a remnant of an alignment which was never further developed or utilized.

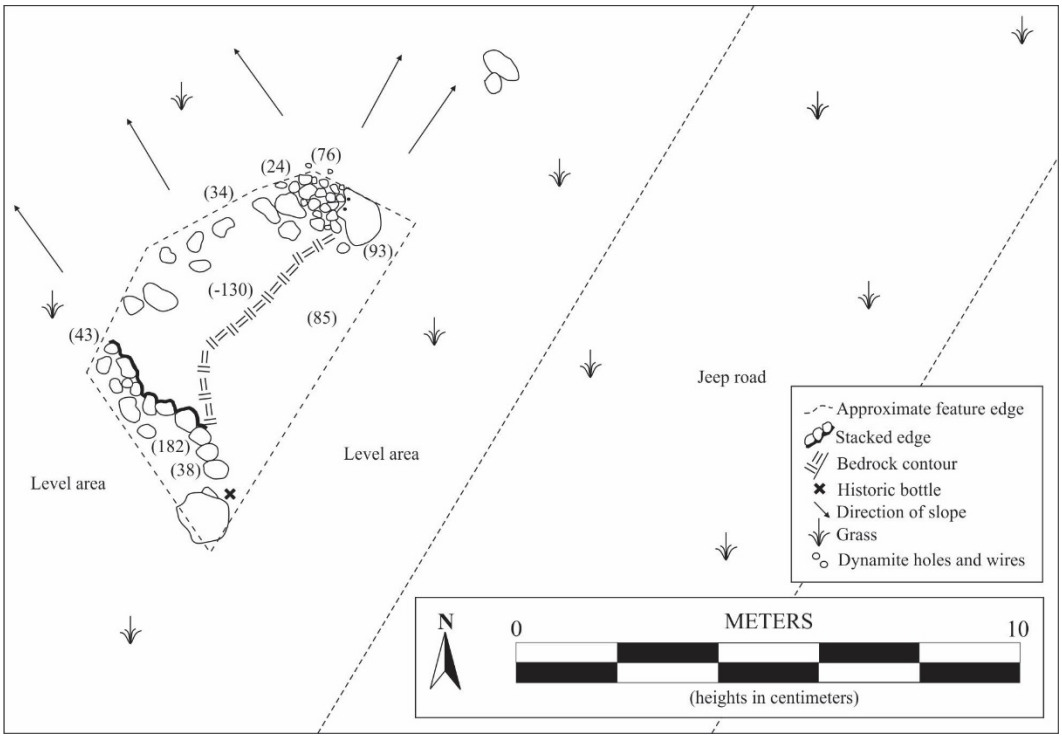

Figure 78. Site 30924 plan view.



Figure 79. Site 30924, modified depression, view to the west.



Figure 80. Site 30924, stacked southern interior wall, view to the south.



Figure 81. Site 30924, modified depression,view to the south.



Figure 82. Site 30924, boreholes and detonation cord in boulder at northern end of site, overview.



Figure 83. Site 30924, interior, view to the northeast.



Figure 84. Site 30924, glass fragments from Nesbitt's soda bottle, overview.

Site 30925

Site 30925 consists of a modified outcrop situated on the level summit of a low, gently sloping hill in the central, southern portion of the Study Area within Parcel 006 (see Figure 51; Figure 85). It is crudely constructed of medium to large subangular cobbles and incorporates a significant amount of the underlying, exposed bedrock outcrop into its construction, forming a rough U-shaped enclosure (Figure 86). Site 30925 measures 3.23 meters in length by 2.85 meters in width, with heights ranging between 0.33 and 1.15 meters. The site opens *makai* (northwest) and its interior is fairly level and soil-filled, with several large, scattered cobbles, with the northern exterior portion being highly collapsed. Two fragments of Historic aquamarine bottle glass from a Coca-Cola® bottle were identified at a distance of roughly one meter southwest from the end of the southwestern wall (Figures 87 and 88). Based upon informal construction, location, and evidence of past activity, Site 30925 is interpreted as a Historic windbreak shelter.

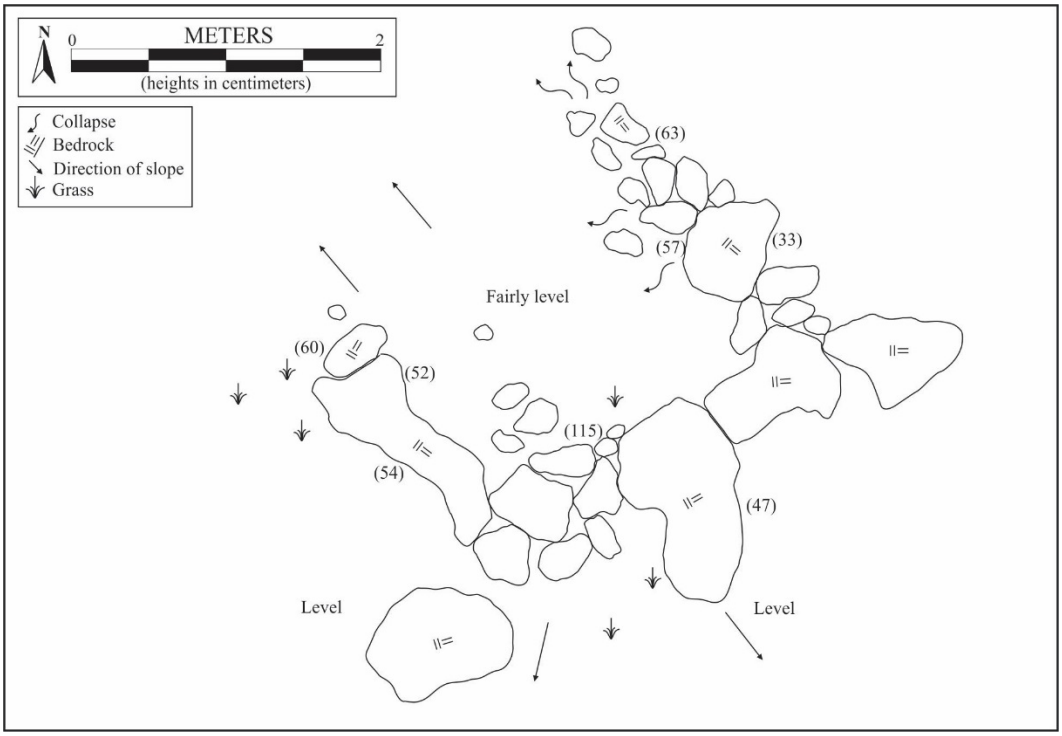

Figure 85. Site 30925 plan view.


Figure 86. Site 30925, modified outcrop, view to the east.



Figure 87. Fragment from Coca-Cola® bottle, overview.



Figure 88. Fragment of Coca-Cola® bottle, overview.

5. SIGNIFICANCE EVALUATIONS, TREATMENT RECOMMENDATIONS, AND EFFECT DETERMINATION

The recorded archaeological sites are assessed for their significance based on criteria established and promoted by the DLNR-SHPD and contained in the Hawai‘i Administrative Rules 13§13-284-6. For a resource to be considered significant it 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 traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

The significance and recommended treatment for the seven recorded sites is presented in Table 3 and discussed below.

Table 3. Site significance and treatment recommendation.

Site #	*Site Type*	*Temporal Affiliation*	*Significance*	*Recommended Treatment*
30919	C-shape	Precontact	d	Data Recovery
30920	Modified outcrop	Historic	d	No further work
30921	Rectangular enclosure	Historic	d	No further work
30922	Wall	Unknown	d	No further work
30923	Former water tank and trough	Historic	d	No further work
30924	Modified depression	Historic	d	No further work
30925	Modified outcrop	Historic	d	No further work

Site 30919, a Precontact C-shaped enclosure, is considered significant under Criterion d for the information it has yielded and is likely to yield relative to Precontact land use within Waikōloa Ahupua‘a. Recovery of additional information from this site could potentially augment our understanding of the site’s age and function, as well as add to the body of knowledge about traditional land use in this portion Waikōlola Ahupua‘a. A data recovery plan in accordance with HAR 13§13-278 will be prepared for review and acceptance by DLNR-SHPD.

Sites 30920 and 30925, modified outcrops, are considered significant under Criterion d for the information they have yielded relative to late nineteenth/early twentieth century hunting and ranching practices in Waikōloa. Both sites retain sufficient integrity of all categories to convey their significance under Criterion d. The research conducted during this study has been sufficient to exhaust the information potential of both sites, and therefore no further historic preservation work is the recommended treatment.

Site 30921, a Historic Period rectangular enclosure, is considered significant under Criterion d for the information it has yielded relative to late nineteenth/early twentieth century hunting and ranching practices in Waikōloa. This site retains sufficient integrity of all categories to convey its significance under Criterion d. The research conducted during this study has been sufficient to exhaust the information potential of the site, and therefore no further historic preservation work is the recommended treatment.

Site 30922 is a Historic Period linear, dry-stacked wall. Although the precise function of this site is indeterminate, it is interpreted as being a possible hunting blind and is considered significant under Criterion d for the information it has yielded relative to late Historic/modern hunting and ranching practices in Waikōloa. This site retains sufficient integrity of all categories to convey its significance under Criterion d. The research conducted during this study has been sufficient to exhaust the information potential of the site, and therefore no further historic preservation work is the recommended treatment.

Site 30923, consisting of a Historic Period concrete water tank foundation and associated concrete trough, is considered significant under Criterion d for the information it has yielded relative to early to mid-twentieth century ranching practices in Waikōloa. Both features of the site (Features A and B) retain sufficient integrity of all categories to convey their significance under Criterion d. The research conducted during this study has been sufficient to exhaust the information potential of both features, and therefore no further historic preservation work is the recommended treatment.

Site 30924, a Historic Period modified depression likely associated with the former or current alignment of the Kona-Waimea Belt Road, is considered significant under Criterion d for the information it has yielded relative to transportation in Waikōloa during the first quarter of the twentieth century. This site retains sufficient integrity of all categories to convey its significance under Criterion d. The research conducted during this study has been sufficient to exhaust the information potential of the site, and therefore no further historic preservation work is the recommended treatment.

DETERMINATION OF EFFECT

The results of the current study indicate that seven significant historic sites are present in the Study Area. Six of these sites (Sites 30920, 30921, 30922, 30923, 30924, and 30925) are significant only for the information they yielded during this study have been sufficiently documented to exhaust their information potential. Therefore, the current study has mitigated any potential future adverse effects to these sites. Site 30919, however, is also significant for the information potential it still retains. Data recovery is the proposed treatment for this site, therefore the HRS Chapter 6E review determination for the project is "affect with agreed upon mitigation." A data recovery plan in accordance with HAR 13§13-278 will be prepared for Site 30919 and submitted to DLNR-SHPD for review and acceptance.

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Appendix C

Cultural Impact Assessment

A Cultural Impact Assessment for the Proposed 1,559 Acre Nakahili Community

TMKs: (3) 6-8-002:005, 006, 028, 029, and 030

Waikōloa Ahupuaʻa
South Kohala District
Island of Hawaiʻi

DRAFT VERSION



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ASM Project Number 30410.00

A Cultural Impact Assessment for the Proposed 1,559 Acre Nakahili Community

TMKs: (3) 6-8-002:005, 006, 028, 029, and 030

Waikōloa Ahupuaʻa
South Kohala District
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1. INTRODUCTION

At the request of Work Force Developers, LLC , ASM Affiliates (ASM) prepared this Cultural Impact Assessment (CIA) in support of environmental documentation being prepared to comply with Hawai‘i Revised Statues (HRS) Chapter 343 and expected permitting applications for the proposed development of a workforce family agricultural community called “Nakahili”. Nakahili will be ceveloped on approximately 1,559 acres of land identified by Tax Map Keys (TMKs) (3) 6-8-002:005, 006, 028, 029, and 030 (Study Area) in Waikōloa Ahupua‘a, South Kohala District, Island of Hawai‘i (Figures 1, 2, and 3), and is proposed to contain 1) farm dwellings on agricultural lots; 2) a small neighborhood commercial “village” area with apartments and limited retail and light industrial uses; 3) parks; and 4) community infrastructure (Figure 4).

This CIA was prepared pursuant to Act 50; and in accordance with the Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impact, adopted by the Environmental Council, State of Hawai‘i, on November 19, 1997. As stated in 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, “environmental assessments . . . should identify and address effects on Hawaii’s culture, and traditional and customary rights . . . native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the ‘aloha spirit’ in 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.”

Presented below is a description of the Study Area, which is followed by a detailed culture-historical background and a presentation of prior studies; all of which combine to provide a physical and cultural setting and context for the Study Area. A summary of consultation is provided next, followed by a discussion of potential cultural impacts along with the appropriate actions and strategies necessary to mitigate any such impacts.

STUDY AREA DESCRIPTION

The Study Area consists of roughly 1,559 acres of land within TMKs: (3) 6-8-002:005, 006, 028, 029, and 030 in Waikōloa Ahupua‘a, South Kohala District, Island of Hawai‘i (see Figures 1, 2, and 3). Situated at an elevation of roughly 1,880 to 2,640 feet (573 to 804 meters) above sea level on the western flank of Mauna Kea Volcano, the Study Area extends along the *makai* (west) edge of Māmalahoa Highway (Highway 190) and is identified as Lots 7 and 8 of the Waikōloa Ranch Subdivision. The property is accessed by two gated roads that enter into the Study Area from Highway 190: a partially paved road at the central, northern portion of Parcel 028 and another unimproved road near the northeastern corner of Parcel 006. As a result of nearly two centuries of cattle grazing, vegetation within the Study Area is sparse and dominated by introduced species. Ground cover consists primarily of fountain grass (*Cenchrus setaceus*) and buffelgrass (*Cenchrus ciliaris*) interspersed with *‘a‘ali‘i* (*Dodonaea viscosa*), apple of sodom (*Solanum linnaeanum*), and the occasional prickly pear (*pānini*) cactus (*Opuntia ficus-indica*). Several pockets of eucalyptus (*Eucalyptus* sp.*)* and silky oak (*Grevillea robusta*) and the occasional lone *kiawe* (*Prosopis pallida*) are scattered throughout the Study Area. Within actively grazed paddocks, cattle aid in keeping the vegetation cover down. Charred branches and trunks of numerous trees indicate that the area is prone to periodic wildfires. Soils within the Study Area are classified as belonging to the Waikoloa-Puu Pa complex on 2 to 10 and 10 to 20 degree slopes (Figure 5) (Soil Survey Staff 2017). These soils consist of a medial very fine sandy loam derived from weathered volcanic ash deposits overlying *‘a‘ā* lava flows that originated from Mauna Kea Volcano 250 to 65 thousand years ago during the Pleistocene epoch (Figure 6) (Wolfe and Morris 1996). Mean annual rainfall within the Study Area averages approximately 444.2 millimeters, with the majority of the rainfall occurring during the months of December and January, and the least occurring in August (Giambelluca et al. 2014). The climate is generally cool, with a mean annual temperature ranging from 59 to 72 degrees Fahrenheit (Giambelluca et al. 2014).

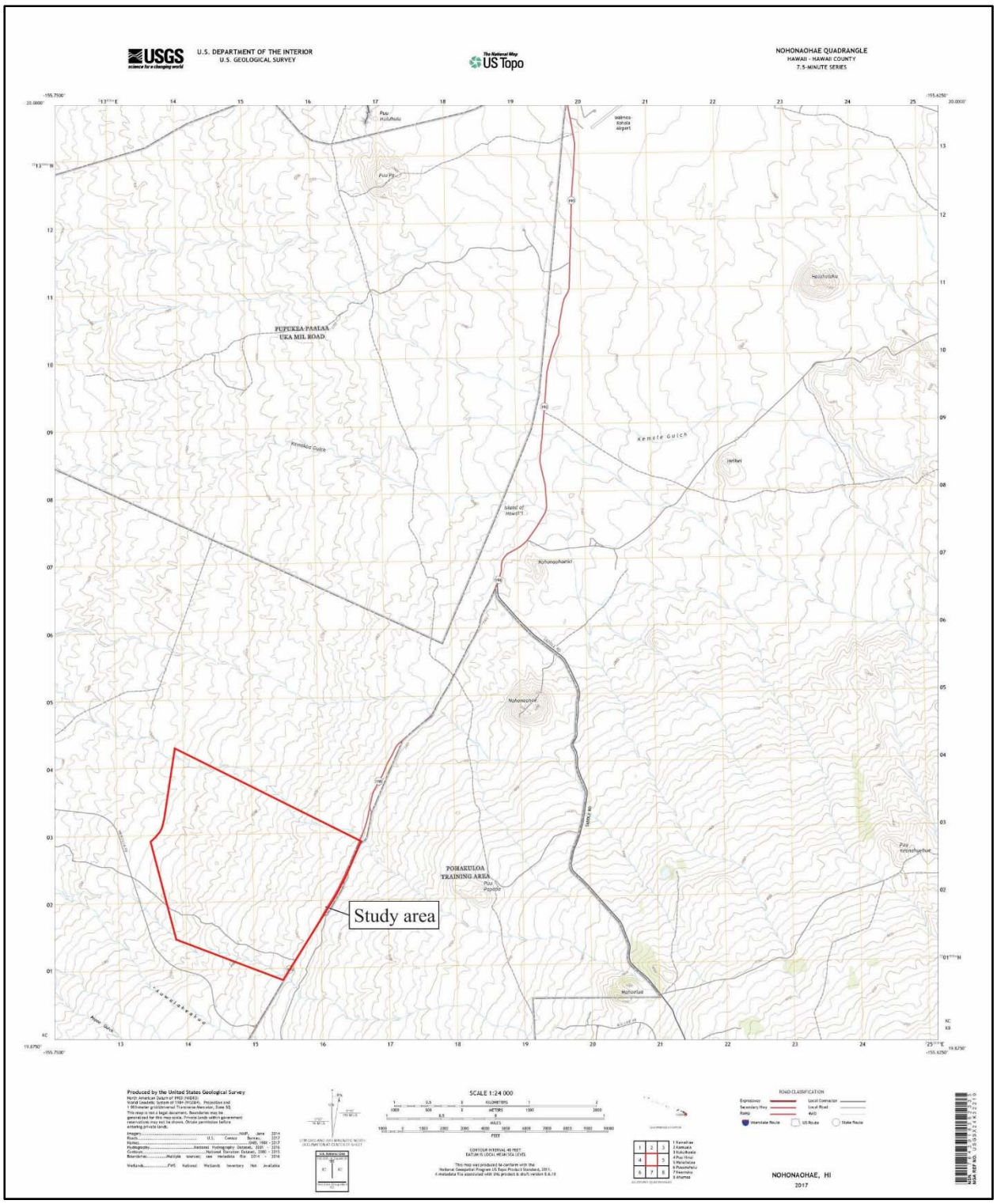


Figure 1. Study Area location plotted on 2017 Nohonaohae USGS quadrangle map.

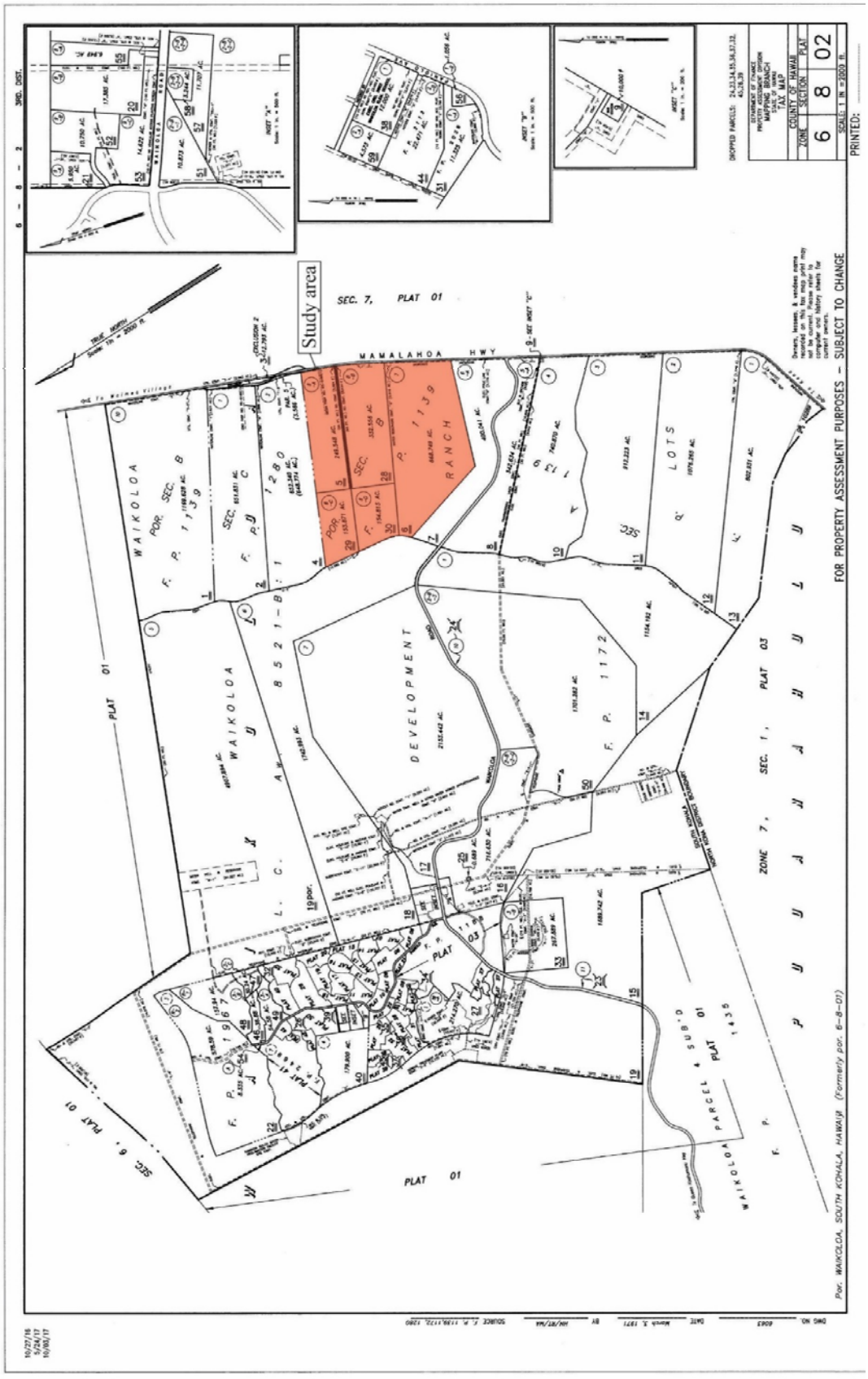
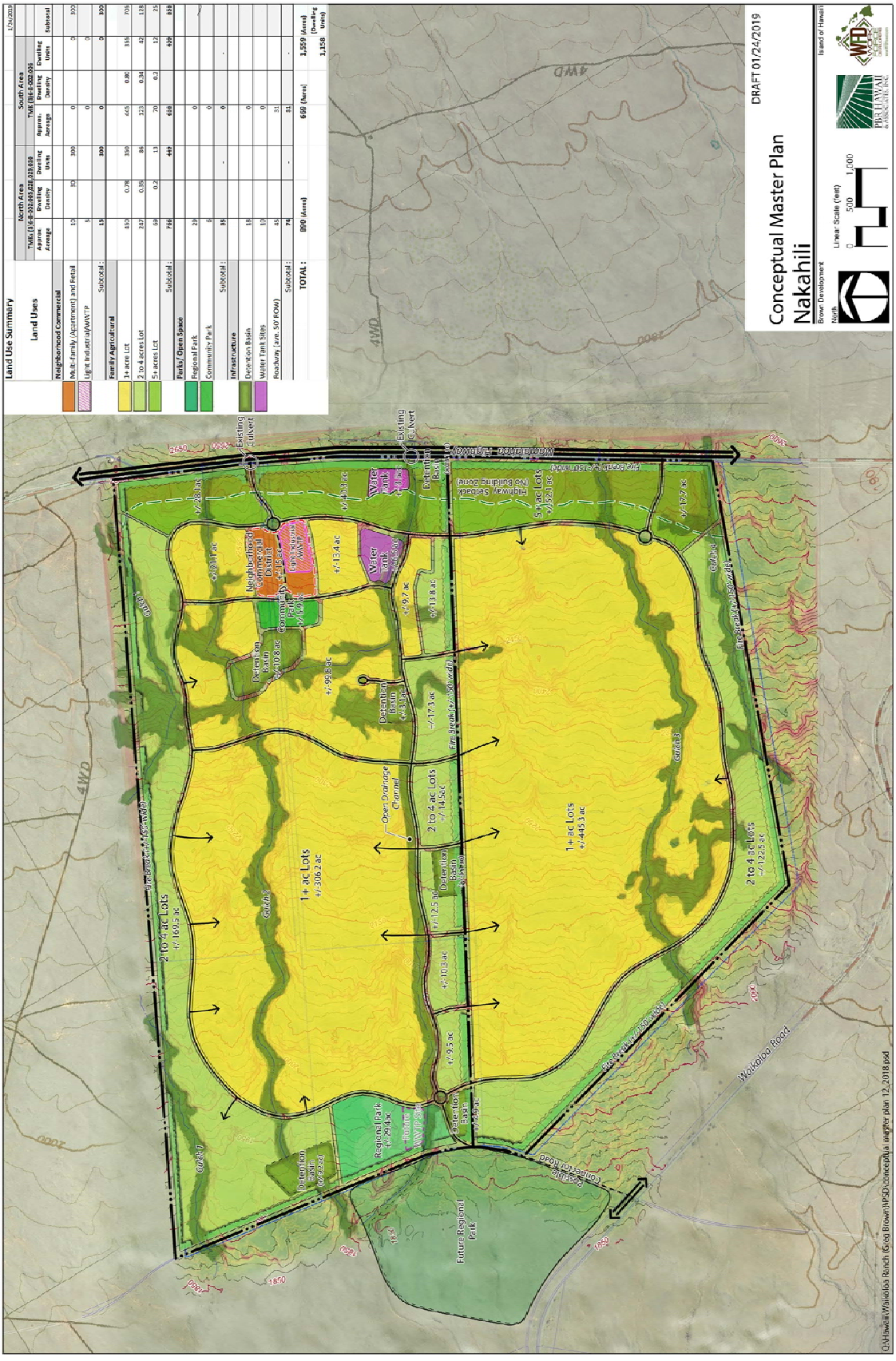


Figure 2. Tax Map Key (3) 6-8-002 showing location of Study Area (shaded red).



Figure 3. Google Earth™ satellite image showing Study Area location (outlined in red).


Land Use Summary
Land Uses
North Area
South Area
TMK: (3) 6-8-005:020 (por.) 039 & 048
TMK: (3) 6-8-005:055
Approx. Acreage
Dwelling Density
Dwelling Units
Subtotal
Neighborhood Commercial
Multi-Family (Apartment) and Retail
Light Industrial/WWTP
Subtotal :
Family Agricultural
1+ acre Lot
2 to 4 acres Lot
5+ acres Lot
Subtotal :
Parks/ Open Space
Regional Park
Community Park
Subtotal :
Infrastructure
Detention Basin
Water Tank Sites
Roadway (ave. 50' ROW)
Subtotal :
TOTAL :
800 (Acres)
650 (Acres)
1,559 (Acres)
1,158 (Dwelling Units)
DRAFT 01/24/2019
Conceptual Master Plan
Nakahili
Brown Development
Hawaii
North
Linear Scale (feet)
0
500
1,000
Waikoloa Road
Mamalahoa Highway
Future Regional Park
Future WWTP
Neighborhood Commercial District +/- 15 ac
Community Park +/- 6.9 ac
Regional Park +/- 29.4 ac
Water Tank +/- 3 ac
Water Tank +/- 3 ac
Water Tank +/- 3 ac
Detention Basin +/- 10.8 ac
Detention Basin +/- 9.8 ac
Detention Basin +/- 3.1 ac
Detention Basin +/- 17.3 ac
Detention Basin +/- 12.5 ac
Detention Basin +/- 10.3 ac
Detention Basin +/- 9.5 ac
Detention Basin +/- 5.9 ac
Detention Basin +/- 9.2 ac
Open Drainage Channel
Open Drainage Channel
Gulch
Gulch
Gulch

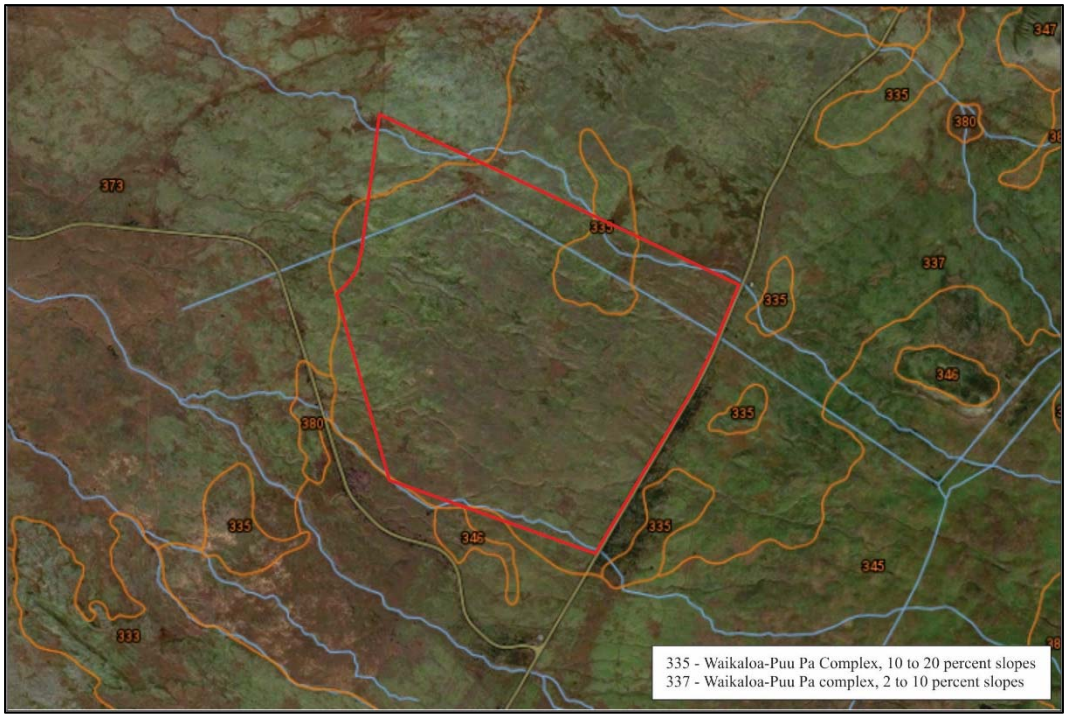


Figure 5. Map showing the classification of soils within the Study Area (USDA 2013).

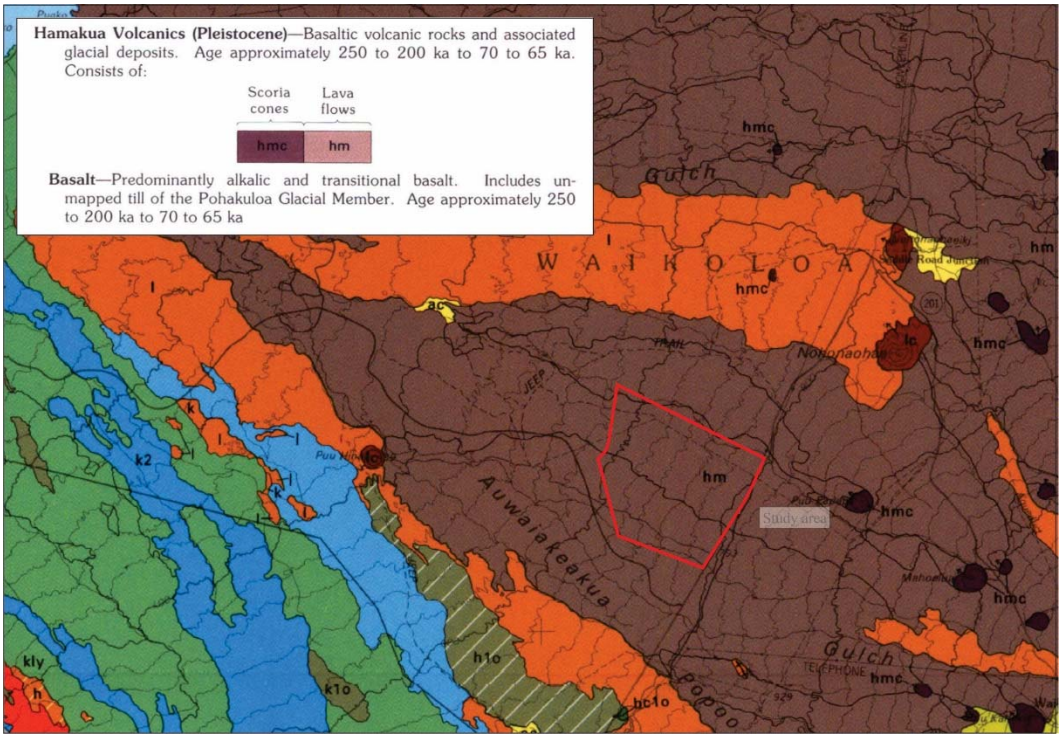


Figure 6. Map showing the Study Area lava flows (Wolfe and Morris 1996).

2. BACKGROUND

This section of the report includes a discussion of the cultural-historical background for the Study Area and a synthesis of relevant prior archaeological and cultural studies. This information is presented to provide a comprehensive understanding of the cultural significance of the Study Area and general vicinity and to establish an analytical basis for the assessment of any potential cultural impacts. The ability to assess the cultural significance of the Study Area is contingent upon developing (at a minimum), a comprehensive understanding of the *ahupua'a* in which the Study Area is located. As will be demonstrated in the ensuing section, a consideration of the broader region and island landscape is also required at times.

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 specific legendary references to Waikōloa and a discussion of the general settlement patterns for South Kohala. 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 South Kohala after contact. The summary includes a discussion of the changing lifeways and population decline of the early Historic Period, a review of land tenure in the study *ahupua'a* during the *Māhele 'Āina* of 1848, and the subsequent transition into the ranching industry during the last quarter of the nineteenth century and the first three-quarters 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, several theories have been offered that derive from various sources of information (i.e., genealogical, oral-historical, mythological, radiometric). However, none of these theories is today universally accepted (c.f. Kirch 2011). What is more widely accepted is the answer to the question of where Hawaiian populations came from and the transformations they went through on their way to establish a uniquely Hawaiian culture. The initial settlement in Hawai'i is believed to have originated from the southern Marquesas Islands (Emory in Tatar 1982). During these early times, Hawai'i's inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy and Handy 1991). This was a period of great exploitation and environmental modification when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order; which was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1880), the Hawaiians brought from their homeland certain universal Polynesian customs and belief: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *'aumakua* concept; and the concept of *mana*.

In the District of Kohala, the long ridge of the Kohala Mountains extends perpendicular to the predominant northeasterly trade winds, creating an orographic rainfall pattern that separates the district into two distinct environmental zones; a wetter windward zone on the eastern (Hāmākua) side, and a drier leeward zone on the western (Kona) side. The initial permanent settlements were established at sheltered bays with access to fresh water primarily in the windward valleys and gulches. The communities would have shared extended familial relations and had an occupational focus on the collection of marine resources. The upland habitation that followed focused on agricultural field systems, which undoubtedly provided much of the produce for the coastal inhabitants (Carlson and Rosendahl 1990). Most of the *kalo* (taro) and *'uala* (sweet potato) fields of this part of the island were located in the rainier uplands near the present-day town of Waimea, where there was a sizable permanent population as well. Waimea's high elevation, fertile landscape, and sufficient rainfall facilitated the creation and development of the Waimea Field System during the 16th century. The traditional cultivating places in the upland field systems were planted in sweet potato, irrigated *kalo*, *wauke*, *māmaki*, plantains, bananas, sugarcane, coconuts, and *hala* (Haun et al. 2003). Coastal residents in South Kohala, however, relied primarily on the ocean for sustenance, and they augmented their diet with produce procured through trade with the upland areas. Marine resources were brought ashore in the small bays with sandy shores found in the coastal section of Waimea (now called South Kohala), where, as Handy and Handy (1991:532) relate, fishermen lived and probably cultivated potatoes in small patches."

The earliest inhabitants of the region emphasized the use of natural caves and overhangs, along with the construction of small, simple surface features for habitation purposes, but as populations increased and expanded, so did the occurrence of more permanent habitation structures in both the coastal and upland areas (Jensen 1994). A network of coastal and inland trails, over which the exchange of goods occurred, connected the coastal and upland population centers and resource areas (Hommon 1976). Over a period of a few centuries, the areas with the richest

natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the common people. As populations increased so did societal conflict, which resulted in hostility and war between neighboring groups (Kirch 1985). Soon, large areas of Hawai‘i were controlled by a few powerful chiefs.

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

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

By the 17th century, large areas of Hawai‘i Island were controlled by a few powerful *ali‘i ‘ai moku*. There is island-wide evidence to suggest that growing conflicts between independent chiefdoms were resolved through warfare, culminating in a unified political structure at the district level. It has been suggested that the unification of the island resulted in a partial abandonment of portions of leeward Hawai‘i, with people moving to more favorable agricultural areas (Barrera 1971; Schilt and Sinoto 1980). ‘Umi a Līloa, a renowned *ali‘i* of the Pili line, is often credited with uniting the Island of Hawai‘i under one rule during the Precontact Period (Cordy 1994). ‘Umi-a-Līloa is also credited with formalizing the land division system on Hawai‘i Island and separating the various classes of chiefs, priests, and laborers (Beamer 2014; Cordy 2000; Kamakau 1992). Upon the death of ‘Umi-a-Līloa, Hawai‘i Island came under the control of his eldest son Keli‘iokāloa-A-‘Umi (Cordy 2000), whose reign is marked by his mistreatment of the lesser chiefs and commoners. His reign was short lived and by the early eighteenth century Hawai‘i Island fell under the control of Alapa‘inui, who assembled a robust army and assigned his closests potential usurpers (his nephews Keawema‘uhili, Kalani‘ōpu‘u, and Keōua) as generals in his militia. The prodigious ‘Ī clan, spread across the districts of Ka‘ū, Puna, Hilo, and portion of Hāmākua was also a powerful force and threat to Alapa‘i campaign (Cordy 2000). As Alapa‘i gathered his forces to strike back at Kekaulike, the *ali‘i nui* of Maui, the high ranking *ali‘i wahine* (chiefess) Keku‘iapoiwa made her way to Kokoiki, Kohala to gave birth to Pai‘ea, the birth name of Kamehameha (ibid.). Kamehameha was reared in the traditions and customs of the ancient chiefs and trained under some of the most skilled warriors of that time including Kekūhaupi‘o. Upon Alapa‘i’s death, his eldest son Keawe‘ōpala was named heir to the kingdom. By the mid eighteenth century, the young and determined Kamehameha directed his efforts toward consolidating Hawai‘i Island under his rule. To accomplish this monumental task,

Kamehameha continued his training under his more experienced kin namely Kalani‘ōpu‘u, who was the *ali‘i nui* of Hawai‘i Island (‘Ī‘ī 1959). During Kalani‘ōpu‘ū’s reign, the first foreign vessels arrived in Hawaiian waters captained by British explorer, James Cook. Cook first landed at Waimea, Kaua‘i in 1778 and in 1779, he anchored just off the shores of Kealakekua Bay, Kona. Aboard these ships were innovative technologies and diseases unknown to the inhabitants of these islands. Items such as metal, nails, guns, canons, and the large foreign vessels themselves stirred the interest of the *ali‘i* and *maka‘āinana* alike. Acquisition of these technological advancements came through barter. This resulted in the *ali‘i* gaining possession of such items that ultimately set traditional Hawaiian warfare in new trajectory; one that would be forged by none other than Kamehameha. Wars occurred regularly between intra-island and inter-island polities during this period. It was during this time of warfare that Kamehameha, who would eventually rise to power and unite all the Hawaiian Islands under one rule (Kamakau 1992).

A Brief History of Hawai‘i After Western Contact

The arrival of Western explorers in Hawai‘i signified the end of the Precontact Period and the beginning of the Historic Period. With the influx of foreigners, Hawai‘i’s culture and economy underwent drastic changes. Demographic trends during the early Historic Period indicate population reduction in some areas, due to war and disease, yet increase in others, with relatively little change in material culture. At first, there was a continued trend toward craft and status specialization, intensification of agriculture, *ali‘i* controlled aquaculture, the establishment of upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although western influence was already altering the cultural fabric of the Islands (Kent 1983; Kirch 1985). Foreigners very quickly introduced the concept of trade for profit, and by the time Kamehameha had conquered O‘ahu, Maui, and Moloka‘i, in 1795, Hawai‘i saw the beginnings of a market system economy (Kent 1983). Some of the work of the *maka‘āinana* shifted from subsistence agriculture to the production of foods and goods to trade with early visitors. Introduced foods often grown for trade included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845). In 1819, Kamehameha died and the *kapu* system that governed all aspects of traditional Hawaiian society was symbolically abolished when Liholiho (son of Kamehameha) ate in the presence of his mothers Keōpūolani and Ka‘ahumanu. Shortly after 1820, Christianity established a firm foothold in the islands, and introduced diseases and global economic forces began to have a devastating impact on traditional life-ways.

WAIKŌLOA AHUPUA‘A AND THE GREATER SOUTH KOHALA DISTRICT

The Study Area is located within Waikōloa Ahupua‘a, in the traditional *moku* (district) of South Kohala, a portion of which comprises the traditional *moku-o-loko* of Kohala. Kohala is comprised of some seventy *ahupua‘a* on the leeward shores of Hawai‘i Island. The modern-day *ahupua‘a* of Waikōloa, which translates literally as “duck water” (Pukui et al. 1974:223), is bounded to the west by the fishponds of ‘Anaeho‘omalu and Kalāhuipua‘a, to the north by Lālāmilo Ahupua‘a, to the east by Pā‘auhau Ahupua‘a, and to the south by the *ahupua‘a* of Pu‘u Anahulu (Figure 7). The following traditional Hawaiian proverb describes the extent of the Kohala district, spanning from Honoke‘ā in the north, to Keahualono at the south:

> *Kohala, mai Honoke‘ā a Keahualono.*
> Kohala, from Honoke‘ā to Keahualono.
> The extent of Kohala. (Pukui 1983:196)

While Waikōloa is referred to today as an *ahupua‘a*, traditionally it was an *‘ili* of the *kalana* (or *‘okana*) of Waimea, and in ancent times was referred to as Waikōloa Nui (Figure 8). As a *kalana*, Waimea was treated as a sub-district: smaller than a district (*moku-o-loko*), but composed of several other land divisions, such as *ahupua‘a* and the more independent *‘ili kūpono*, all of which contributed to its wealth (Maly and Maly 2002). The lands subject to the *kalana* of Waimea were those that form the southern limits of the present-day South Kohala District including ‘Ōuli, Wai‘aka, Lālāmilo, Puakō, Kalāhuipua‘a, ‘Anaeho‘omalu, Kanakanaka, Ala‘ōhi‘a, Paulama, Pu‘ukalani (Pukalani), Pu‘ukapu, and Waikōloa (Figure 9). In ancient times, Waikōloa was referred to as Waikōloa Nui, and the neighboring area of Lālāmilo was referred to as Waikōloa Iki (Maly 1999). Bernice Judd, a former librarian at the Hawaiian Mission Children’s Society, explains that:

> In the early days Waimea meant all the plateau between the Kohala Mountains and Mauna Kea, inland from Kawaihae. This area is from eight to ten miles long and from three to five miles wide. There was no running water on Mauna Kea, so the inhabitants lived at the base of the Kohala Mountains, where three streams touched the plain on their way towards the sea. . . The middle stream, which was famous for wild ducks, was named Waikoloa, or Duckwater. This and the most westerly stream, called Kahakohau, went towards Kawaihae, but neither reached the sea, except in times of flood. (Judd 1932:14)

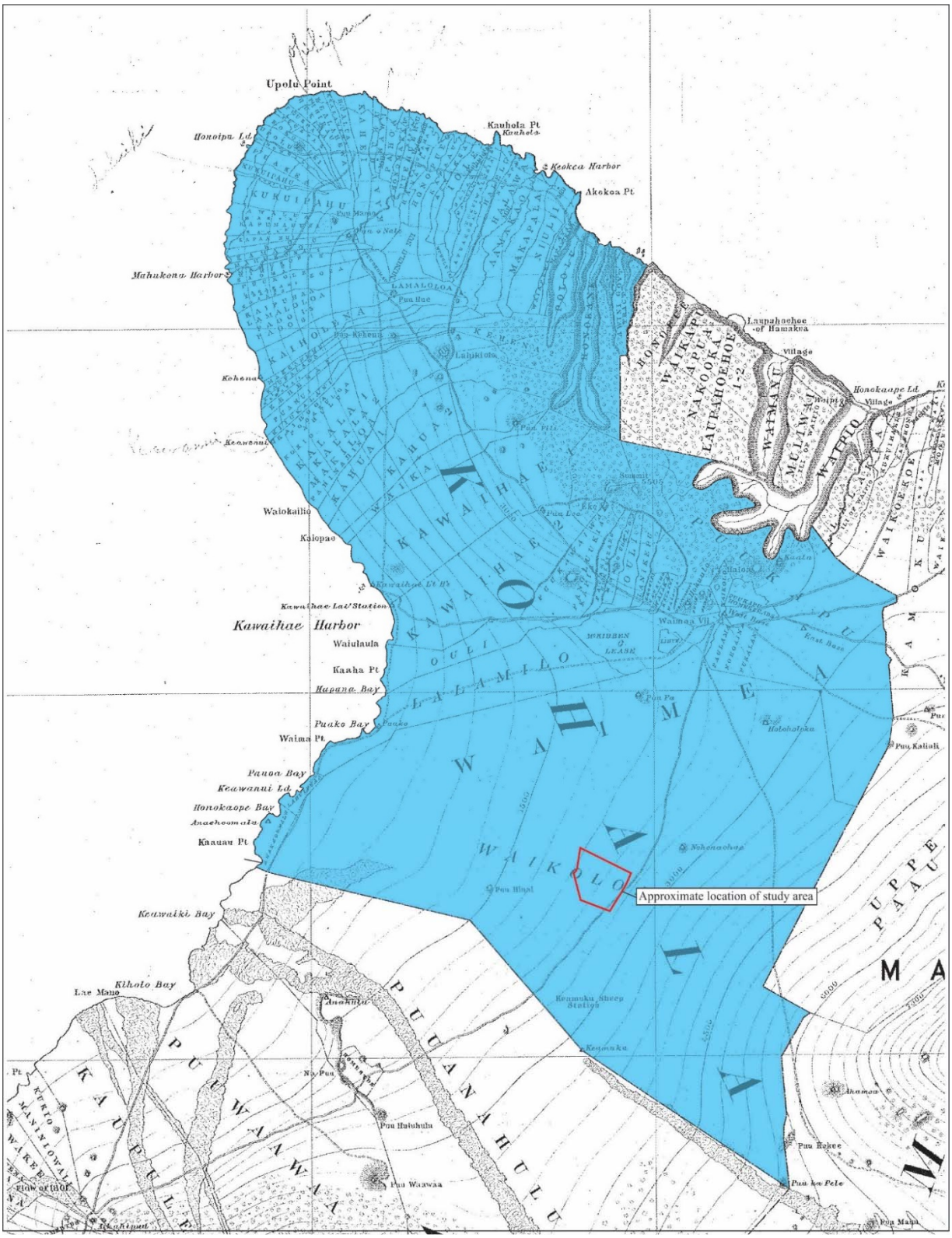


Figure 7. Portion of Hawai‘i Registered Map No. 2060 by John M. Donn (ca. 1901) showing location of the Study Area within Waikōloa.

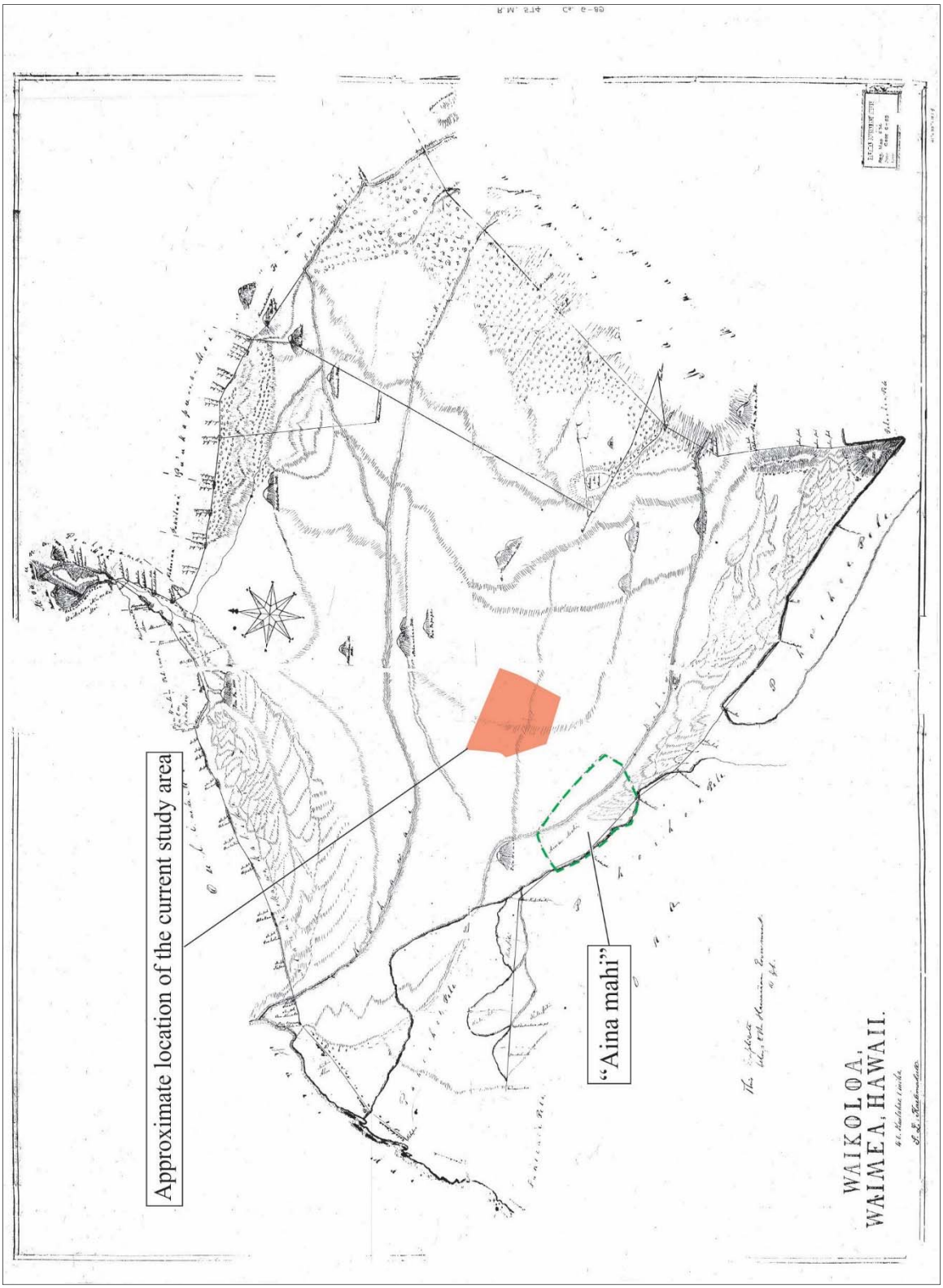


Figure 8. Hawai'i Registered Map No. 574 by Kaelemakule showing the approximate location of the current Study Area (shaded red).

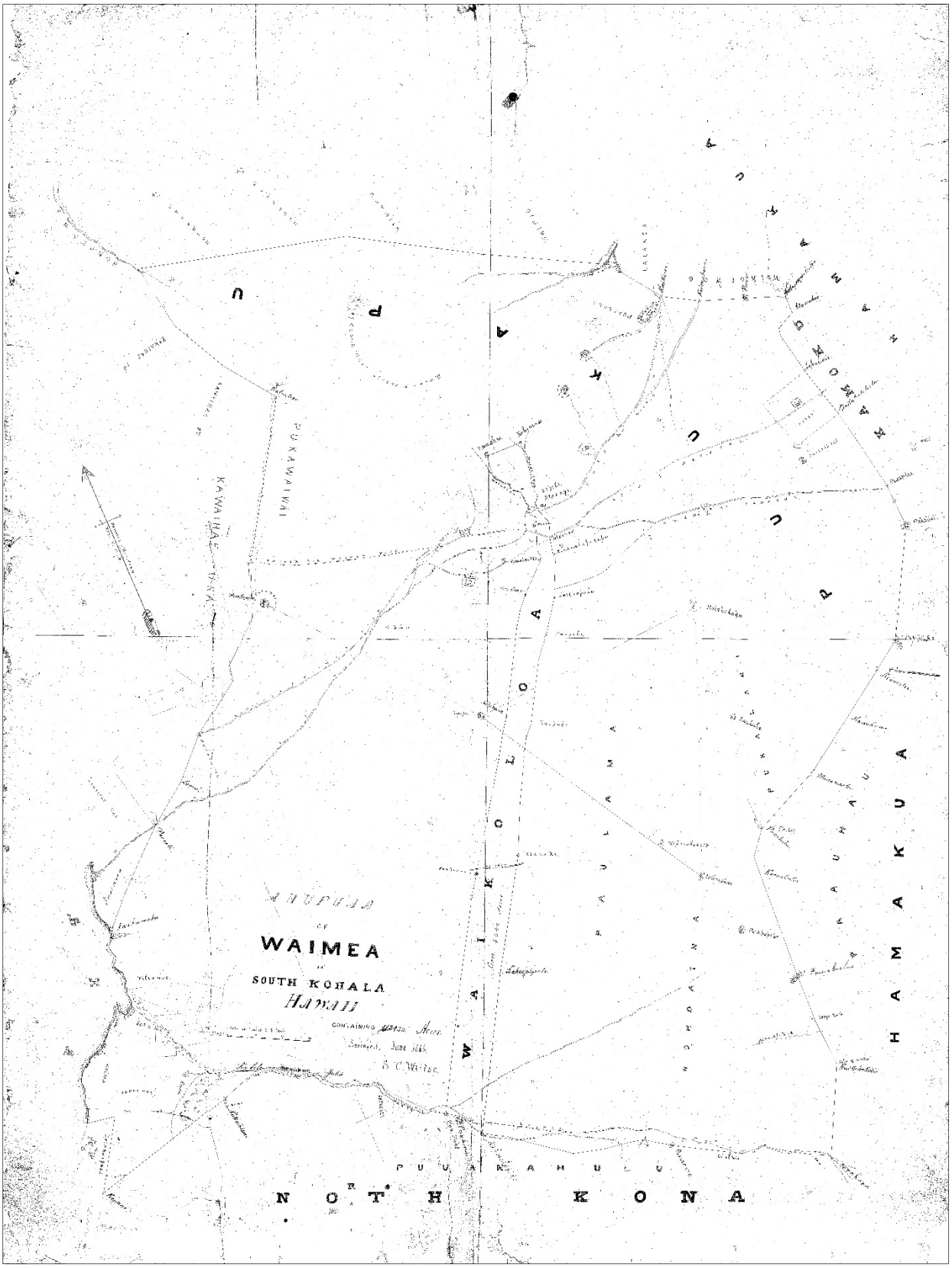


Figure 9. Hawai‘i Registered Map No. 712 showing the *kalana* of Waimea and associated *ahupua‘*a, prepared by S.C. Wiltse, June 1866.

Select *Mo'olelo* for Waikōloa and the Greater South Kohala District

As the Hawaiian people had no written language until after the arrival of the first Protestant missionaries in 1820, traditional *mo'olelo* (stories, tales, and myths), *mele* and *oli* (songs and chants), and *'ōlelo no'eau* (proverbs and sayings) were passed down orally from one generation to the next. Traditional *mo'olelo* associated with Waikōloa are limited, and those recorded focus primarily on the famous winds of the Kohala region including the intense *Mūmuku*, *'Āpa'apa'a*, and namesake *Waikōloa* winds. Other references to Waikōloa include exalted figures in Hawaiian history such as Lonoikamakahiki, Kamalālāwalu, Keawenui a 'Umi, and the inclusion in at least one eminent battle that played a significant role in the sociopolitical history of Hawai'i Island.

The Ancestry of Waikōloa in The Heart Stirring Story of Ka-Miki

The name of a land division sometimes indicates its importance, records its history, or reveals something about its resources or population. A traditional *mo'olelo*, "The Heart Stirring Story of Ka-Miki" (*Ka'ao Ho'oniua Pu'uwai no Ka-Miki*), originally appeared in the Hawaiian language newspaper *Ka Hōkū o Hawai'i* between 1914 and 1917. This *mo'olelo* was likely authored during the late 1800s through early 1900s by noted Hawaiian scholars John Wise and J.W.H.I. Kihe. Maly (1998:17) notes that although this *mo'olelo*:

> . . . 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.

This tale tells of the two supernatural brothers, Ka-Miki and Maka-'iole, who were skilled *'ōlohe* (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 *'ōlohe.* Upon the mysterious and premature birth of Ka-Miki, he was placed in the cave of Pōnahanaha and given up for dead. He was eventually saved and raised by his ancestress, Ka-uluhe-nui-hihi-kolo-i-uka, a manifestation of the goddess Haumea, at Kalama'ula, an area located on Hualālai. Ka-Miki was later joined by his elder brother Maka-'iole, and their ancestress trained her grandsons in *'ōlohe*, or experts skilled in fighting, wrestling, debating, riddle solving, running, and how to use their supernatural power.

A portion of this tale describes the naming of South Kohala's land divisions, and focuses explicitly on the Waimea region and three associated *'ili*, including Lālāmilo, Puakō, and Waikōloa:

> Pili-a-Ka'aiea the chief of Kona greatly loved octopus fishing, and had sent several messengers to inquire of Lālāmilo how he might acquire the lure. All of the messengers were killed by Lālāmilo and Piliamo'o. While at the contest field called Hinakahua in Puapua'a, Ka-Miki agreed to fetch the lure for Pili as one of the conditions he needed to fulfill in order to become the foremost favorite of Pili. Now as these events at the court of Pili were unfolding, Lālāmilo decided to visit his father Pu'u-hīna'i; his sister Pu'u'iwa'iwa; and his grand aunt Waikōloa, who was Pu'u'iwa'iwa's guardian. To this day, places are named for all of these people as well.
>
> Lālāmilo arose and told his wife Puakō, and his mother Nē'ula that he was going to the uplands to visit his father, sister, and the people who worked the upland plantations. Lālāmilo desired to eat the sugar cane and bananas, and drink the *'awa* which grew on the hill of Po'opo'o. Po'opo'o was also the name of a seer (makāula) who saw to the continued peaceful dwelling of the people. Lālāmilo placed the lure in Kanakanaka's gourd and secured it near the ridge pole of his house. Lālāmilo then asked Puakō and Nē'ula to go and look after the gourd in which the *'ōnohi* (eyeball or cherished possession) of Ha'aluea was kept.
>
> Lālāmilo then departed and traveled up towards the residences and agricultural lands of Pu'uhīna'i *mā*, as he drew near his destination, his thoughts returned to the lure. Lālāmilo looked towards the ocean, and his desire to see the lure was very great (July 5, 1917). At the same time, Lālāmilo also had a premonition, so he returned to the shore without visiting his father and sister. During the time when Lālāmilo was gone, Ka-Miki had traveled to Lālāmilo's land and met with a man of the area named Nīheu. Ka-Miki inquired, "Where is the chief Lālāmilo's house?" Nīheu said, "It is there above the canoe landing." Ka-Miki then asked, "And where is the chief?" Nīheu responded by saying, "I don't know, perhaps he is in the house." Ka-Miki then went to Lālāmilo's house, peering in he saw the gourd container and he lowered it, removing the cordage. Ka-Miki then took out the lure and departed from Lālāmilo without incident. . . (Maly 1998:28)

Another portion of the legend was set in Waikōloa, where the brothers collected a native sedge to strain *ʻawa* (kava; *Piper methysticum*) to mix with the sacred waters from Mauna Kea. Upon transporting the bowl of *ʻawa* from Holoholokū in Waimea, a gust of wind identified in the story as the Waikōloa wind blew a bit of the sacred water out of the bowl, thereby forming a spring called Waikiʻi:

> Upon completing their training, Ka-uluhe sent Ka-Miki and Makaʻiole to fetch *ʻawa* from Waipiʻo water from a sacred spring on Mauna Kea, and other items needed to prepare the *ʻawa* for drinking. While traveling on the plain of Waikōloa, Ka-Miki and Maka-ʻiole gathered the sedge Ka-lau-o-ke-Kāhuli which was to be used for straining the ceremonial *ʻawa* drink. At Holoholokū, some of the sacred water of Kāne which Ka-Miki was carrying in the *ʻawa* bowl Hōkūʻula was lifted out by the wind, Waikōloa. The water was carried some distance, and where it fell a spring was formed. The deity Pōhaku-a-Kāne retrieved some of the water from the spring, and carried it to his companion deity Pōhakuloa at the base of Mauna Kea. The spring from where Pōhakuakāne fetched the water came to be called Waikiʻi (Water fetched). . .
>
> While on their journey around the island, the brothers stopped at Kapalilua, South Kona, and Ka-Miki was described as the skilled *ʻōlohe* from the lands of Nāpuʻu (the Puʻu Anahulu-Kekaha region). In describing Nāpuʻu, the wind Waikōloa was mentioned:
>
> Nāpuʻu (pū) ʻAlu Kinikini i kuʻia e ke ao-lewa i ka makani i ka hoʻohae a ka Nāulu, i ka hōʻelo ʻia e ka Waikōloa a me ke Kaumuku kuehu lepo i ke kula pili – the many gullied or folded hills where the wind borne Nāulu rain clouds appear, [land] moistened by the Waikōloa wind, with the Kaumuku winds which stir up the dust on the pili grass covered plain. . .
>
> Native historian Samuel Kamakau also wrote that Waikōloa was one of several winds that came to Hawaiʻi from Kahiki when they were sent by Lonopele as he tried to destroy the priest Pāʻao and his companions. (Maly 1999:25)

The Legend of Kuapākaʻa and the Wind-Gourd of Laʻamaomao

The winds of Kohala are also enumerated in a traditional *moʻolelo* featuring the famous wind-gourd Laʻamaomao, which was said to contain all the winds of Hawaiʻi. Originally published by Moses Kuaea Nakuina, the legend relates the story of Pākaʻa, son of Laʻamaomao and Kūanuʻuanu and the highly trusted, personal attendant and favorite of the *aliʻi ʻai moku* Keawenui a ʻUmi, grandson of celebrated *aliʻi nui* ʻUmi a Līloa. Pākaʻa succeeded his father as *kahu* (personal attendant) of Keawenui a ʻUmi, and had charge over many belongings, and he dutifully served the the *aliʻi* by keeping a close and careful watch over his material possessions. But Pākaʻa's greatest and most cherished responsibility was the keeping of a highly treasured personal possession: a very special and sacred *ipu* (gourd) passed down to him from his mother. Originally, the *ipu*, known as the wind-gourd of Laʻamaomao, belonged to Pākaʻa's grandmother. Nakuina (2005:14–15) explains the gifting of the *ipu* to Pākaʻa and the instructions from his mother:

> Then Laʻamaomao lifted the lid of a large calabash and took out a small, long, highly polished gourd in a woven bag. The gourd was covered securely. She [Laʻamaomao] turned to her keiki and said, "I'm giving you this gourd which belonged to your extraordinary kupunawahine for whom I was named. Her bones are inside the gourd. While she was alive, she controlled all the winds of the islands—she had them under a supernatural power. She gathered all the winds and put them into this gourd, where they're still kept. She memorized one by one the names of all the winds of Hawaiʻi to Kaʻula. On windless days, she could remove the cover and call out the name of a wind, and the wind in this gourd would blow. This gourd, called 'the wind gourd of Laʻamaomao,' was famous.
>
> Before she died, she entrusted me to put her bones inside this gourd and care for them until I had a child. Then I was to give the gourd to the child to watch over. You're my only child, so now I'm giving the gourd to you. You must look after it according to the wishes of your extraordinary kupunawahine.
>
> You must care for this gourd because it had been handed down from the kupuna. This gourd has great value—you may not think so now, but when you sail with the aliʻi and arrive at an area where no wind blows and the canoes are becalmed, say that the winds are at your command; all you have to do is call, and the winds will blow.
>
> "When you're laughed at, remove the lid of the gourd and call for a wind. The wind will blow and bring the canoes to shore. The aliʻi will be grateful to you, and you'll be loved and valued by him."

> Before Pākaʻa sailed off, Laʻamaomao taught him the names of all the winds, along with the prayers, songs and chants concerning them, and when she was done, Pākaʻa had memorized everything. Then he took the wind gourd and tied it with a cord he had made, prepared his other things for the voyage, and left home.

Pākaʻa settled into his role as *kahu*, and he became the utmost favorite of Keawenui a ʻUmi. However, the favoritism of Pākaʻa inspired considerable virulence and collusion against him by two men, Ho-okele-i-Hilo and Hoʻokele-i-Puna. The pair conspired to entrap Pākaʻa in scandal by spreading untruths about him to Keawenui a ʻUmi and slandered his name in an effort to undermine Pākaʻa's prestige in the eyes of his *haku* (master). Keawenui a ʻUmi was incensed, and relinquished all of Pākaʻa's gifted lands and authority, transferring all power to the two antagonistic men who had usurped Pākaʻa's power with their cruel deception. Utterly hurt by Keawenui a ʻUmi's naivety to the slander that had befallen his name, Pākaʻa gathered some of the belongings of his former *haku*, placed them inside his special family heirloom, departed from Waipiʻo, and eventually made a life for himself on Molokaʻi. While on Molokaʻi, Pākaʻa fathered a son, Kūapākaʻa whom he groomed the way his own father had groomed him, to one day serve the man who would one day become his *haku* and avenge Pākaʻa's enemies.

Meanwhile, the true character of the two schemers who deposed Pākaʻa of his esteemed position began to surface, and Keawenui a ʻUmi grew regretful of his decision to scorn his former *kahu* in their favor. The tale continues with Keawenui a ʻUmi's frantic and persistent search for Pākaʻa, with whom he had been communicating with in dreams. Pākaʻa and Kūapākaʻa knew that the *aliʻi* would come searching for them, and strategically positioned themselves in their canoe where they fished for *uhu* (parrot fish) in the dark of morning off the shore of Molokaʻi. Keawenui a ʻUmi's party approached the pair, but unsuspected their true identity, especially because Pākaʻa had assumed the guise of a hunched-over deaf fishermen. The six fleets of men and chiefs from each district on Hawaiʻi Island approached Pākaʻa and Kūapākaʻa, led by the *aliʻi* of Kohala, Wahilani:

> Then Wahilani's canoe passed by, and Kūapākaʻa called out loudly: "Wahilani, our aliʻi of Kohala goes by. He's not an aliʻi, only a kaukaualiʻi [low-ranking chief] who hides himself in the stands of Kohala cane. The only iʻa in his land is the grasshopper—there on the sugarcane leaf, there on the flower-stem of grass. Kohala is a land without any iʻa and the only ʻai is the sweet potato. The defect in the land is that Wahilani is not an aliʻi, yet he enjoys the bounty of Kohala, so he's called an aliʻi." (Nakuina 2005:31)

With each passing fleet, Kūapākaʻa continued to hurl insults, incensing each district *aliʻi*, who continued past the father and son allowing Keawenui a ʻUmi's bevy closer and closer to them. Just before dawn, as Keawenui a ʻUmi's party approached, Kūapākaʻa chanted to his *haku* at the request of his father. His chant was rivaled by a chant from the Kuhina Nui, Kahikuokamoku, who was part of Keawenui a ʻUmi's party and unaware of the youth's true identity. Kūapākaʻa, in an effort to lure Keawenui a ʻUmi's party onshore so he could isolate Ho-okele-i-Hilo and Hoʻokele-i-Puna, continued his chants implicating impending stormy weather. However, Kahikuokamoku challeneged his prophecy, arguing the impossibility of poor weather, and refused to come ashore. Furthermore, Kahikuokamoku challenged Kūapākaʻa's knowledge of Hawaiʻi Island's winds, for how could a young native boy from Molokaʻi possibly understand and foretell that strong winds would be heading towards them from Hawaiʻi Island and cause havoc enough that they would be forced upon the shore. In response, Kūapākaʻa drew upon his heirloom gourd and his ancestral knowledge, and began chanting his warning of destruction (bolded, italicized, and underlined emphasis added):

> Hurry, hurry,
> The source of the storms of Hilo,
> Is the wind called ua kea,
> Shearing off the edges of a hale and breaking it up,
> Kēpia is of Hilo of the upright cliffs,
> Uluau is of Waiākea,
> Ulumano, ʻAwa, Puʻulena,
> Moaniʻala are of Puna,
> **The winds of <u>Kuamoaʻe</u> have gathered,**
> **My <u>Moaʻe</u>, the wind that is swelling,**
> Apaiahaa is at Kanakaloloa,
> Hau is of Kapalilua,
> ʻEka is of Kona,
> Kipu is of Kahuā,
> ʻEʻelekoa is of Uli,

Kīpu‘upu‘u is of *Waimea*,
‘Ōlauniu is of Kekaha,
Pa‘ala‘a is in the ocean,
Nāulu is of *Kawaihae*,
A wind that comes
And dashes the milo leaves of *Makaopau*,
***Kalāhuipua‘a*, ‘Āpa‘apa‘a is of *Kohala*’s upland cliffs,**
The wind that flies about like vapor,
Pu‘ukolea is of Kapa‘au,
Holopo‘opo‘o is of Waipi‘o,
‘Aeloa is of Hāmākua,
Kona is the wind of the sky
Above the ‘Alenuihāhā sea,
You should come ashore,
The spray of the sea flies up,
The spray of the wind, a storm is coming (Nakuina 2005:39–40)

Keawenui a ‘Umi was rapt with attention at the youth’s enumeration, so Kūapāka‘a continued chanting, the winds of Hawai‘i:

At Ka‘ū’s windy cape is Ka ‘Īlio a Lono,
The paddle is dipped into the sea of Kāiliki‘i,
At Puna’s foundation turns the sun, the light,
Go and feel the wind of Kumukahi,
Hilo’s wind-blown rain at sea,
The rain is seaward, over the hala of Leleiwi,
The spray of rain is at Hāmākua,
Hāmākua is the bridge to the cliffs,
At Kohala-iki is the Moa‘e wind, the Moa‘e blows,
Kona awakens with the Kēhau breeze,
Kona’s burden diminishing with the Kēhau breeze,
Keawenuia‘umi, come ashore, a storm is coming. (ibid.:40)

He continued:

There, there are the winds rising from the earth,
The ‘Āpa‘apa‘a is of *Kohala*,
The rainy wind called Nāulu is of *Kawaihae*,
The Kīpu‘upu‘u is of *Waimea*,
A cold wind that hurts the skin,
A wind that whips the kapa of that land about,
Tossing up dust before it,
Frightening the procession of travelers,
‘Ōlaniu is the wind,
Pili-a is of Kanikū,
A‘e is of Kala‘au,
Pohu and ‘Eka are the winds of Kona,
Ma‘a‘akuulapu is of Kahalu‘u,
Pilihala is of Ka‘awaloa,
Kēhau is of Kapalilua,
Piuohooilo is of Ka‘ū,
Ho‘olapa is of Kamā‘oa,
Kuehulepo is of Nā‘ālehu
Uahipele is of Kīlauea,
‘Awa is of Leleiwi,
Pu‘ulena is of Waiākea,
Uluau is of Hilo-pali-kū,
Koholālele is of Hāmākua,
Holopo‘opo‘o is of Waipi‘o,

The tip of that wind,
The tip of this wind,
They will twist into a whirlwind,
The bundle of bones at the back of the canoe exhaling,
Breaking off the buoy floating at the front;
Taking the load from the swamped canoe,
The small canoe will be swamped,
Destroyed with the large canoe,
The aliʻi will die, the kahuna will die,
The weak will die, the strong will die,
The dark wisemen, the bright wisemen,
They will search out, they will confer
To locate the stars of the wave,
O Hōkūʻula, O Hōkūlei,
They will swimp singly, they will swim by twos,
Yesterday was a calm day,
A crowd of fishermen was at sea,
The paddling of the good canoes,
The strength of the hoewaʻa,
The wisdom of the hoʻokele,
Don't go far out to sea, ē dear ones,
Stop here, those from Hawaiʻi,
Come here over the sea surface,
You will be possessed on Oʻahu,
There will be darkness only on calm Oʻahu,
Yesterday was calm, today will be stormy;
Keawenuiaʻumi, come ashore, a storm is coming. (ibid.:41-42)

After Kūapākaʻa's recital of the winds of Hawaiʻi, Oʻahu, Kauaʻi, Maui, and Kaʻula, Keawenui a ʻUmi became unsettled with suspicion that the boy's forecast would be realized. Perturbed at the possibility of meeting certain death in the face of violent weather, Keawenui a ʻUmi consulted with his two advisors, and thus the ultimate targets of the trickery, who adamantly insisted that Kūapākaʻa was lying and that they should depart. Kūapākaʻa continued chanting his warning, enumerating upon the winds of Maui and Molokaʻi in an effort to beguile them onshore, but Keawenui a ʻUmi's party still retained suspicion and were not sure if they were being duped. Kahikuokamoku demanded the youth's name, but Kūapākaʻa denied him, arguing that he would reveal his name once the men landed, but they did not comply, and instead the canoes sailed off to Oʻahu.

Soon after their departure, and upon the command of his father, Kūapākaʻa chanted:

Ē winds that I've called,
Blow here, those of Kaʻula and Kauaʻi first,
Those of Oʻahu and Hawaiʻi from the sides,
Those of Maui and Molokaʻi last,
Blow true, and overtake the canoe fleet
Of Keawenuiaʻumi, the aliʻi. (ibid.:63)

And with this utterance, every wind that had escaped Kūapākaʻa's lips through chant ravaged the atmosphere, wreaking utter havoc upon Keawenui a ʻUmi's fleet. Soon, the survivors and their *aliʻi* made their way back to Molokaʻi to escape the mayhem, and were led safely to shore by Kūapākaʻa and his father, who continued to play the role of the unassuming fisherman. Keawenui a ʻUmi was cold and wet from the escapade, and Kūapākaʻa was concerned for his well being:

> By evening, all the canoes had landed, but Keawenuiaʻumi remained on the platform of his double-hulled canoe because he had no dry kapa or malo to wear since all his clothing had been lost at sea. Kūapākaʻa saw his haku shivering on the canoe, so he went to speak to his father: "I pity my haku because he's suffering from the cold. He just sits there in a wet malo on the canoe, without any kapa covering."
> Pākaʻa took out one of Keawenuiaʻumi's malo which he had cared for when he was the aliʻi's kahu; he gave it to his keiki: "Here's one of your haku's malo. Take it to him. Ask him to remove the wet malo he's wearing and bring it back here. Tell him that this malo you give him is yours."

> Kūapākaʻa took the dry malo and offered it to Keawenuiaʻumi saying, "Here's my insignificant malo for you. Please remove your wet one."
> Keawenuiaʻumi gave his wet malo to Kūapākaʻa, and the keiki gave the aliʻi the dry one. Keawenuiaʻumi noticed the dry malo looked very much like one of his own. He said to Kūapākaʻa, "Perhaps this is one of my malo—it looks like one of mine."
> The keiki said, "The malo is mine. My mother beat the kapa for it and I was saving it until I could wear it in public as an adult. But now it's yours, my haku."
> After the aliʻi had taken off his wet malo and put on the dry one, he placed the wet one in the keiki's care.
> The keiki returned with it and when he reached the door of Pākaʻa's hale, his father asked him, "Where is your haku's malo?"
> "Here it is."
> "Hang it at the door of my hale, so that the ʻāʻipuʻupuʻu can no longer come in here."
> "I've hung it at the door."
> Pākaʻa said, "Now only you can enter here because you've been made sacred for your haku by the handling of his kapa. From now on, you'll distribute the food in here to the ʻāʻipuʻupuʻu who come, because they can longer enter." (ibid.:66-67)

The scenario repeated with Pākaʻa giving Kūapākaʻa a beautifully-scented *kapa* that he had cared for over the years for Keawenui a ʻUmi. Although suspicious, the *aliʻi* presumed the tale told to him by the boy was true, that it was a *kapa* of the same fragrance as his but from Wailau, Molokaʻi and not in fact one of his own. Being that Keawenui a ʻUmi had lost everything in the storm, Kūapākaʻa continued to care for his *haku*, who was still clueless as to the boy's true identity. He dutifully attended to his every need, just as his father Pākaʻa had in previous years. Meanwhile, Pākaʻa continued to craft his revenge plot on Hoʻokele-i-Hilo and Hoʻokele-i-Puna, and in order to facilitate this, his son let loose the winds of his gourd to keep the weather just unstable enough so Keawenui a ʻUmi would not be able to leave the island.

Four months later the weather became agreeable once more, and Keawenui a ʻUmi and his men readied their canoes for sailing. That night, Kūapākaʻa chanted to each of the six district *aliʻi* and their men to ready themselves for sailing:

> Get up, get up, it's day, there's light,
> The sun has arrived, and there above,
> Iao [the planet Jupiter], Maio [a navigation star],
> Kamaha, Kahikikuokamoku,
> Kani-ʻūʻū, the star at Helani,
> Get up, move, Kohala,
> The land of Wahilani. (ibid.:73-74)

The men were confused, as the voice urging them to depart belonged to Kūapākaʻa, who instructed them to set sail to Kaʻula and explained to them that Keawenui a ʻUmi would shortly follow. However, Kūapākaʻa did not wake his *haku* immediately, and allowed him to sleep in, while the other fleets departed Molokaʻi. When day broke, Keawenui a ʻUmi and his men (including Hoʻokele-i-Hilo and Hoʻokele-i-Puna) departed to Kaʻula in search of Pākaʻa. Being that the rest of his party had departed, Keawenui a ʻUmi requested that Kūapākaʻa accompany him to Kaʻula to search for Pākaʻa, which he agreed to do as this was part of his father's plan. As part of Pākaʻa's conspiracy to exact revenge on his enemies, he had instructed his son to load the double-hulled canoe of the *aliʻi* with a hollowed-out tree trunk secretly filled with food, drink, palm fronds, and a large stone to be used as an anchor.

Meanwhile, the rest of Keawenui a ʻUmi's party was en route to Kaʻula, but stalled at Oʻahu to wait for their *aliʻi*, but he never arrived. Exhausted from their journey, the men fell asleep. When they awoke, they unexpectedly found that they had drifted to Hawaiʻi Island, and found themselves on the shores of Kawaihae. Meanwhile, Keawenui a ʻUmi and his party were voyaging to Kaʻula, with Hoʻokele-i-Hilo and Hoʻokele-i-Puna steering the canoe, oblivious to their immenent, discretely planned demise. To carry out the final segment of the grand scheme, Kūapākaʻa allowed the winds out of Laʻamaomao, and the weather became severe. He anchored the canoe with his big rock and encouraged the men to ride out the storm in place, arguing that it would be better than fighting the bad weather. The bitter wind and rain chilled the men to the bone and they began to get hypothermic. Just before they reached the verge of death, Kūapākaʻa then revealed the hidden trove of food. He gave palm fronds for protection and food and drink for strength to everyone on board except his father's enemies, Hoʻokele-i-Hilo and Hoʻokele-i-Puna, who inevitably sucuumbed to the cold and perished.

As the weather cleared and became pleasant, Kūapāka‘a assumed the role of the now-deceased steersmen, and set sail for Ka‘ula. However, that night when everyone was sleeping, the boy opened his wind-gourd yet again, and the winds wafted them to Hawai‘i Island where they landed at Kawaihae. Once there, joy and excitement overcame Keawenui a ‘Umi and his party, and they rushed to lovingly greet their families while Kūapāka‘a was utterly forgotten, abandoned, and alone. Eventually, word of a canoe race that the boy participated in reached the ears of Keawenui a ‘Umi by a messenger, and it was realized that Kūapāka‘a’s neglect had been inadvertent, as it was mistakenly presumed that the youth had been taken in and cared for. As part of the wager for the canoe race against Keawenui a ‘Umi’s favorite fishermen, it was agreed that should Kūapāka‘a reign victorious, the losers be baked in an *imu* (underground oven). During their conversation, Kūapāka‘a informed his *haku* that he intended to make true on his wager and kill the men. But he was met with opposition from Keawenui a ‘Umi, who did not want to see his men perish. Eventually, a deal was made in which Kūapāka‘a would fetch Pāka‘a from Moloka‘i if Keawenui a ‘Umi agreed that the fishermen be put to death.

Though Pāka‘a longed to serve his *haku* once more, he refused to travel back to Hawai‘i Island without having his land, position as navigator, and other rights restored. When Keawenui a ‘Umi was informed of this, he immediately consented, eager to reconnect. Only once Keawenui a ‘Umi agreed to restore everything that had been revoked from Pāka‘a, did his beloved *kahu* return to him to serve him faithfully for the rest of his days.

Lonoikamakahiki and the Battle of Hōkū‘ula

Lonoikamakahiki was a celebrated ruling chief of Hawai‘i Island, and boasts lineage from the ancient Pili dynasty with heritage rooted on Hawai‘i Island, and likely Waipi‘o Valley, since roughly A.D. 1300. He was the son of Keawenui a ‘Umi, and the grandson of celebrated *ali‘i nui* ‘Umi a Līloa, and recognized as an accomplished and dexterous warrior. He integrates prominently into the history and significance of Waikōloa as a *wahi pana* (celebrated place) to the people of old. With respect to Waikōloa, Lonoikamakahiki figures into this notable *mo‘olelo* regarding his triumph over the invading Maui chief Kamalālāwalu. During the time of Lonoikamakahiki’s rule, there were several battles that transpired in the coastal portion of South Kohala and also in the general vicinity of the Study Area. One such battle was fought between Lonoikamakahiki and his older brother, Kanaloakua‘ana, who rebelled against him. According to Fornander (1880:120–121):

> Informed by Kaikilani of the revolt on Hawaii, Lonoikamakahiki left Oahu at once, crossed the channels of the group, and avoiding the Kohala coast, where the rebels were in force, sailed to Kealakeakua {Kealakekua], and sent messengers to Kau to acquaint Pupuakea of the arrival of himself and Kaikilani. Pupuakea responded promptly, and, taking a mountain road above the coast villages, he joined Lono and the forces that the latter had collected in Kona at Puuanahulu, on a land called Anaehoomalu, near the boundaries of Kohala and Kona. The rebel chiefs were encamped seaward of this along the shore. The next day Lono marched down and met the rebels at a place called Wailea, not far from Wainanalii, where in those days a watercourse appears to have been flowing. Lono won the battle, and the rebel chiefs fled northward with their forces. At Kaunaoa, between Puako and Kawaihae, they made another stand, but were again routed by Lono, and retreated to Nakikiaianihau, where they fell in with reinforcements from Kohala and Hamakua. Two other engagements were fought at Puupa [on the plain north of Waikōloa] and Puukohola, near the Heiau of that name, in both of which Lono was victorious. His brother Kanaloakapulehu was taken prisoner, slain, and sacrificed at the Heiau, but Kanaloakuakawaiea escaped with the scattered remnant of the rebel forces. The rebels now fled into Kohala, and were hotly pursued by Lonoikamakahiki. Several skirmishes were fought during the pursuit; at Kaiopae, where Kanaloakuakawaiea was slain; at Kaiopihi, and finally at Puumaneo, on the high lands above Pololu, where the last remnant of the rebel force was conquered and slain, and the island returned to its allegiance to Lono and Kaikilani.

Fornander (1916–1917) relates that a series of subsequent attacks were instigated and waged by Kamalālāwalu, the *ali‘i nui* of Maui, against Lonoikamakahiki. These battles occurred along the South Kohala coastline, the first of which ensued at Wailea, then Kauna‘oa, and finally commenced at Puakō, where his brother and high chief Kanaloakua‘ana, was brutally tortured and eventually slaughtered. Thereafter, Kamalālāwalu and his army, upon the advice of two of Lonoikamakahiki’s allies Kauhipaewa and Kihapaewa who had gained trust and infiltrated Kamalālāwalu’s camp, proceeded to Hōkū‘ula in Waimea in anticipation of the continuation of battle in which they assumed an automatic victory. Upon awakening the next morning, Kamalālāwalu was stunned to discover that a great constellation of men had amassed near the coast; what seemed like thousands of warriors from all of Hawai‘i Island had gathered as far as the eye could see and were prepared to savagely wage war upon the intruder Maui chief.

Realizing that he was vastly outnumbered, Kamalālāwalu attempted to reconcile differences with Lonoikamakahiki in an attempt to escape certain death, but the former, being enraged at the manner in which his ally Kanaloakua‘ana was slain, denied him. The supreme volume of Lonoikamakahiki’s forces was incomparable to Kamalālāwalu’s, especially when coupled with the latter’s unfamiliarity with the battle ground. According to Fornander (1916–1917:344), “the Kau and Puna warriors were stationed from Holoholoku to Waikoloa. Those of Hilo and Hamakua were located from Mahiki to Puukanikanihia, while those of Kohala guarded from Momoualoa to Waihaka.” After just three days, Lonoikamakahiki reigned victorious, and Kamalālāwalu and nearly all of the invaders, with the exception of his son Kauhiakama, were executed.

‘Ōlelo No‘eau of South Kohala

The oral tradition of Hawai‘i is perhaps best preserved in *‘ōlelo no‘eau*, which have been passed down throughout the generations. Many *‘ōlelo no‘eau* speak of South Kohala, and most mention the the famed winds of the region. The following proverbs illustrate the character of South Kohala in great detail, and appear below as they were interpreted and published in *‘Ōlelo No‘eau, Hawaiian Proverbs & Poetical Sayings* by Mary Kawena Pukui (1983):

> *‘A‘ohe u‘i hele wale o Kohala.*
> No youth of Kohala goes empty-handed.
> Said in praise of people who do not go anywhere without a gift or a helping hand. The saying originated at Honomaka‘u in Kohala. The young people of that locality, when on a journey, often went as far as Kapua before resting. Here, they made *lei* to adorn themselves and carry along with them. Another version is that no Kohala person goes unprepared for any emergency.
> (25)
>
> *He pā‘ā kō kea no Kohala, e kole ai ka waha ke ‘ai.*
> A resistant white sugar cane of Kohala that injures the mouth when eaten.
> A person that one does not tamper with. This was the retort of Pupukea, a Hawai‘i chief, when the Maui chief Makakuikalani made fun of his small stature. Later used in praise of the warriors of Kohala, who were known for valor.
> (95)
>
> *I ‘ike ‘ia no o Kohala i ka pae kō, a o ka pae kō ia kole ai ka waha.*
> One can recognize Kohala by her rows of sugar cane which can make the mouth raw when chewed.
> When one wanted to fight a Kohala warrior, he would have to be a very good warrior to succeed. Kohala men were vigorous, brave, and strong.
> (127)
>
> *Ipu lei Kohala na ka Moa‘ekū.*
> Kohala is like a wreath container for the Moa‘e breeze.
> Kohala is a windy place.
> (136)
>
> *Kahilipulu Kohala na ka makani.*
> Kohala is swept, mulch and all, by the wind.
> Kohala is a windy place.
> (143)
>
> *Ka makani ‘Āpa‘apa‘a o Kohala.*
> The ‘Āpa‘apa‘a wind of Kohala.
> Kohala was famed in song and story for the ‘Āpa‘apa‘a wind of that district.
> (157)
>
> *Kohala ‘āina ha‘aheo.*
> Kohala, land of the proud.
> The youths, *lei*-bedecked, were proud of their handsome appearance and of their home district.
> (196)
>
> *Kohala ihu hakahaka.*
> Kohala of the gaping nose.
> Kohala is full of hills, and the people there are said to breathe hard from so much climbing.
> (196)
>
> *Le‘i o Kohala i ka nuku na kānaka.*
> Covered is Kohala with men to the very point of land.

A great population has Kohala. Kauhiakama once traveled to Kohala to spy for his father, the ruling chief of Maui. While there, he did not see many people for they were all tending their farms in the upland. He returned home to report that there were hardly any men in Kohala. But when the invaders from Maui came they found a great number of men, all ready to defend their homeland.
(213)

Lele au la, hokahoka wale iho.
I fly away, leaving disappointment behind.
Said of one who is disillusioned after giving many gifts. Waka‘ina was a ghost of North Kohala who deceived people. He often flew to where people gathered and chanted. When he had their attention he would say, “I could chant better if I had a tapa cloth.” In this way he would name one thing after another, and when all had been given him he would fly away chanting these words.
(213)

Lele o Kohala me he lupe la.
Kohala soars as a kite.
An expression of admiration for Kohala, a district that has often been a leader in doing good works.
(214)

Na ‘ilina wai ‘ole o Kohala.
The waterless plains of Kohala, where water will not remain long.
After a downpour, the people look even in the hollows of rocks for the precious water.
(243)

Nani ka waiho a Kohala i ka la‘i.
Beautiful lies Kohala in the calm.
An expression of admiration for Kohala, Hawai‘i, or for a person with poise and charm—especially a native of that district.
(248)

‘Ohi hāpuku ka wahie o Kapa‘au.
Anything was gathered up as fuel at Kapa‘au.
Said of one who takes anything and everything. At one time Kohala suffered a drought and food became scarce. The women did their best to raise food at ‘Āinakea while the men traveled far in search of some means of relieving the famine. In order to cook their meager, inferior crops, the women used whatever they found for fuel—dried sugar-cane leaves, grasses, potatoes, and so forth.
(258)

‘Ope‘ope Kohala i ka makani.
Kohala is buffeted by the wind.
(277)

‘Uala ne‘ene‘e o Kohala.
Ne‘ene‘e potato of Kohala.
A person who hangs around constantly. Ne‘ene‘e, a variety of sweet potato, also means “to move up closer.”
(309)

The Legacy of 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.

During the *Māhele*, native tenants of the lands that were divided up among the Crown, *Konohiki*, and Government could claim, 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). The history of the *kuleana* claim and award process is summarized in an 1856 report by the Minister of Interior:

> …During the ten months that elapsed between the constitution of the Board and the end of the year 1846, only 371 claims were received at the office; during the year 1847 only 2,460, while 8,478 came in after the first day of January 1848. To these are to be added 2,100 claims, bearing supplementary numbers, chiefly consisting of claims which had been forwarded to the Board, but lost or destroyed on the way. In the year 1851, 105 new claims were admitted, for Kuleanas in the Fort Lands of Honolulu, by order of the Legislature. The total number of claims therefore, amounts to 13,514, of which 209 belonged to foreigners and their descendants. The original papers, as they were received at the office, were numbered and copied into the Registers of the Commission, which highly necessary part of the work entailed no small amount of labor…
>
> …The whole number of Awards perfected by the Board up to its dissolution is 9,337, leaving an apparent balance of claims not awarded of say 4,200. Of these, at least 1,500 may be ranked as duplicates, and of the remaining 2,700 perhaps 1,500 have been rejected as bad, while of the balance some have not been prosecuted by the parties interested; many have been relinquished and given up to the Konohikis, even after surveys were procured by the Board, and hundreds of claimants have died, leaving no legal representatives. It is probable also that on account of the dilatoriness of some claimants in prosecuting their rights before the Commission, there are even now, after the great length of time which has been afforded, some perfectly good claims on the Registers of the Board,

> the owners of which have never taken the trouble to prove them. If there are any such, they deserve no commiseration, for every pains has been taken by the Commissioners and their agents, by means of oft repeated public notices and renewed visits to the different districts of the Islands, to afford all and every of the claimants an opportunity of securing their rights… (in Maly 2002:7)

As a result of the *Māhele,* Waikōloa Nui (originally an *'ili* of Waimea *kalana*) was awarded to George Davis Hūʻeu as an *ahupuaʻa* based on Kamehameha I's gift of the land to Hūʻeu's father Isaac Davis. This award (LCAw. 8521-B:1) did not include the coastal areas of ʻAnaehoʻomalu and Kalāhuipuaʻa, which were retained by the crown. The Davis Hūʻeu award was primarily restricted to the non-agricultural *pili* lands south of the agriculturally-productive Lālāmilo area and *mauka* of the rich coastal resource area. There were nine small residential *kuleana* awarded in the uplands of Waikōloa near the town of Waimea (Maly 1999), however no *kuleana* were awarded within or near the Study Area.

Boundary Commission Testimony for Waikōloa Nui

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawaiʻi to legally set the boundaries of all the *ahupuaʻa* that had been awarded as a part of the *Māhele*. Subsequently, in 1874, the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were old native residents of the lands, many of which had also been claimants for *kuleana* during the *Māhele*. This information was collected primarily between 1873 and 1885 and was usually given in Hawaiian and transcribed in English. Although hearings for most *ahupuaʻa* boundaries were brought before the Boundary Commission and later surveyed by Government employed surveyors, in some instances, the boundaries were established through a combination of other methods. In some cases, *ahupuaʻa* boundaries were established by conducting surveys on adjacent *ahupuaʻa*. Or in cases where the entire *ahupuaʻa* was divided and awarded as Land Claim Awards and or Government issued Land Grants (both which required formal surveys), the Boundary Commission relied on those surveys to establish the boundaries for that *ahupuaʻa*. Although these small-scale surveys aided in establishing the boundaries, they lack the detailed knowledge of the land that is found in the Boundary Commission hearings.

In 1859, Hūʻeu and John Palmer Parker began a dispute over the boundary between Hūʻeu's *ahupuaʻa* of Waikōloa and Parker's holdings in Pāʻauhau, which included lands in the Hāmākua District located southeast of the subject parcels. The boundary issue was quickly resolved, but the dispute lead Lot Kamehameha, Minister of the Interior, to recommended to W. S. Spencer, Interior Department Clerk, that boundary testimony for all *ahupuaʻa* be collected (Maly and Maly 2002). Disputes over the boundaries of Waikōloa and the neighboring Crown lands of Waimea also soon arose. On August 8 and 9, 1865 the boundaries for Waikōloa Nui were brought before the Boundary Commission and certified a day later on August 10, 1865. Several individuals knowledgeable about the boundaries testified at the hearing (Boundary Commission, Volume A, No. 1 pp. 6-12) and applicable testimonies are presented below (bolded, underlined, and italicized emphasis added):

> George Davis claims that **Waikoloa**, as he had heard, begins at **Puaapilau**, thence down the road from **Hamakua** to **Waimea**, to **Puu Ohikona**, thence to **Paakai nui**, thence to **Ouli**, the land of Keoniana, and along the boundary of **Ouli** to the sea shore at **Kaihumoku**, thence along the shore to **Lalamilo**; thence to Keaha [**Keahaaha**], thence to Keakolono [i.e., **Keahuolono**], on the boundary of **Kona**; then along the boundary of **Kona** to **Kaohe**, then along the boundary of **Kaohe** to Kemoli [**Kemole**], thence to **Kupaha**. (Maly and Maly 2005:354)

Ehu, a native of Puʻukapu, Waimea, testified:

> I am *kamaaina* of **Puukapu**. I was born in **Waimea**. I know the boundary from my own and my father's knowledge.
>
> Commence at **Puaapilau**, thence to **Napamakani**, thence to **Paakainui**, thence to **Kapuulepo**, thence to **Kapalihalapepe**, thence to **Puuainako**, thence to **Kalalakoa**.
>
> I knew **Kahanapilo** w. wife of George Davis, she was not *konohiki* of the *ili*s on **Waikoloa**, nor of **Waimea**. I was in **Kona** when she died.
>
> I am *kamaaina* of **Puukapu** only—Kainea was the *Konohiki* when I lived there. There was no *pili* grass on that land; my father was not a bird catcher, he used to *mahiai* [farm]. **Waikoloa** <u>was the land that had the birds</u>; the boundary as stated is the boundary from the time of Kamehameha first.
>
> [cross-examined]

> Kainea was *Konohiki* in the time of Kalaimoku—Kainea is dead. **Waikoloa** is an *Ahupuaa* of **Waimea**, which is a *Kalana*, with eight divisions. I only know about **Waikoloa**. I have been on to **Pukalani**, **Nohoaina** and **Paulama**; they join **Waikoloa**, but do not run far out. **Pukalani** joins **Puukapu**. **Nohoaina** joins **Pukalani**, and **Paulama** joins **Waikoloa**. **Puukapu** is a division of **Waimea**. **Pukalani** belonged to Kamehameha and he gave it to his man Kekoikumoku. **Nohoaina** belonged to the chiefs of **Waimea**, Kupapaulu. **Paulama** belonged to Kupapaulu. **Puukapu** belonged to Kalaimoku. (I do not know the present owners). I do not know who was the *Konohiki* before Kainea. (ibid.:354-355)

Wahahee, another native of Pu'ukapu, testified as to the division of Waikōloa (Waikōloa Nui and Iki) and related knowledge of it being *pili* land:

> I am *kamaaina* of the King's land **Puukapu** – I was born there. Commence at **Puaapilau**, thence to **Pooholua**, thence to **Leohu**, thence to **Paakainui**, thence to **Kapuulepo**, that is all I know.
>
> **Puulepo** is close to **Pukalani**, which land joins **Puukapu**. –My parents showed me the boundary. –My mother belonged at **Puukapu**, my father was from **Napuu**. . .
>
> **Nohoaina** joins **Pukalani**, **Paulama** joins **Nohoaina**, and **Waikoloa** joins **Paulama**. **Pukalani** belonged to Kamehameha fourth. – **Nohoaina** and **Paulama** to the same; also **Puukapu**; and I suppose they descended to Kamehameha V.
>
> [cross-examined]
>
> I do not know the boundary of **Paulama** and **Waikoloa**. –I heard that **Waikoloa** was divided. –there are two **Waikoloa**'s, they lie side by side. I do not know the adjoining lands to **Waikoloa**, except **Paulama** on the *mauka* side. –I heard that **Waikoloa** joins **Napuu**. –I have not heard that **Paulama** joins **Napuu**. –All the *pili* belonged to **Waikoloa**. (ibid.:355)

Mi 1st, a native of Waikōloa, testified in detail about the extent of Waikōloa and the quality of land the *ali'i* were willing to give a foreigner like Davis:

> I live on **Waikoloa** – I am a *kamaaina* of the lands in dispute. The name of the large land is **Waimea** – I am a witness for George Davis and also for the Rex [King] – **Waimea** is a *Kalana* – which is the same as an island divided into districts – there are eight *Okana* in **Waimea**. In those *Okana* are those lands said to extend out (*hele mawaho*). These lands came in to the possession of Kamehameha I who said to Kupapaulu, go and look out to of the large lands running to the sea, for John Young and Isaac Davis. Kupapaulu went to Keawekuloa, the *haku aina*, who said if we give **Waikoloa** to the foreigners they will get Kalahuipua [**Kalahuipuaa**] and Anaiomalu [**Anaehoomalu**] (two lands at the beach) then your master will have no fish. So they kept the sea lands and gave **Waikoloa** to Isaac Davis. John Young asked my parents if it was a large land they said, the black *aa* was **Napuu**, and the good land **Waimea**.
>
> They kept all the valuable part of the lands and gave the poor land outside to Isaac Davis. They kept **Puukapu**, **Pukalani**, **Nohoaina**, **Kukuiula** (above the church), and **Paulama**; and gave **Waikoloa** to Isaac Davis. The other **Waikoloa** [**Waikōloa Iki**, or **Lālāmilo**], this side of the stream dividing them, was the King's. It comes down along the stream by Mr. Lyon's, then along the ditch, then along the wall of **Puuloa**, to **Ahuli** on the King's land, to the round hill, **Uleiokapihe**, and is cut off here by Davis' **Waikoloa**. - The wall was the boundary below, between **Waikoloa** of Isaac Davis and the land of the King, Kamehameha I. The latter built it by Kauliakamoa [**Kauliokamoa**]; to keep the cattle off from the King's land. The boundary runs to **Liuliu**, and the *pili* was all South, on Davis' land; then I know along an old road, **Puupa**, **Waikoloa** being South and **Waimea** North of the road, then to **Kaniku**. That is all I know.
>
> [cross-examined]
>
> My parents heard the command of Kamehameha I to Kupapaulu, and they told me, and also about John Young's asking about the land.
>
> I never heard that **Puukapu**, **Nohoaina**, **Pukalani**, and **Paulama** extended out to the *pili*. A road divided the land of the King and that of I. Davis.
>
> **Waikoloa**. - The wall was built to keep off the cattle, and to mark the land. The church is on the King's land. When Kalama measured **Waikoloa** he took in the church, I heard. I went with Kalama some of the time. Kalama said leave the old boundary and make a straight boundary, so I left them,

lest Davis' land would go to the King. The boundary as I know it is from the English school house along a hollow, to the ditch near to **Hoomaloo**; thence to **Puu Makeokeo**; thence to hills outside of **Ahuli**. The church is on **Paulama** which joins **Waikoloa**.

I know the boundary of **Paulama** it does not reach **Napuu**.

I know the *mauka* boundary of **Waikoloa** and **Puukapu**. **Puukapu** extends to **Puulepo**, then goes in. (ibid.:355-356)

Kuahine, a native of Līhu'e in Lālāmilo (in Waikōloa Iki) testified to the boundaries of Waikōloa and indicated the presence of an old road that extended along its southern boundary which is depicted in Figure 9. Kuahine's testimony also relates that George Davis Hū'eu's wife, Kahanapilo, was a *konohiki* of Waikōloa:

I am *kamaaina* at **Lihue**. I know the boundaries of **Waikoloa**; viz. from **Koananai** to **Puuokaa**, to **Kekio**, to **Pahoa**, which are cut off from **Waikoloa**, and are cut off by it; they are all divisions of the *Okana* **Lihue**.

Liuliu is an old road, forms the boundary between **Waikoloa** and the *ahupua'a* to **Puuwaawaa**, where the road divides, one goes to the sea shore, and the other goes along the boundary, along the *pili* to **Kepani**; thence to **Keahu a Lono**, **Waikoloa** being *mauka* of the road. –My father, who was *luna* [overseer] of the land **Lihue**, told me the boundary.
[cross-examined]
Kahanapilo w. was *Konohiki* of **Waikoloa** – it descended from her parents, and from her husband, Hueu, this is from my knowledge.

I know about the wall built, my father was *luna* at the time. I was large at the time, and could carry stones. Kupapaulu and Keawekuloa were the *Konohikis* of the land. I never saw Kamehameha I. But I was born before his death. I was a babe when **Kiholo** was built.

I know **Waikoloa** first, it goes to the mound near **Ahuli**. (ibid.:356)

Numerous others provided testimony regarding the boundaries of Waikōloa

Moolau sworn.
Puaapilau to Keahu, to Kipukapamakani, to Puakamimi, to Kapuulepo, between Puukapu and Waikoloa, to Pukalani. Palahahapapa, to Puuainako, to Keanakoloa, between Pukalani and Waikoloa, to Nohoaina, which joins Paulama; the road is the boundary all the way. At Ahuli the King's Waikoloa is cut off, while Davis' Waikoloa runs towards the sea. Then Puuokaa joins; also Kekio, Pahoa, Puupili, Kaleiokumakeau, and Puuhuluhulu; the wall built as before spoken of is then the boundary of the King's land inside, and Waikoloa outside, to Liuliu, as perhaps said by the other witnesses; then the road Puupa is the boundary, along the pili; all the plain was given to Waikoloa, and Keanakaloa secured the fish lands at the shore. All the *pili* from Ouli to the *aa* of **Kona** belonged to **Waikoloa**.

I went around the land with my father.

Hueu was *Konohiki* of **Waikoloa**, and it descended to George Davis.

Kahanapilo was only *Konohiki* of **Waiau**, her father's land. When I was small, the wall was built, and I helped carry the stones. I was born at **Kiholo**. (ibid.:356-357)

Kalua sworn. (For the boundary of Napuu)
I am *kamaaina* of this boundary (**Nāpu'u**). Commence at **Hiiakaakaiki**, thence to **Keahuolono**, thence to **Puupoe**, thence to **Keanawiliwili**, the corner of the land joining **Waikoloa**, Davis' land. **Waikoloa nui**. **Waimea** Joins **Napii** below this point, to the sea; the *Ahupuaa* of **Waimea**.

I was born at **Waikoloa Iki**, the King's land; it extends to **Ahuli**; from **Keanawiliwili** to **Kapualei**; thence to **Hanaialii**; thence to **Wawaekea**; thence to **Kaoheakauholo**; thence to **Kalawamauna**. That is all I know. Keauhou here cuts it off. I have heard **Waikoloa** of George Davis joins **Napuu** to **Kalawamauna**. (ibid.: 357)

Moolau - recalled:
I know some of the boundaries of **Napuu**, and have heard some. From Ohiiakakaalei [**Hiiakaikaalei**] to **Keahuolono**; thence to **Puupoe**; thence to **Kapalihai**; thence to **Makahonu**; thence to **Hanamauloa**; thence to **Kauakahialaa**; thence to between **Keanawiliwili** of **Waikoloa** and **Kahoohewahewa** of **Kona**; thence to **Kapukaiki**; thence to **Puuulaula**; thence to **Hanaialii**; then this side of **Wawaekea**, and *awawa* of **Keahuolono**; to **Keamuku** of Kona; thence to

Puukapele; this is the boundary between **Kona** and **Waikoloa** to **Hamakua**. Only at the sea shore is the Kings.

The *mauka* boundary of **Waikoloa** is from **Puukapele** to **Puukeekee**; thence to **Kilohana**; thence to **Waikii**; thence to **Kapoowaiakeakua** [‘**Auwaiakeakua**]; thence to **Kamakoa**; thence to **Kalapamaile**; thence to **Kemole**; thence to **Kupahaa**, between **Kaohe** and **Waikoloa**. Thence turn down **Kapaakea**; thence to **Puupueo**, thence to **Kapuaapilau**. (ibid.: 357)

Kuahine – recalled.
I know the boundary of **Napuu**. The *aa* is **Napuu**, and the *Pili* is **Waikoloa**. *Mauka* of the road from **Puukapele**, **Kaohe** lies *mauka* of the road, and **Waikoloa** *makai* to **Waikii**. (ibid.:357)

Kaolulu sworn. (For the King)
I am *kamaaina* of the lands in dispute from one end to the other. I was born on **Ouli**, and have lived on different parts of the lands. (ibid.: 357)

Commence at **Kokiaina**, the head of **Waikoloa**, thence to **Waikalehua**, thence to **Kapele**, thence to **Alaanui**, thence to **Alaohia**, thence to **Keakualapalapa**, thence to **Kulanapahu**, thence to **Kaopapa**, thence to **Keanakii**, thence to **Kahoalapiko**, the *makai* boundary is from **Puupanui** to **Puuakowai**, thence to **Kilohana**, thence to **Puuokaa**, thence to **Waikoloa**, thence to **Puuohu**, this is the boundary of **Waikoloa nui** of George Davis.
[cross-examined]
Puupanui is the corner *makai*. This description begins at **Paulama**. **Puuhuluhulu** is the land *makai* of **Waikoloa**; and also **Kaleikumikiau**; **Puupili**; **Pahoa**; **Kekio**; & **Puuokaa**; and **Waikoloa** are King’s lands adjoining. I know about the wall; I could carry stones then; in the time of Kamehameha I. I know the boundary of **Waimea**. – Commence at **Puukapu**, the head of the land. **Waikoloa** is an *ili* of the *Ahupuaa* **Waimea**, as I have heard.

Waikoloa first reaches **Napuu** at **Puupanui**. – The two **Waikoloas** joined *mauka*. The King’s **Waikoloa** reaches **Puuokaa**, which is cut off by Davis’ **Waikoloa**. Davis’ **Waikoloa** does not reach **Puukeekee**, nor **Waikii**.

The land from here down to the sea is **Waimea**, which has divisions. **Paulama** is adjoining **Napuu**; so is **Nohoaina**. **Paulama** and **Waikoloa** meet **Napii** at **Kahooalapiko**. Kahanapilo w. was never *Konohiki* of any land but **Waiauia**. (ibid.: 357-358)

Kuupele sworn.
I am not *kamaaina* of **Waikoloa**, but of **Waimea** *Ahupuaa*. The boundary of **Paulama** and **Waikoloa** commence at **Nohoaina**; thence to **Waiakalehua**; thence to **Kapele**; thence to **Alaanui**; thence to **Alaohia**; thence to **Kalualapalapa**; thence to **Kulanapahu**; thence to **Kaopapa**; thence to **Kanakii**; thence to **Kahoopapale**; thence to **Kahooalapiko**; thence to **Puuanahulu**.

The *makai* boundary is from **Puupaha** to **Puuakowai**; thence to **Kilohana**; thence to **Puukaa**; thence to **Kamakeokeo**; thence to **Puuohu**.

Waikoloa first adjoins the **Puukii**, **Kalapapa**, **Kanakanaka**, **Lauhulualii**, **Manienieula**, that is all I know. **Paulama** adjoins *mauka*, then comes **Kukuiula** and **Nohoaina**.

I know the wall, it was built to keep off the cattle from the cultivated land. I could carry stones, it was after **Kiholo** in the time of Kamehameha I.

Davis’ **Waikoloa** reached **Napuu**. The King’s **Waikoloa** only reaches **Puuokaa**. **Kahooalapiko** is the point where **Paulama** and **Waikoloa** join **Napuu**.

Puuwaiwa is the *mauka* corner of **Paulama** on the boundary of **Napuu**.
[cross examined]
Puuohu is in Davis’ **Waikoloa**. – explanation; **Puuohu** is in **Waikoloa** of the King, it was formerly in the other **Waikoloa** when it was surveyed by **Kalama**.

Kaleiokumikiau is the land *makai* of **Waikoloa** on the boundary of **Napuu**; then comes **Puuhuluhulu**, and **Kokiapuueo**. **Paulama** is *makai* of **Puukeekee**, and the land adjoins that.

Kanakaole sworn.
I am *kamaaina* of **Pukalani**, land of the King [Waikoloa Iki] commences at **Kulanapahu**. (**Paulama** joins **Waikoloa** of Davis, and **Nohoaina** joins **Paulama**, then comes **Pukalani**.) Thence

to **Kapaakea**, thence to **Keanaauloa**, thence to **Puukapu**, *mauka*, and along **Puukapu** to **Haloa**, where there is a *loi* [irrigated pond field].

Pukalani belongs to the King, and is leased to the Grazing Company. (ibid.:358)

Kanehailua sworn.
I am *kamaaina* of **Waimea**. I know the boundary of **Waikoloa** and the King's land. **Paulama** joins **Waikoloa**. Commence at the woods, at **Kokiaina**, thence to **Puakalehua**, thence to **Kapele**, thence to **Alaanui**, thence to **Alaohia**, thence to **Kekualapalapa**, thence to **Kulanapahu**, thence to **Keanakii**, thence to **Kahoopapale**, thence to **Kahooalapiko**. **Puuanahulu** cuts off **Paulama** here. **Nohoaina** joins **Paulama** from the woods to **Napuu**. That is what I know of the boundary *mauka* of **Waikoloa**. The *makai* boundary is from **Puupaha** to **Puuakowai**, thence to **Kilohana**, also adjoining **Puuokaa** and **Kamakeokeo**, to the settlement of Mr. Lyons *ma* [folks].

Waikoloa of the King joins *makai*, then comes **Pahoa** first and second. **Puupili**, **Kalaeokumikiau**, **Puuhuluhulu**, **Kaleohai**, **Kokiapuueo**, **Paaina**, **Opuokopukini**, **Kaluaana**, **Papuaa**, **Wailoa**, and **Mahoe**, which is the *kahawai* [stream gulch] of **Puuiki**. All of these are the King's lands. **Waikoloa** is an *ili* of **Waimea** *Ahupuaa*; as are also these other lands. **Waimea** is an *Okana*. **Nohoaina** is between **Paulama** and **Puukeekee**; these lands reach **Napuu**. **Waimea** is the land adjoining **Kona**. [cross-examined]
Puuhinai is the *makai* corner of Waikoloa of George Davis on the boundary of Kona. **Puupaha** is the corner of the King's **Waikoloa**. **Puupili** joins **Napuu**, so does also **Kalaeokumikiau**. **Kapaakea** is the name of the place where **Puupili** joins **Napuu**. The **Hooneene** gulch is where the land joins **Napuu**. **Puuhuluhulu** joins **Napuu** at **Halolo** gulch. **Kaleohai** joins **Napuu**. **Kokiapuueo** joins **Napuu**. These are all the lands that join **Kona**. (ibid.:359)

Kahakauwila sworn.
I am *kamaaina* of **Waimea**. I know the boundary of **Waikoloa**. Commence at **Kokiaina**; thence to **Waiakalehua**; thence to **Kapele**; thence to **Alaanui**; thence to **Alaohia**; thence to **Kekualapa**; thence to **Kulanapahu**; thence to **Kupapa**; thence to **Kekuanakii**; thence to **Koopapale**; thence to **Koalapiko**; thence to **Napuu**. The *makai* boundary is from **Puupaha** to **Puako**; thence to **Kilohana**; thence to **Puuokaa**; thence to **Makeokeo**; thence to **Puuohu**, which is the corner. There are two boundaries of **Waikoloa** of George Davis. It is bounded by **Waikoloa nui** of the King *makai*, and **Paulama**, *mauka*. **Waikoloa iki** [sic – Nui] is Davis', and **Waikoloa nui** [sic – Iki] is the King's.

The boundary of **Waikoloa nui** commencing at **Puuokaa** runs *mauka*, **Pahoa**, the *mauka* corner. **Puuiki** to **Kanakanaka**, **Halapepe**, **Lauhulualii**, **Manienie**, **Olelokoa**, to **Keanuiomanu**, the corner of **Hauhanalamea**, **Puaahopu**, **Napooekolu**, **Waiemi**, **Haleapala**, **Koleakanea**, **Puukole**, **Kahuhu**, **Paaina**, **Kokiapuueo**. **Waikoloa** boundary, **Kekio Puupili**, **Kumaikeau**, **Puuhuluhulu**. [cross-examined]
Napuu is the boundary of all these lands. (ibid.:359)

Kualehelehe sworn.
I am *kamaaina* of **Puukapu**. I was born there. The boundary of **Hamakua** and **Puukapu**, commencing at **Waipio**, at **Pupukualana**; thence to **Kahakolea**; thence to **Kaimuhonu**; thence to **Puumoe**; thence to **Kalapapohaku**, along Kanaina's land to the corner. Thence to **Manukea**; thence to **Papalaokiekie**; thence to **Kahaleula**; thence to **Makahaluhalu**; thence to **Kapuaapilau**; thence to **Puukaliali**; thence along **Paauhau** to **Puupapapa**; thence to **Keanaauloa**, the corner of **Paauhau**; thence to **Kapuulepo**; thence to **Waialolo**; thence to **Kaloa**, along **Pukalani** to the corner. Then along **Nohoaina** to **Paulama** and on to **Puuohu**, the corner of **Waikoloa** of Hueu; and thence on to **Wawaihae**. **Pukalani**, **Nohoaina** and **Paulama** lie between **Puukapu** and **Waikoloa** of Davis. I had charge of **Puukapu** when the late King was king. I am *kamaaina* of this land only. **Pukalani** belongs to the King. (ibid.:359)

Moolau again recalled by permission of the King – and sworn.
The remaining boundary of Waikoloa: commence at Kapele, thence to Kaluamanu; thence to Kokiaina; thence to Kaholopalaa; thence to Puuiki; then turn and run along the foot of Puuohu at Wainehe (Puuohu is the King's), to Mr. Lyon's, Waikoloa; thence to Kamakeokeo, and along the middle of the ridge to Puuokaa.

Review the whole boundary of Waikoloa: commence at Puaapilau; to Keaohu; Kipukapamakani; Paakainui; Kapuulepo; Palehalapepe; Puuainako; Kamakalae; Nawawaekanakaikeike;

> Kekualapalapa; Kapele; Kaluamanu; Kokiaina; Kaholopalaoa; Puuiki; turn down at foot of Puuohu; Wainehe; Waikoloa; Makeokeo; Akuanui; along Puuokaa; Pookahuhu; Puuhuluhulu; Liuliu; along road Puuanuanu; Palinui; Kalapunakekua; Kapaakea; Kapohakau; Pooholua; Kapae; Kaala; Puuweuweu; Kiikii; Kapeaa; Pohakuloa; Keahualono; Puupoe; Kapalihai; Makahuna; Hanamauloa; Kauakahialaa; through Keanawiliwili; Kapukaiki; Uwekaula; Keanaohia; Hanaialii; between it and Wawaekea; Kaohekauhola; Keamuku; Kaawa; Puukapele; Puukeekee; Kilohana; Waikii; Kapoowaiokeakua; Kamakoa; Kalapamaile; Kemole; Kupahaa; turn down to Kapaakea; Puupueo; Puaapilau.
>
> The Boundaries of Waikoloa nui as decided by the Commissioners of Boundaries at Waimea – Hawaii, August tenth 1865.
>
> Commencing at Kokiaina run to Waiakalehua, to Kapele, Alaanui, Alaohia, Keakualapalapa, Kulanapahu, Kaopapa, Keanakii, Kahoopapale, Kahooalapiko, then along Napuu to Puupaha; then along the King's land to Puakowai, Kilohana, Puuokaa, Makeokeo, Waikoloa, to Puuohu, and to commencement, as given by Kaolulu, Kuupele, Kanehailua, and Kahakauwila.
>
> P. Cummings
> F.S. Lyman (ibid.:360)

The following testimonies were collected from informants in a series of dated communications curated in the Hawai'i State Archives and presented by Maly and Maly (2005) in *Mauna Kea: "Ka Piko Kaulana o ka 'Āina*. The testimonies extracted from that document illustrate land use as well and describe geologic and cultural features near the Study Area in great detail and are reproduced below in their entirety, with bolded, underlined, and italicized emphasis added.

Kiai (on behalf of G. Davis Hū'eu) testified to the boundaries of Waimea on October 13, 1866, and noted that the *pili* lands of Waikōloa extended southwest encompassing Pu'u Hīna'i. Furthermore, Kiai indicated the presence of *'iliahi* (sandalwood) in this area and related that he used to hunt for *'uwa'u* (dark-rumped petrel) and *nēnē* (Hawaiian goose; *Nesochen sandvicensis*) birds in these parts:

> Born in **Waimea** at the time of the Dysentery [ca. 1804]. . . Beginning at **Keahualono** and running to **Hanamauloa**; thence on to **Puuhinai**; thence to **Hanaialii**; thence to the Keamuku; thence to **Puukapele**; thence to **Naopili**. **Puukapele** is at the junction of **Kohala**, **Kona**, and **Hamakua**, where **Waikoloa**, **Napuu** [**Puu Anahulu**] and **Kaohe** meet.
>
> **Keahuolono** is a rocky point. **Hanamauloa** is *pili* land. So is **Puuhinai**. At **Hanaialii** is a cave and lava. **Keamuku** is a point in lava field. Has known the boundary since the time of Kamehameha first. Got my information from my father. I have visited the places mentioned by me. . .
>
> [answer to question from W. Stanley for Government] **Puuhinai** is a slight rise in the *pili* lands, a low hill. . . **Keamuku** is a lava field quite near **Puukapele**. **Hanaialii** is two miles perhaps from **Keamuku**. There is no road nor any gulches on the boundary. I know no gulch between Hanaialii and **Puukapele**. There is a gulch of **Waikii** and one of **Palihai**, but they are not near the line. These gulches join at **Naamana** or **Namahana**. . . I am well acquainted with that part of the boundary, and the rest of it also. I have travelled the whole line personally. Used to hunt for *uwau* [*'uwa'u*] and *neenee* [*nēnē*], and to cut sandal wood in that part of the country. (ibid.:365)

Haupu relayed that he learned of the boundaries from his *kūpuna* (ancestors):

> Lives on **Haleaha**, **Waimea**. Born near the **Kawaihae** line, at the time of the building of Kamehameha firsts' first *heiau* at **Kawaihae** [ca. 1790]. Know the boundary of **Kohala** and **Kona**, beginning at **Keahuolono** and running to **Hanaumauloa**; thence to **Kapukaiki** near **Puuhinai**; thence on to **Hanaialii**; thence to **Keamuku**; thence on to **Puukapele** at the junction of the Districts of **Kona**, **Kohala**, and **Hamakua**, where **Kaohe**, **Napuu**, and **Waikoloa** meet. There is a cave at **Kapukaiki**. I got my knowledge from my ancestors, with whom I went over the country for sandal wood. Travelled the line in person and have seen the places I named. Saw it when I was a boy in the time of Kamehameha first, and that boundary was always regarded as settled; undisputed until recently. (ibid.:365)

Haupu further added to the testimony, referencing the presence of a cultivated area on the Waikōloa side of Pu'u Hīna'i to the southwest of the Study Area, likely the sizeable parcel of land depicted on a ca. 1859 map (see Figure 8) labeled "Aina Mahi":

> From **Keahuolono** to **Hanamauloa** is a long distance. From **Hanamauloa** to **Puuhinai** is perhaps a mile and a half from **Puuhinai** to **Hanaialii** I cannot say. I cannot state distances confidently. **Puuhinai** is a pretty high hill where people used to cultivate on **Waikoloa** side. There is a gulch which approaches **Puuhinai** within half a mile or so. There is no gulch on the **Kona** boundary, nor very near it. Knows the **Kiikii** road. Knows **Puuwawaea** on the boundary of **Waikoloa** and **Waimea**. . .**Kahooalapiko** is close to **Puuhinai** in **Waikoloa**, not near the boundary. . . has heard of **Puuiwaiwa** from youth, but has not seen it. The **Poopoo** gulch is below the **Keamuku**, it is in **Waimea**, not very far from the **Kona** line. The gulches of **Waikii** and **Palihai** unite at **Namahana**, in **Waikoloa**, a long distance from the Kona line, say nearly 2 miles. (ibid.:365)

Pupuka testified to the boundary between Kohala and Kona. His testimony mentions two roads: the road extending from Waimea to Kona, and another that extended *mauka* from Keahuolono (also referred to as Keahualono) near the coast, past Puʻu Hīnaʻi up towards Keʻāmuku:

> Lives half a mile below this house. Born on **Ouli**, in the time of Kamehameha, when he died, I was grown up. I know the boundary between **Keahuolono** to **Hanamauloa**; thence to **Kapukaiki**; thence to **Hanaialii**; thence to **Keamuku**; thence to **Kapuukapele**, there is a hill there. It forms a junction at this place of **Kohala**, **Kaohe** and **Napuu** of **Kona**. **Kaohe** is in **Hamakua**. **Waikoloa** is on the **Kohala** line. I obtained my information from my ancestors. I first knew the boundaries when I used to hunt birds upon **Waikoloa** from the time of Kamehameha 1st. I have examined the boundaries personally, that has always been the boundary between **Kona** and **Kohala**, from the time of Kamehameha first. . .
>
> My father died at about the time of the abolition of the *Kapu* [1819]. I have gone over the boundaries with my father and he showed me the boundaries of **Kona** and **Hamakua**. **Keahuolono** is a rocky point of rocks. **Kahanamauloa** is *pili* land. **Kapukaiki** is close to **Puuhinai**. From **Puuhinai** to **Hanaialii** is as far as from Court House to Lyons place. From **Hanaialii** to **Keamuku** is as far as from the board house to the French Mission. From **Keamuku** to **Puukapele**, as far as from the Court House to Mr. Purdy's. The places I have given are the most prominent. I am unable to give you any other places upon the line. There is a Road that runs out of **Waimea** into **Kona**. There is a road between **Keahuolono** and **Puuhinai** that comes up to **Keamuku**. I don't know the **Kiikii** gulch or road. There is a gulch this side of the boundary upon **Waikoloa**. I cannot give the name of the gulch, it is as far from here as to Mr. Lyon's place.
>
> I know the **Poopoo** gulch, it finds it's source at **Naopili**. There is another branch at **Waikii**. They form a junction at **Naamana**, which is the same place as **Namahana**. I don't recognize the gulch **Palihai**. **Namahana** is as far as the Hill **Holoholoku** to the **Kona** boundary, from the Court House. I did not hear anything about the dispute between His Majesty and Geo. Davis. (ibid.:365-366)

Pololi testified to the Kohala/Kona boundary as learned from his father during bird hunting and *ʻiliahi* collecting excursions. From his testimony, we learn that the junction of Nāpuʻu (Puʻu Anahulu in North Kona), Kaʻohe, and Waikōloa is a hill called Puʻu Kapele, which is the convergence of the Kona, Kohala, and Hāmākua Districts. Furthermore, Pololi related that Waimea was *pili* land and that he lived there prior to 1823 while he sought out birds:

> Lives in **Kona**, was born in **Waimea** before the time of **Kiholo**, about that year. Knows the boundary between **Kohala** and **Kona**, beginning at **Hiiakaikaalei** on the sea shore and running to **Keahuolono**; thence on to **Kapukaiki** thence to **Hanaialii**; thence to **Keamuku**; thence on to **Puukapele**, where **Napuu**, **Kaohe**, and **Waikoloa** join. This is the junction of **Kona**, **Kohala**, and **Hamakua**. Learned the boundary from his father, when they went to hunt for birds; also going for sandalwood. Has also traveled there frequently. . .
>
> There is a cave with a small mouth at **Kapukaiki**. . . **Kapukaiki** is as far from the sea as say six miles. I know **Puuhinai**, it is in **Waikoloa**, not on the boundary, opposite **Kapukaiki**. Cannot state how far part. My father showed me the boundary from the sea to **Puukapele**. The last time I traversed the boundary was when I went to **Kaohe** after cattle. I did not go with my father along all the line, but he pointed out all the points on that line to me from **Keahuolono**. I could see **Puukapele** from that place, and **Puuhinai** also.
>
> [cross-examined]
>
> There is no gulch on the boundary [Kohala/Kona], nothing but stones and old lava, and stony *pili* land in places. There is no gulch on the line. The *aa* is in **Kona** and the *pili* land in **Waimea**. There

> is a gulch in **Waikoloa**, not far from the boundary. The name of the gulch is **Heewai**, ¾ of a mile or so from the line. The **Waikii** and **Palihai** gulch is on **Waikoloa**. Some mile and a half from the *aa* on the boundary, and more than three miles from **Puukapele**. . . I don't know any other name than **Heewai** for the first gulch. The name **Poopoo** is applied to **Waikii** and **Palihai** gulches. . .
>
> I live at **Kainaliu** between **Kailua** and **Kealakekua**. I never resided on **Napuu**. I lived in **Waimea** when I went for birds. I went to live in **Kona** when Liholiho went to England [1823]. I have traveled from **Kona** to **Waimea** by the road which crosses the boundary near **Puukapele**. I have only been on the *mauka* part of the boundary since that time, not on the part *makai* of **Hanaialii**. I have been after sandalwood in Kuakini's time on **Napuu**, in the *aa*, on the line of **Kaohe**, boundary of **Hamakua**. Also across the mountain after cattle. (ibid.:366)

On October 15, 1866, Kuehu of Puʻu Anahulu, on behalf of George Hūʻeu Davis, testified to the boundary of Kohala and Kona. He related his familiarity with the boundary, having learned it from his father, who in turn learned of them from his ancestors. Kuehu relates the presence of two resting places along the boundary between Waikōloa and the Kona District to the south of the Study Area:

> Resides on **Puuanahulu**. Was born there. Helped to carry stones to build **Kiholo** [in ca. 1810]. Saw Kamehameha the first. Knows the boundary of **Kohala** and **Kona**. It begins at **Keahuolono** and runs up to **Puupoe**; thence on to **Palihai**; thence on to **Hanamauloa**; thence on to a hill called **Kauakahiala**; thence to **Paliokaakaa** where is a road and a resting place; thence to **Kapukaiki** on a road; thence to a resting place called **Kikiha**; thence to **Hanaialii**, where people sleep; thence to **Wawaekea** a resting cave; thence on to **Keamuku**; thence to **Heewai** Gulch where is a resting place in the *aa*; thence to **Kaaawa**; thence to **Puukapele**, at the junction of the three Districts. **Kaohe**, **Puuanahulu** and **Waikoloa** meet at that place.
>
> **Puupoe** is clumps of rocks and old lava. I learned the boundary from my father who got his information from his ancestors. We were familiar with that boundary. He showed me the whole line. I was grown up at the time. It was before the death of Kamehameha. I was a bird catcher as well as my father. Many others know that to be the boundary and can testify. (ibid.:366-367)

Kuahine, a former *luna* (overseer) of Waikōloa, was born at Līhue (an *ʻili* of Waimea). He expressed familiarity with the boundary between Kohala and Kona, having traversed it while seeking out *ʻiliahi* and hunting *ʻuwaʻu* and *nēnē*:

> I live at **Napuu** in **Kona**. I was born about the time of **Kiholo**. I was born at **Lihue**, I know the boundary between **Kona** and **Kohala**. From **Keakalaihi** [**Hiikaikaalei**] at the sea shore, at the land of **Anaehoomalu**; thence up to **Keahuolono**; thence to **Puupoi**; thence to **Palihai**; thence on to **Hanamauloa**; thence to **Kahuakaiala**; thence to **Palaokaka**; thence to **Kapukaiki**; thence to **Kikiaha**; thence on to **Hanaialii**; thence to **Wawaekea**; thence on **Keamuku**; thence to **Heewai**; thence to **Kaaawa**; thence on to **Puukapele**. That is the end of the line. There the three lands join, **Kohala**, **Hamakua**, and **Napuu** *ma* **Kona**. **Kaohe** is in the **Hamakua** district. I derived my knowledge from my father and my elder brother. I have been a *luna* upon **Waikoloa** in the time of Kamehameha III. I have been on the boundary hunting *uau*, wild geese and in search of Sandal wood. (ibid.:367)

Malai, a resident of Waikōloa, testified that Puʻu Hīnaʻi was a place of cultivation where he had gone to obtain leaves of the *ʻuala*. More than likely, this cultivated area is the plot labeled as "Aina Mahi" in Figure 8). Malai also related the presence of a road called Puuokowai extending from the coastline inland from Keahuolono:

> I live on **Waikoloa**. I was born at **Pukalani** in **Waimea**. I was born about the time of **Kiholo**, while they were building it. . . I used to hunt with my father, I was a boy when Kamehameha 1st died. . . My father went with me to **Kiholo** to help build **Kiholo**, my mother remained at **Pukalani**. I have been to **Puuhinai** to obtain the Potato leafs, it is a place of cultivation. It is not on the boundary. You can see Puukaple [**Puukapele**] standing at **Keahuolono**, that is the top of **Puukapele**. I have been over the whole boundary line, hunting, sleeping at the caves, in and out of the line, sometimes upon one side and sometimes upon the other. Makahuna [**Makahonu**] is a cave in **Kona** not far from **Palihai** and from the boundary. I did not state it was upon the boundary before the Boundary Commissioners. **Huikaula** is in **Kikiaha**, an old sacrificing ground of the ancestors; it is not on the boundaries. I stated it was upon the boundary of **Waikoloa** and **Napuu**, before the Commissioners. **Keamuku** is a streak of old lava to this point.

> I know some roads crossing the boundaries from **Waimea** into **Kona**. There is a road, **Keahuolono** to **Puupoi** to **Makahuna**; thence on to **Hanamauloa**, the road crosses the boundary and recrosses it at various places. The road comes from the sea shore to **Puuhinai**, at **Makahuna**, a part of **Kona** crosses the road and comes this side of **Puupoi**. The next point is also upon the **Kona** side. At **Palihai** it is upon the boundary. **Hanamauloa** is also upon the boundary. **Kanakaola** is a burying place. At that point the road is on the **Kohala** side, about 50 paces from the burying place. At **Paliokaka** the road is upon the boundary. The name of the road from **Keahuolono** is "**Puuokowai**."
>
> There was a road from **Kapukaiki** on to **Kikiaha**. At **Hanaialii** the road is not on the boundary. At **Wawaekea** the road is in Kohala. It is close to the boundary, the road passes on to **Keamuku** and goes into the **Kona** side. After you pass **Keamuku**, you cannot call it a land, there is a gulch, it is called **Heewai**. (ibid.:367)

On November 10, 1866, Keawekoloua of Puʻu Anahulu testified to the boundaries of Kohala and Kona and identified the location of the cultivated land section (likely the "Aina Mahi" depicted in Figure 8 adjacent to Puʻu Hīnaʻi) mentioned by Malai. Keawekoloua related that he learned the boundaries between these lands from his father while hunting for *ʻuwaʻu*, *nēnē*, and seeking out sandalwood south of the Kohala boundary in Nāpuʻu (Puʻu Anahulu):

> I was born at **Puuanahulu** in **Kona Hawaii**, adjoining **S. Kohala**. I was born after the building of **Kiholo**. I know the boundaries of **Kohala** and **Kona**. It commences at sea shore at **Hiiakaikaalaihi**; thence to **Keahuolono**; thence to **Pohakuloa**; thence to **Kepani**; thence to **Kapuuale**; thence to **Kiikii**; thence to **Kahawaiokalolo**; thence to **Kapaakea**; thence to **Puupoha**; thence three lands join – viz the *Ahupuaa* of **Waimea**, **Napuu** & **Waikoloa**. Thence to **Kahoalapiko**. **Waikoloa** ceases there. Thence to **Puuiwaiwa**; thence to **Namahana**, the junction of **Paauhau**, **Napuu** & **Waimea**. **Paauhau** is in the district of **Hamakua**.
>
> **Namahana** is a gulch. There is a road from **Namahana** to **Kona**. There is a road on the line which I have described, dividing **Kona** & **Kohala**.
>
> I know **Puukapele** it adjoins & belongs to **Napuu**. It is on the edge of **Napuu**, on side adjoining **Kaohe**. I know **Naopili**, it is a cave. It's where **Paauhau** ends, joins **Kaohe**. I have learned these things from my grandfather and father. Accompanied my father in excursions hunting the *uau* and *nene*. Went after *uau* till they were destroyed by wild cats. Afterwards went after sandal wood. I have very frequently visited these places. Have been a guide to foreigners from **Kaawaloa** to the volcano. My father belonged to **Napuu**. I lived at **Napuu** and **Waimea**. . . **Naohulelua** is the junction of **Napuu**, **Keauhou** & **Hamakua**. **Puukapele** & **Puukeekee** stand near eachother, are in **Napuu**, *mauka* of them is **Kaohe**. I have been to **Naopili**. It is beyond **Puukeekee** toward **Mauna Kea**. I have been to **Namahana** with my father who pointed out the country. Have been there since his death.
>
> Have been there with Joaquim after cattle. It was a place of meeting where we drove cattle & lassoed them. Heard the name **Namahana** from my father. Never knew **Puukapele** was the ancient boundary of **Kona**.
>
> . . .I know **Waikoloa** in **Waimea**. Part of it is cultivated, at **Kapanaolona**, in potatoes. Pumpkins, melons and gourds grow if planted there. There is a hill called **Puuhinai** on the **Kona** side. . . It was not considered a part of **Waimea** till very recently at least. . .
>
> The boundary runs to **Kahooalapiko**. **Kahooalapiko** is at junction of **Waikoloa**, **Waimea** & **Napuu**. I was there last about two years ago. I pass that way to **Napuu** when I visit my sisters at **Napuu**. This place has been pointed out by my father on bird catching. It was necessary to know the boundaries so as not to trespass. I took birds on **Napuu**, **Kaohe** & **Keauhou**. . . [HAS – Interior Department Lands; 1866]. (ibid.:368)

From the testimonies, we learn that the coastal areas of Waikōloa Nui (e.g. the *ʻili* of ʻAnaehoʻomalu and Kalāhuipuaʻa) were considered more valuable than its interior portions, and as such were not given to Isaac Davis by Kamehameha I. The lands of Waikōloa Nui were known as being *pili* lands and a place for bird catching. Several of the informants revealed that the lands along and adjacent to the South Kohala/North Kona boundary were hunting grounds for *ʻuwaʻu* and *nēnē* birds.

Numerous localities in Waikōloa in the general vicinity of the study area are mentioned in the testimonies, including several named caves (Hānaialiʻi, Kapukaiki, Wawaekea), resting places (Heʻewai Gulch, Kikiha,

Palioka‘aka‘a), a burial ground (Kanakaola), sacrificial grounds (Huikaula), roads (Kiikii, Liuliu, Palioka‘aka‘a, Puuokowai), and prominent gulches (‘Auwaiakeakua, He‘ewai, Palihai, Poopoo, Waiki‘i). While the lands of Waikōloa are generally known for being covered in *pili* grass, several of the informants revealed that they traveled over the country in search of *‘iliahi* (Hawaiian sandalwood; *Santalum* sp.), perhaps in the more interior sections of Waikōloa. Additionally, several testimonies indicate the presence of an area referred to as within “Kapanaolona” near Pu‘u Hīna‘i (located to the southwest of the Study Area) that was cultivated in *‘uala*, pumpkins, melons, and gourds. Oral histories indicate that another dry land planting area referred to as Makahonu was present in Waikōloa, “which was still used through the turn of the [twentieth] century” (Maly 1999:153). Makahonu was located near the intersection of Waikōloa Road and Queen Ka‘ahumanu Highway, well *makai* of the Study Area. There is no information in the oral histories of what was specifically cultivated in that planting area, although ‘Anaeho‘omalu and other proximal locations were favorable areas for growing *‘uala* (Handy and Handy 1991).

Waikōloa Ahupua‘a During the Late Nineteenth and Twentieth Centuries

By the mid-1860s the Waimea Grazing and Agricultural Company (WGAC), founded by Robert C. Janion and William H. Green in 1861, and joined by F. Spencer and Company soon thereafter, had acquired considerable strategic assets around Waimea in an attempt to monopolize the livestock industry in the region (Bergin 2004). From the outset, Spencer, Janion, and Green maintained an adversarial relationship with Parker Ranch, and land disputes and alleged cattle rustling were common occurrences between these two competing entities. During the early 1860s Parker successfully thwarted Janion’s men from harvesting unbranded cattle on his lands, but attacks by Frank Spencer contesting Parker’s claim to more than 17,800 acres in other parts of the island more difficult to resolve, and were still ongoing when John Palmer Parker, the founder of Parker Ranch, died on August 20, 1868 (Bergin 2004). At the time Parker Ranch controlled about 47,000 acres of land in the region. The ranch lands were divided evenly between John Parker II and his adopted son and nephew, Sam Parker Sr. (Bergin 2004).

On July 2nd, 1868, G. D. Hū‘eu leased his remaining lands in Waikōloa Nui to the WGAC for a twenty year period (Maly and Maly 2002). With the acquisition of this land, the WGAC became the largest ranching operation on the island. Under the terms of the lease the Hū‘eu family was allowed to continue grazing their 1,000 head of cattle, 1,000 head of sheep, and 100 horses on the Waikōloa lands (Escott 2008).

Despite the growth of the ranching industry, Lorenzo Lyons estimated that by 1867 the population of Waimea was only four hundred people; during the 1870s the town of Waimea contained five stores and a hotel (Doyle 1953). An 1877 *Report of the Royal Commissioners on Development of Resources* documents the effects of cattle ranching on the environment of the Kohala-Waimea region, and the resultant outmigration of the native population during this period:

> The forests on the Kohala mountains are dying rapidly. The land is mostly for grazing purposes, though on the mountain potatoes of fine quality can be raised in large quantities. In sheltered places, coffee would doubtless grow, but owning to the sparseness of the population and the superior attractions to other parts of the district, this part will hardly soon be settled. The once fertile and populous plain of Waimea looked sterile and desolate when visited by the Commission - a painful contrast to Kohala loko on the other side of the mountain.
>
> The complaint of the people is well founded. The water they use is fouled in many places by cattle, horses and other animals, and as the stream is sluggish it has no chance to free itself of impurities, and the water used by the people in their houses must be a cause of disease and death, especially to the children . . . It is little wonder that with his crops trodden out by the sheep or cattle of his stronger neighbors, his family sickened perhaps to death by the polluted waters, that the small holder should yield to despair, and abandoning his homestead seek employment in some other district, usually without making another home . . .
>
> The plains of Pukapu [Pu‘ukapu] and Waimea·are subject to high winds, aggravated by the loss of the sheltering forests of former days. The soil however is very good in many places for sugar cane and other products. To develop its best resources, efforts must be made to restore the forests and husband the supply of water at their sources to furnish a supply for agricultural purposes. At present the lands are used almost exclusively for grazing purposes. Although the proprietors and lessors are probably not averse to the establishment of agricultural enterprises, it is to be feared that the denudation of the neighboring mountains and plains of the forests will render the climatic conditions unfavorable to success.

> It would seem that a wise appreciation of the best interests of this district, even of the grazing interests themselves, would lead to the decrease of the immense herds which threaten not only Waimea but even Hamakua with almost irreparable disaster. It is to be feared that they will in time render a large part of the land of little value even for grazing purposes. Owing to the increasing frequency and severity of droughts and consequent failure of springs. Some thousands of cattle are said to have died this last winter from want of water, and the works erected in Waimea for the purpose of trying out cattle have been idle for months for want of water.
>
> The commission do not propose here to discuss fully the vexed Questions of the causes of the diminution of the forests, but in view of the fact that they are diminishing and the streams and springs diminishing a corresponding rations, also that with the cattle running upon the lands as at present, any effort to restore them must be futile and any hopes of their recuperation vain, the Government, if it would wish to preserve that part of the island of Hawaii from serious injury, must take some steps for reclaiming the forests.
>
> In this connection we would say that it is unfortunate that large tracts of Crown and Government lands have been lately leased on long terms for grazing purposes, without conditions as to their protection from permanent injury, at rates much lower than their value even as preserves for Government purposes or public protection. The commission deem (sic) this a matter of grave importance, challenging the earnest attention of the Government, and involving the prosperity of two important districts. (in Maly and Maly 2002:58–59)

By the late-1870s, largely due to persistent drought conditions within its grazing lands, the WGAC went out of business, and its herd was purchased by Parker Ranch (Parker Ranch would also eventually acquire the lease of Waikōloa Ahupuaʻa) (Bergin 2004). Francis Spencer formed Puʻuloa Sheep and Stock Company, and continued to raise sheep in Waikōloa and neighboring lands. In October of 1876 Spencer sold his interest in the sheep ranch to George W. Macfarlane; included in this transaction were the Waikōloa Nui lands lease from G. D. Hūʻeu (Maly and Maly 2002). George Bowser, the editor of *The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide*, visited Waimea in 1880 and stayed at Spencer's house. Browser writes:

> . . . Waimea has always been a place of some considerable importance, and there are around it several pretty homesteads, notably the residences of Mr. F. Spencer and the Reverend Lyons. From Mr. Spencer's veranda there is a striking view of Maunakea, the summit of which was at this time of the year still in its winter robe of snow. The snow never leaves this mountain top entirely, but the position of the snow-line varies considerably with the season of the year, and also from one year to another, according to the weather which characterizes them. The country all round is chiefly suitable for grazing, and, besides innumerable wild cattle, descended, no doubt, from those which Vancouver gave to Kamehameha I, there are some 20,000 head depastured in the neighborhood, the property of Mr. Parker, who has, besides, some large droves of horses, probably numbering a thousand head in all. Mr. Spencer has turned his attention chiefly to sheep farming, and occupies a large tract of country with his flock of 15,000 sheep and 15,000 goats. Waimea itself, although of immemorial age, and once populous, is now only a scattered village, with but two stores and a boarding and lodging house and coffee saloon. (Bowser 1880:540)

Parker Ranch continued to expand their operations in the Waimea area throughout the 1870s and 1880s. The ranch eventually acquired the lease to roughly 95,000 acres in Waikōloa still held by G.D. Hūʻeu that had formerly been leased to the WGAC. By the mid-1880s Sam Parker's poor business dealings had led to a rapidly degenerating financial situation for Parker Ranch, and in 1887 the entire ranching operation was entrusted to Charles R. Bishop and Co. for a fee of $200,000 (Bergin 2004). With the move to trusteeship new managers were brought in to oversee the day-to-day operations at the ranch.

By the early 1900s, Parker Ranch was under the direction of Alfred W. Carter, chosen as the guardian and trustee for Thelma Parker, John Parker III's daughter, upon his death at the age of nineteen. Early on in his tenure as Ranch Manager, Carter concentrated on acquiring and converting more of the ranch's lands from lease to fee. In 1903, with only a short period left on its lease, Carter acquired nine-tenths interest in the Waikōloa Nui lands from Ms. Lucy Peabody for $112,000, securing important grazing lands for the ranch (Bergin 2004). Soon thereafter, Carter purchased the adjacent lands of ʻŌuli and the Puʻuloa Sheep and Stock Company, encompassing over 3,700 acres and including the Keʻāmuku Sheep station in Waikōloa, which he converted to cattle ranching over the next decade. Much of these

grazed lands were divided into paddocks, and transportation and water conveyance infrastructure projects were undertaken to increase the productivity of the Waikōloa rangelands. In 1906, on behalf of Thelma Parker, Carter bought out Sam Parker's half-interest in Parker Ranch for a sum of $600,000. Other important purchases made by Carter during the first dozen or so years of his trusteeship included Humu'ula, Ka'ohe, Waipunalei, and Kahuku Ranch (Bergin 2004). During his time as ranch manager, Alfred W. Carter obtained water rights at the headwaters in the Kohala watershed, which he used to create a large high-pressure water pipe that brought water up to nearby Waiki'i (which had no consistent water source). This water line ran from the head waters in the Kohala Mountains down through the current day Waimea Town. From the town, the pipeline expanded into a networking of pipes that continued across the Waimea-Waikōloa plains, through the Study Area, and on to Waiki'i (Figure 10). This system was quite controversial on the ranch and contributed to the on-going conflict between Carter and Sam Parker, Jr. (Bergin 2004). After Carter's initial pipeline proved successful, however, other pipes and pump stations were added to this water conveyance system.

The expansion of Parker Ranch's land- and lease holdings throughout the late 19th and early 20th centuries allowed the ranch to raise cattle and sheep in paddocks around the island. Once ready for the market, these animals would be brought back to Waimea for sorting before being driven down to Kawaihae to be shipped. During these drives the cowboys followed a well-used network of trails that connected the distant stations at Waiki'i, Kalai'ehā, and Ke'āmuku with the town of Waimea and shipping harbors on the Kohala coast (Maly and Maly 2002). One segment of this network, the -Ke'āmuku trail, is located in close proximity to the Study Area.

The earliest published depiction of a trail through Waikōloa from Waimea Town was published in the *Pacific Commercial Advertiser* on February 17, 1859 (Figure 11). The route appears as a dashed line between Waimea and the saddle between Mauna Kea and Mauna Loa. The scale of the map, which was drawn to show the progress of the lava flow from the Mauna Loa eruption, does not allow for any detailed information about the route. The general route indicated in the 1859 map proceeds in a southerly direction from Waimea, across Waikōloa, and around Mauna Kea into the saddle. While the position of the trail is shown in very general terms, the basic route across Waikōloa appears to have persisted at least until the turn of the 20th century, when the Waimea-Kona highway redirected traffic across the Waikōloa plain.

Three years after the 1859 map was published, surveying work began on a "Mountain Road" between Waimea and Hilo that crossed through Waikōloa. S. C. Wiltse was contracted to survey a route that would connect Waimea with Hilo *via* Waiki'i and Kalai'ehā (Maly and Maly 2003:118). The map produced by Wiltse during his survey was submitted in a draft form (S.C. Wiltse to F. W. Hutchinson, August 2, 1869, reproduced in Maly and Maly 2002:120) and this draft became Hawai'i Registered Map 528 (Figure 12). Although Wiltse's map shows the landmarks used to triangulate his route (and therefore the route itself), it cannot be used to determine precisely whether the proposed route passed through the Study Area. The map does, however, show the position of the route relative to specific landmarks, and passes *makai* of Pu'u Heihei before it reaches Pu'u Papapa. This characteristic of Wiltse's route differs from later depictions of the Waimea-Ke'āmuku Trail.

During the period between Wiltse's contract for the Mountain Road and the completion of his map, the Waimea Grazing and Agricultural Company (WGAC) had begun to expand into Waikōloa by leasing G.D. Hū'eu's lands for cattle grazing. The trails connecting the WGAC's and other ranching stations appear in maps drawn by J. Perryman in J.S. Emerson's Field Note Books from 1882 (Book 251:109, reproduced in (Maly and Maly 2003:102). As seen from the top of Ahumoa *pu'u* (Figure 13), the route surveyed by Wiltse appears more or less as it is suggested on Hawai'i Registered Map 528, but with one critical difference. In the lower right quadrant of the map, a trail leading from Waimea passes *mauka* of a small unnamed *pu'u* (probably Pu'u Heihei) and Pu'u Nohonaohae. At Nohonaohae, the trail forks into *mauka* and *makai* branches. The *mauka* branch follows the base of Mauna Kea toward Waiki'i Gulch and Kalai'ehā. The *makai* branch of the trail leaves Nohonaohae, passes *makai* of Pu'u Papapa, passes east of the Study Area (in an area labeled "Grazing Land") eventually terminating at Ke'āmuku.

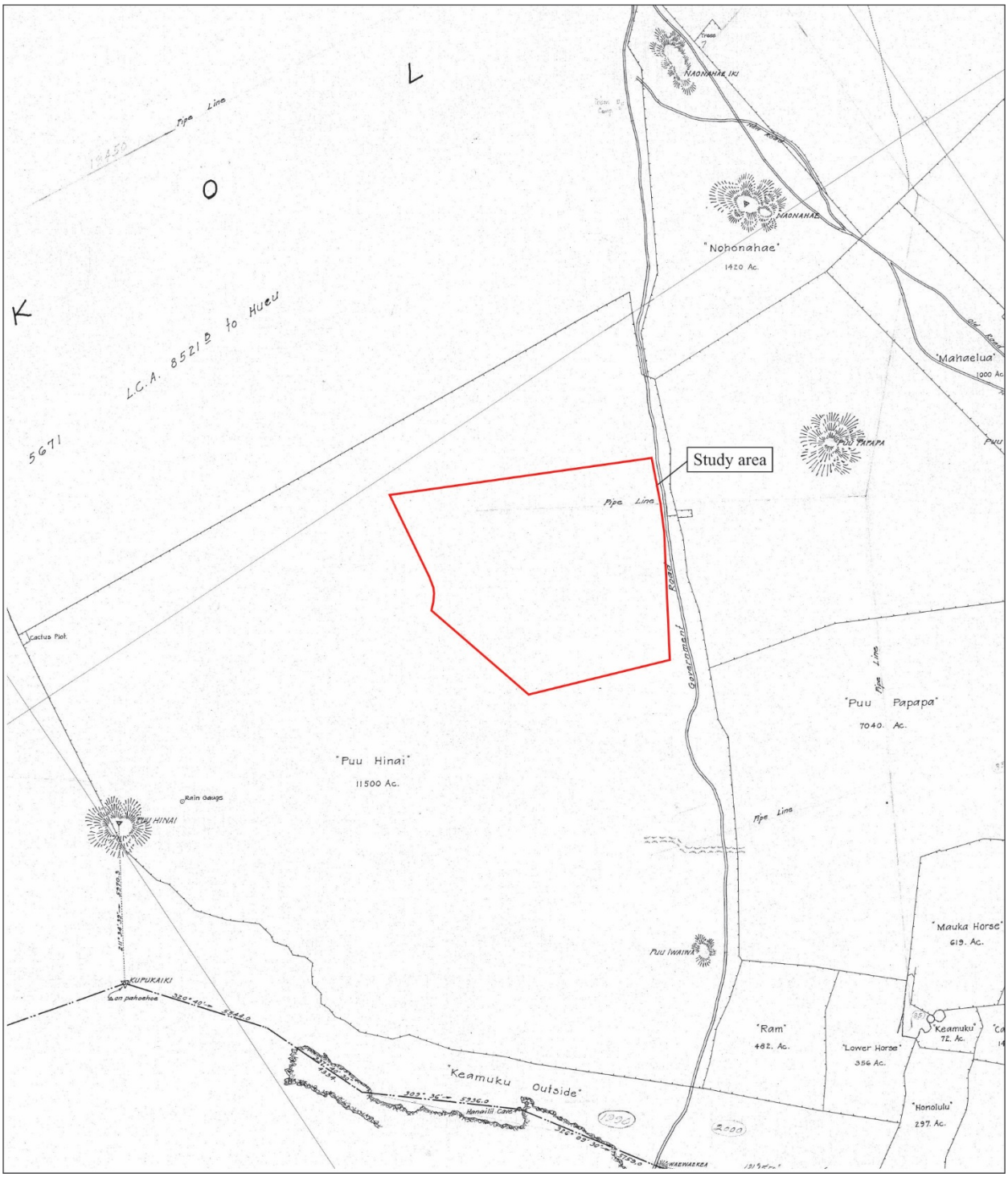


Figure 10. Detail of 1917 Hawai‘i Registered Map No. 2786 by G.F. Wright showing Parker Ranch infrastructure (e.g. pipelines) in the vicinity of the Study Area.

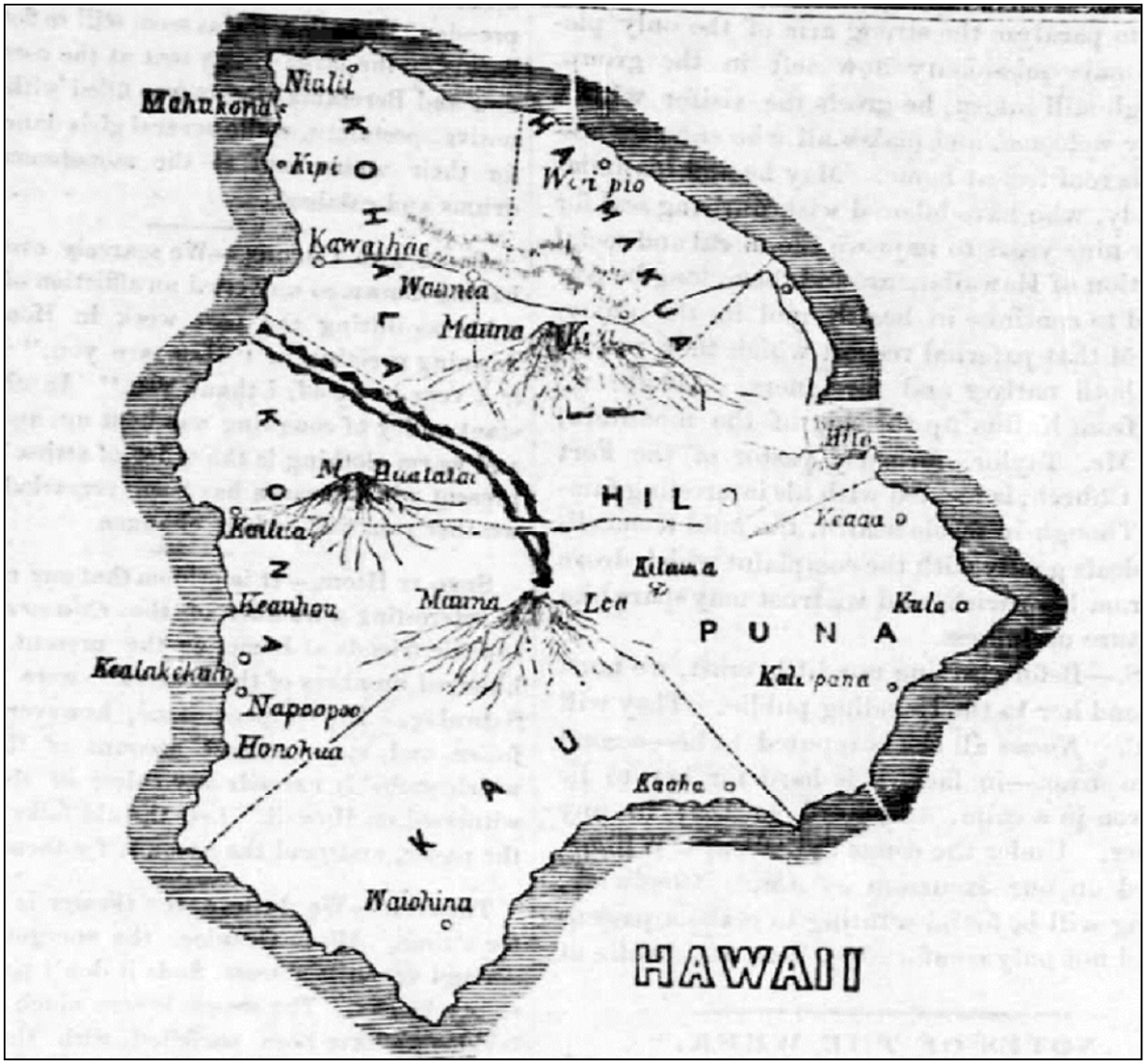


Figure 11. Map of Hawai'i Island published in the *Pacific Commercial* Advertiser on February17, 1859, showing a trail across Waikōloa connecting Waimea and Hilo.

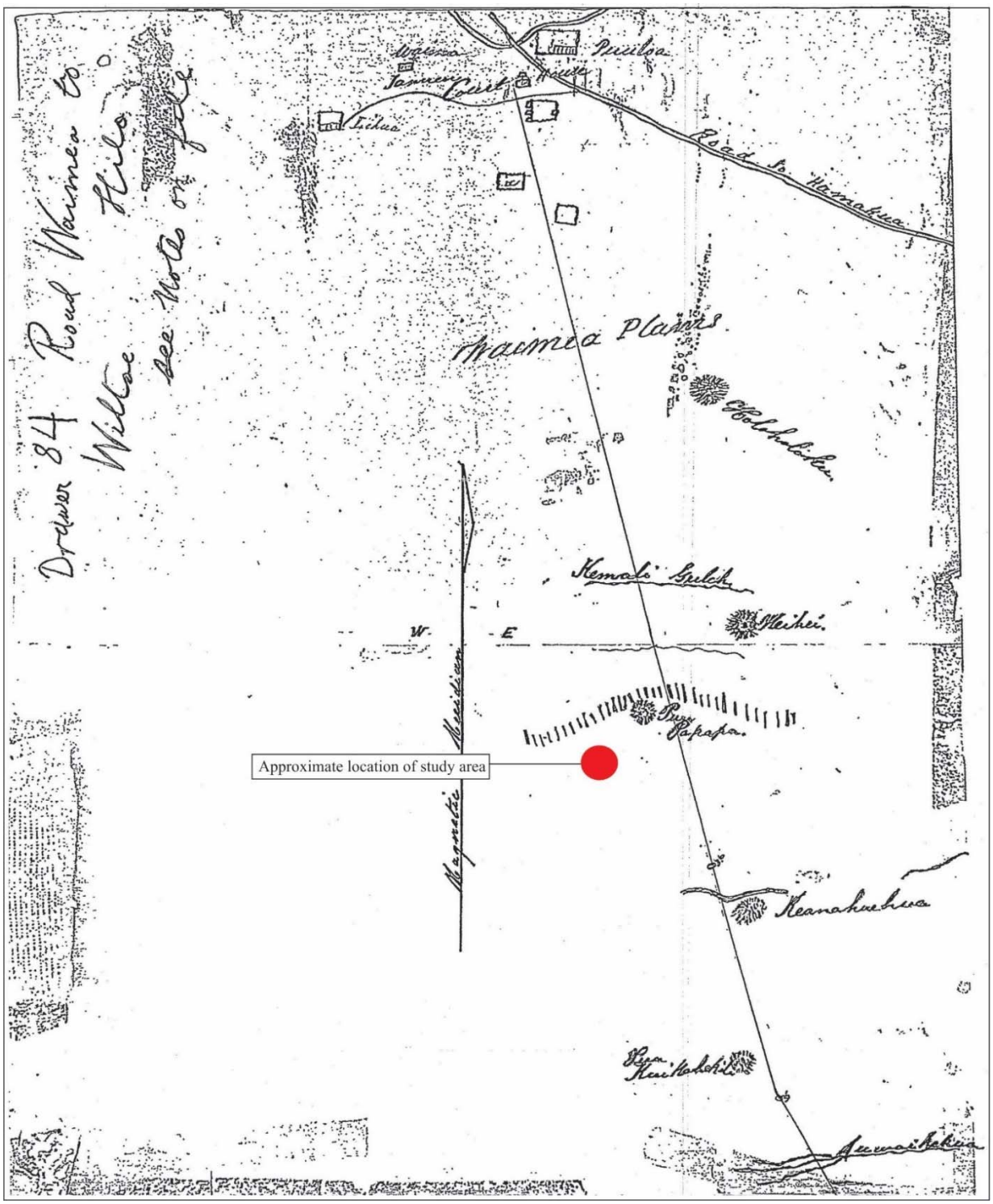


Figure 12. Detail of Hawai‘i Registered Map No. 528 showing a portion S.C. Wiltse’s of surveyed route from Waimea to Hilo passing *makai* of Pu‘u Papapa.

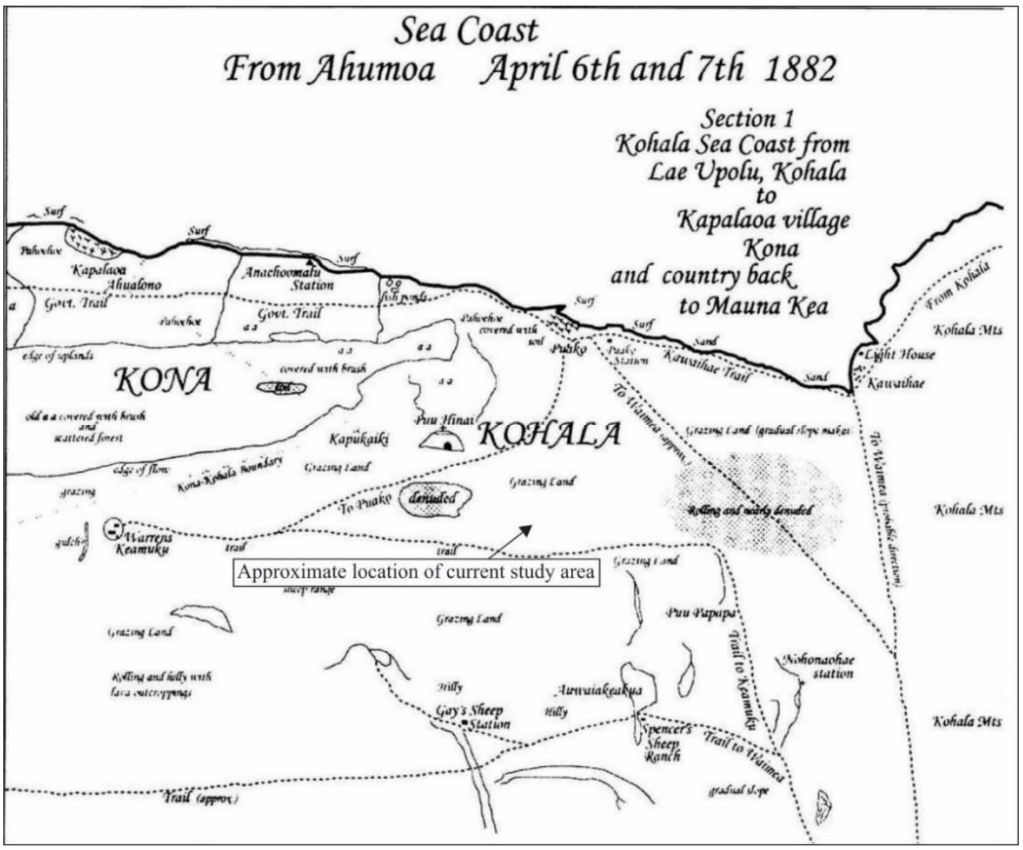


Figure 13. Portion of a sketch map of the sea coast viewed from Ahumoa (Emerson's Sketch Book No. 259:109).

The trail network from Waimea through Waikōloa in the general vicinity of the Study Area is more precisely depicted on Hawai'i Registered Map No. 2786 completed in 1917 by G.F. Wright for the Parker Ranch (see Figure 10). The transportation infrastructure shown on the maps include several recently completed roads and trails. The trail from Waimea towards Waikōloa appears to follow a similar route as the one shown in Perryman's map, and passes east of Pu'u Nohonaohae and Pu'u Papapa (and thus east of the Study Area). Later maps and aerial imagery document the changes in the use of the route from Waimea to the Waikōloa stations, particularly the Waimea-Ke'āmuku trail. A 1926 Territory of Hawai'i Survey map (Figure 14) shows the Waimea-Ke'āmuku trail passing near Nohonaohae and following the pipeline south, essentially as it appears on Hawai'i Registered Map No. 2786. Several of Maly and Maly's (2003) interviewees stated that this trail was used during the 20th century to move livestock from Waiki'i to Waimea. However, to the north of Nohonaohae, a trail labeled "Keamuku Trail" extends southwest along the eastern edge of the *pu'u* from "Waiki Road", and curves around the *makai* side of Pu'u Papapa to the east of the Study Area (see Figure 14). According to several *paniolo* who worked in Waikōloa, Parker Ranch's Waimea-Ke'āmuku trail followed the pipeline south from Nohonaohae into the ranch station (Maly and Maly 2003).

Another segment of this ranching transportation network, the Puakō-Ke'āmuku trail, appears to not have crossed the Study Area either, but rather extended south of it. The Puakō-Ke'āmuku Trail departs from "Warren's Keamuku," which is located near the left-hand edge of Perryman's sketch (see Figure 13). The trail proceeds northerly, then diverges from the Waimea-Ke'āmuku Trail that passes east of the Study Area leading to Waimea. As it travels *makai*, the Puakō-Ke'āmuku trail is shown passing around the northern side of Pu'u Hīna'i, and then curves westerly toward Puakō. Almost no other details are provided about the terrain or conditions along this trail. Route changes to the trail are documented in more recent maps and aerial images and consist primarily of the addition of new road segments. The 1928 USGS Puako Quadrangle map (Figure 15) depicts the Puakō-Ke'āmuku trail beginning at a road (the former sugar mill railroad) near Puakō Harbor and ascending toward Pu'u Hīna'i, passing along its western side and continuing *mauka* until it intersects with the upper road (present-day Highway 190). The route of the trail appears to have then followed the upper road to an unpaved road leading to the Ke'āmuku Station. By the 1950s, portions of the trail mapped in 1928 took on the form of unimproved dirt roads, a result of increased motor vehicles and the use of the Waikōloa area for military training during World War II.

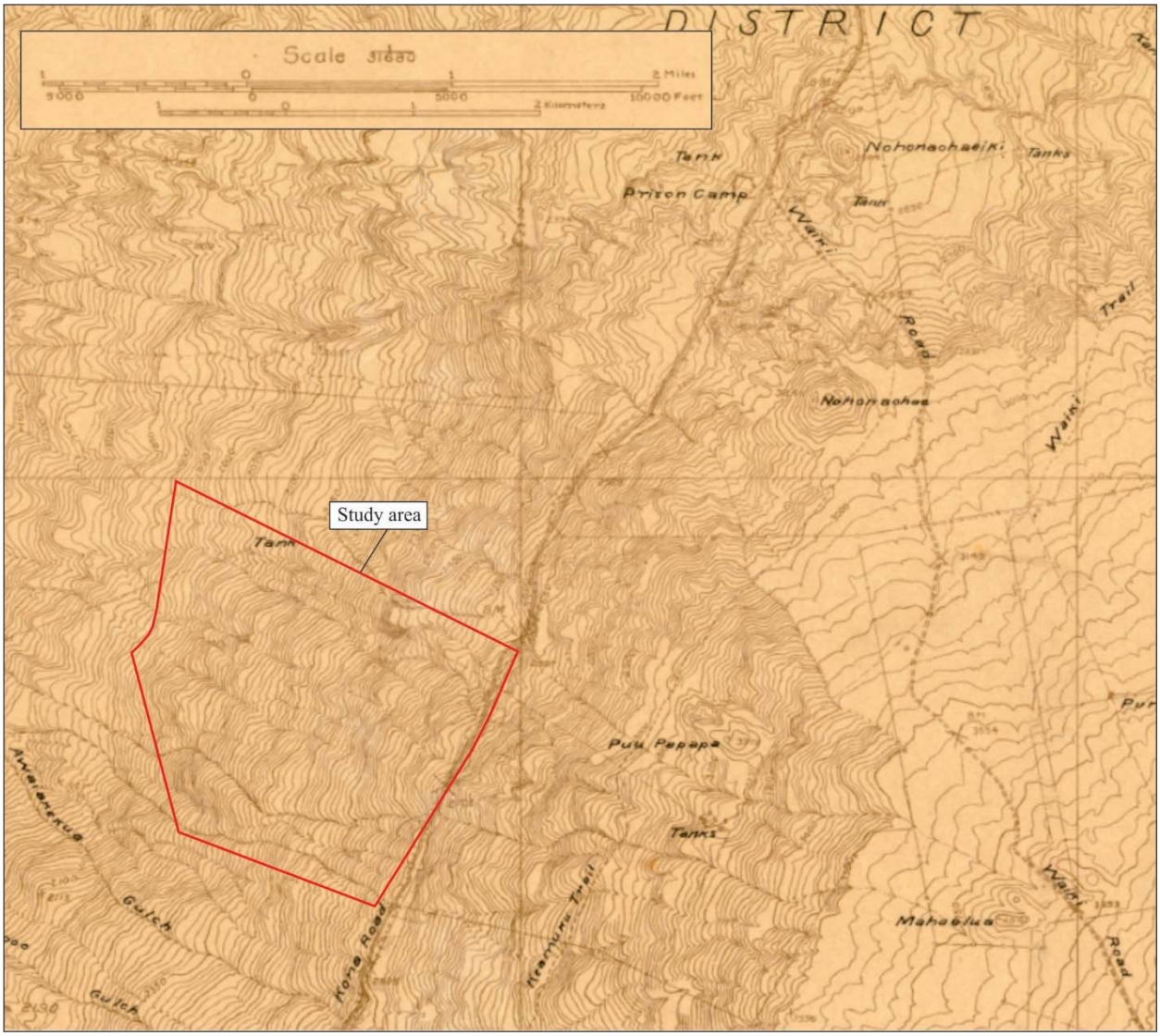


Figure 14. 1926 Territory of Hawai‘i Survey map showing the “Keamuku Trail” (Waimea-Ke‘āmuku Trail]) crossing directly east of the Study Area (outlined in red).

Parker Ranch’s program of paddock and water improvements that were developed in the early part of the twentieth century prompted the creation of Hawai‘i Registered Map No. 2786 in 1917 by G.F. Wright (see Figure 10). The transportation infrastructure shown includes several recently completed roads and trails, but, unlike other trails used by Parker Ranch during the early at the time, the Puakō-Ke‘āmuku Trail does not appear on this map. However, ranching infrastructure appears including a branch from Parker Ranch’s water pipeline network that extends into “Puu Hinai” paddock, and thus into the Study Area. The pipeline route extends southeast to northwest until reaching a water tank identified by Tam Sing and Barna (2018) in the northwestern portion of the Study Area (Site 30923), then continues southwest outside of the study area where it terminates at another water tank situated near the confluence of a light duty (unimproved) road and an unimproved dirt road, both of which are partially situated within the Study Area (Figure 16). Additionally, a fenceline is depicted extending adjacent to the southern boundary of the Study Area south of the light duty road. Aerial photography from 1954 (Figure 17) clearly shows both the light duty and unimproved roads and the water tank within the Study Area, however it does not clearly depict the pipeline or the fenceline. It appears that somewhere between 1956 and 1982 the pipeline fell into disuse and is no longer pictured on any subsequent topographic maps of the area (Figure 18).

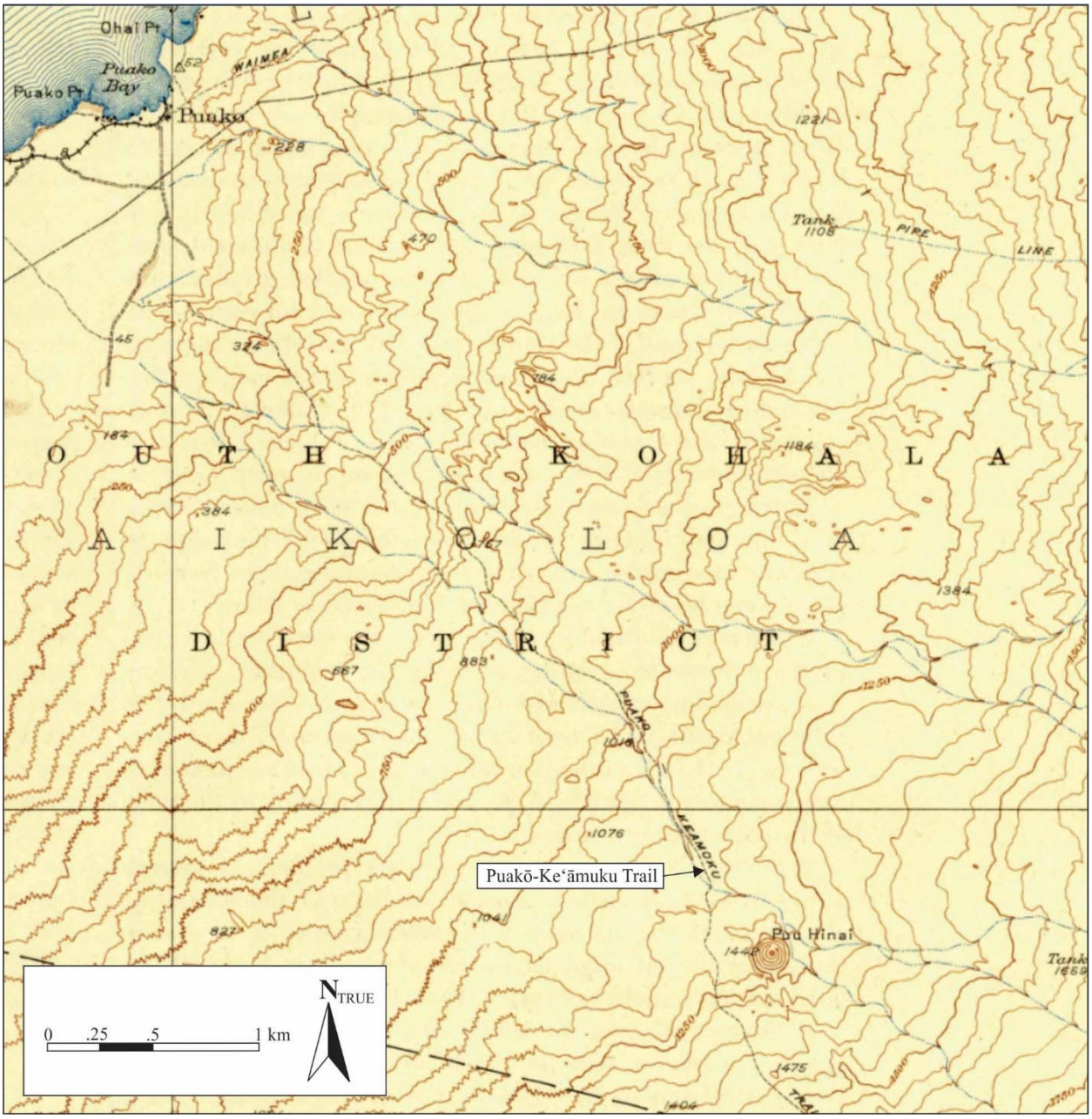


Figure 15. Portion of 1928 Puako USGS quadrangle map depicting the Puakō-Ke'āmuku Trail passing on the southern side of Pu'u Hīna'i.

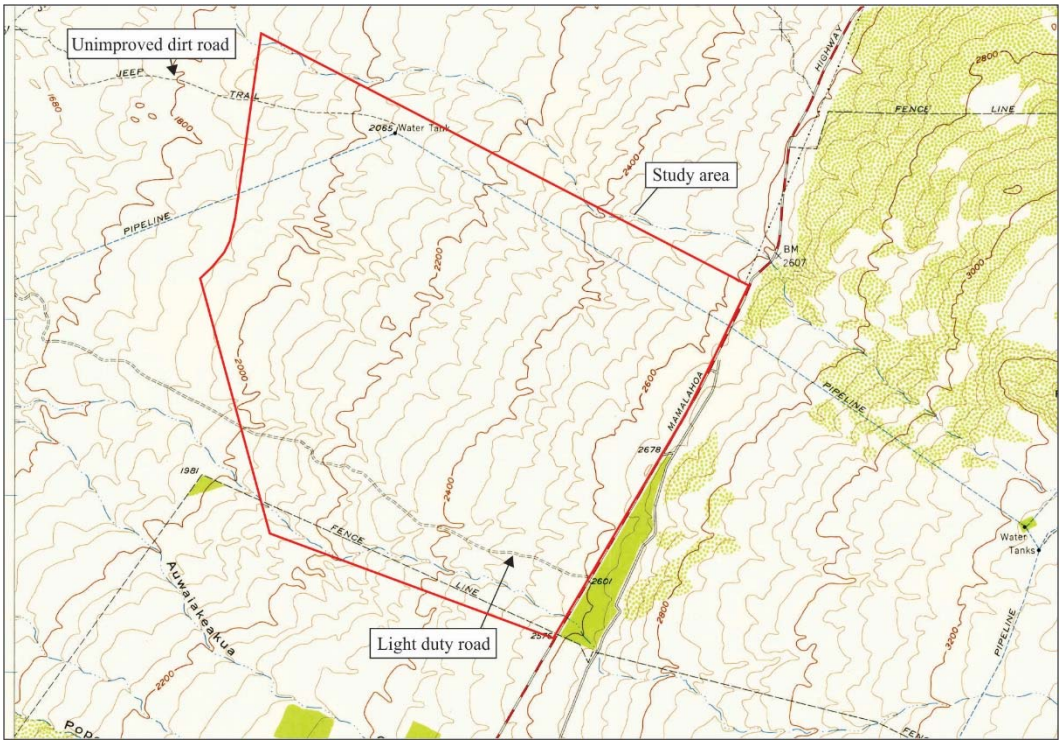


Figure 16. Portion of 1956 Nohonaohae USGS quadrangle map showing pipeline route and roads within the Study Area (outlined in red.)

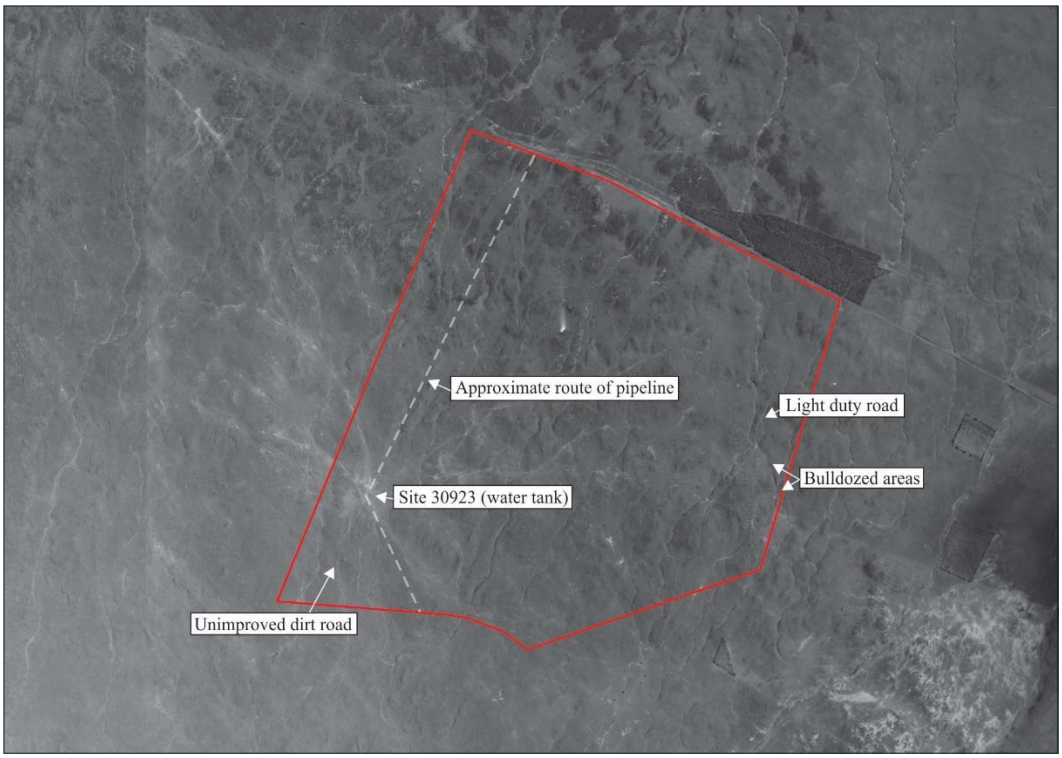


Figure 17. October 14, 1954 USGS aerial photograph of the Study Area (outlined in red).

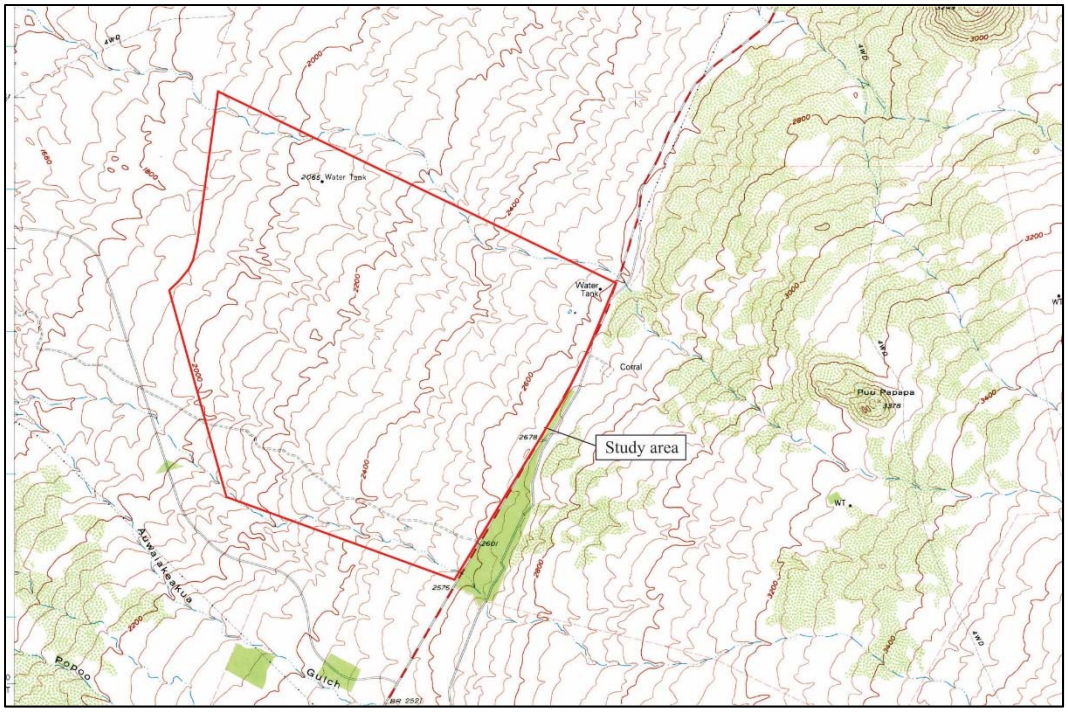


Figure 18. Portion of 1982 Nohonaohae USGS quadrangle map showing absence of pipeline within the Study Area (outlined in red.)

Substantial changes to the area surrounding the Study Area parcels began in the first quarter of the twentieth century with the development of the Old Waimea-Kona Belt Road, which was constructed between 1916 and 1922 and served as the main Kona-Waimea connector for elevent years (Escott and Keris 2009). Due to the tough road conditions on the driver and automobile, the use of the Old Waimea-Kona Belt Road was short lived, and the Government decided to begin construction on a wider, more improved road. The new belt road (Highway 190) was finished in 1933 and extends along the eastern boundary of the Study Area. A description of the new belt road is provided in an article in the July 1933 edition of *The Friend* newspaper, below is an excerpt from the article about the road finishing ceremony:

> "The formal opening of the new belt road on the island of Hawaii, July 22, 1933, was an important occasion, attended by the Governor and his party from Honolulu and many excursionists.
>
> The proposal has been made that the new road be named "Mamalahoe," commemorating the famous edict by King Kamehameha I, "the Law of the Splintered Paddle" making Hawaii's highways safe for the traveler.
>
> A colorful celebration on Saturday was followed by a unique service of worship in the historic Kailua Church the following day. A sermon by the Rev H. P. Judd, broadcast by radio throughout the islands, was a feature of this service. . ." (1933)

The construction of a main thoroughfare connecting Waimea to Kona was not only beneficial for mere transportation purposes, but also facilitated urbanization in Waikōloa. In 1969, just a year before major development activities began across Waikōloa Road, which resulted in the creation of a resort and residential subdivision, approximately 8,309 acres of land situated on the west side of Highway 190 was subdivided into ten lots ranging in size from 350 to over 1,300 acres by the Boise Cascade Home and Land Corp. Trust for the proposed Waikoloa Ranch Lots subdivision (Figure 19). The Study Area is identified as Lots 7 and 8 of this subdivision, which was originally slated for agricultural land use and construction of a single-family dwelling and additional farm building development (U.S. Department of Transportation Federal Highway Administration State of Hawai'i, Department of Transportation Highways Division and State of Hawai'i Department of Transportation Highways Division 2017). Despite the formal subdivision of these lands, the entirety of the Waikoloa Ranch Lots subdivision has remained undeveloped.

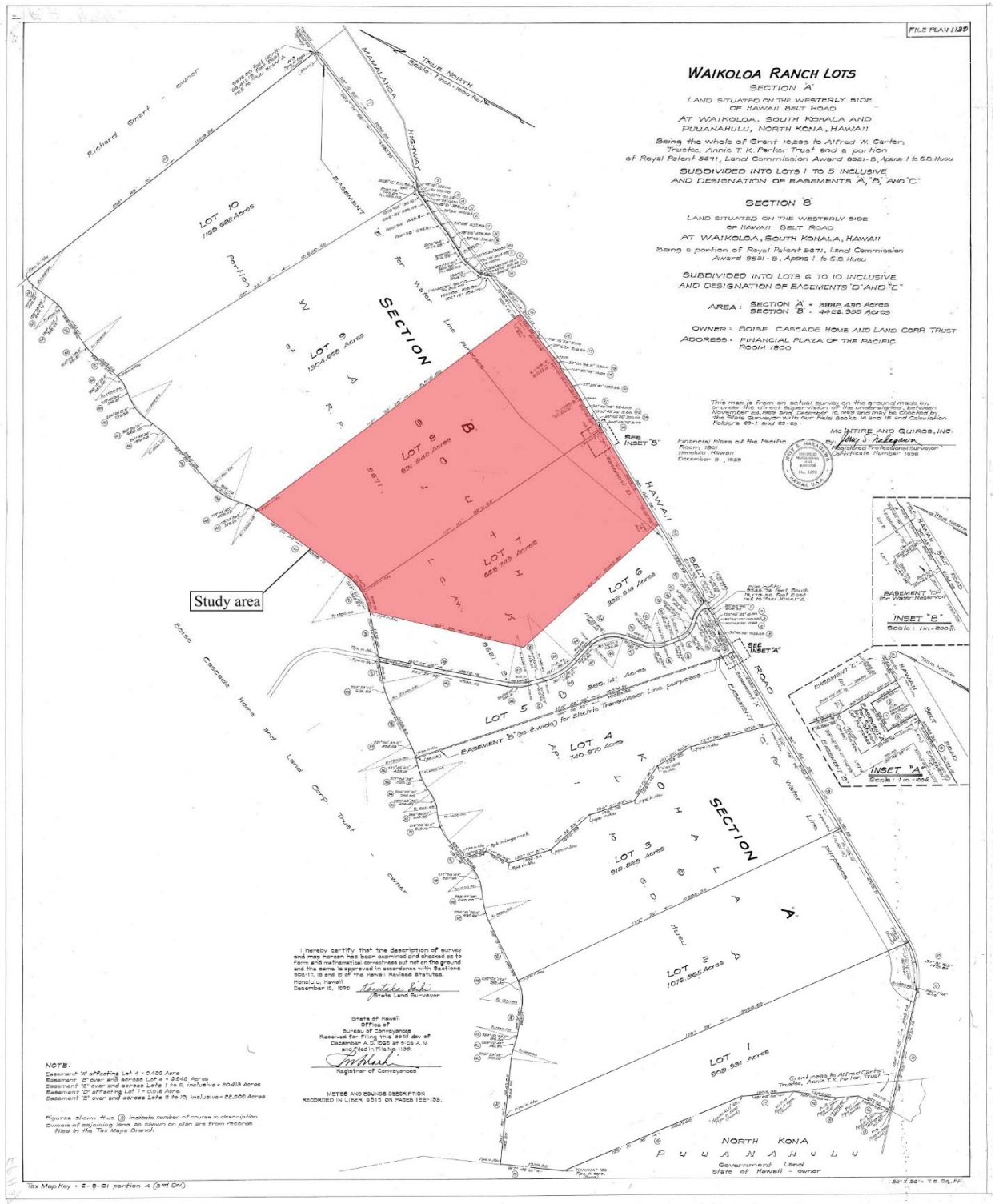


Figure 19. File Plan 1139 dated December 22, 1969 showing the "Waikoloa Ranch Lots" subdivision.

PREVIOUS STUDIES

Archaeological studies in Waikōloa and the neighboring *ahupua'a* of Lālālmilo have largely concentrated on the coastal areas in the vicinity of the large resort developments *makai* of Queen Ka'ahumanu Highway. Collectively, the archaeological investigations conducted in the coastal areas (Ching 1971; Kirch 1979; Rosendahl 1972, 2000) have identified a wide range of Precontact and Historic archaeological site types including caves (lava tubes), petroglyphs, cairns, trails, rock and cave shelters, refuge caves, burials, a *hōlua* slide, and a large number of features associated with both temporary and permanent habitation such as house platforms, overhangs, terraces, modified outcrops, paved areas, U-shape enclosures, sinkholes, walls, and rubble excavation areas. Coastal and inland (*mauka*/*makai*) trail networks have also been documented throughout the South Kohala District. These trails were used for coastal travel between *ahupua'a* and for resource exchange between the coastal areas and the upland agricultural fields.

Fewer studies have been conducted *mauka* of Queen Ka'ahumanu Highway in the arid, intermediate inland area in which the Study Area is situated, and none are known to have been conducted within the Study Area itself. The studies near the highway that have been conducted and near present-day Waikōloa Village have generally included large land areas but have documented none or few archaeological sites. The most common feature types recorded *mauka* of the highway have been C-shaped shelters and cairns, along with Historic military and ranching features. The findings of the previous studies agree that the dry, intermediate inland areas of Waikōloa Ahupua'a were not extensively utilized during Precontact times, but were an area where small scale resource procurement was conducted on a limited basis. In addition to the aforementioned archaeological studies, a single cultural-based study comprised of archival/historical research and oral history components (Maly and Maly 2002, 2003) has been conducted for lands in and near Waikōloa as well. Collectively, these studies sought to identify potential impacts to culturally significant places, practices, and resources through a combination of community consultation, examination of background research, and/or field visits. A summary of the most proximate and relevant studies that have identified resources and/or potential impacts are presented below in Table 1 and are depicted in Figure 21.

Table 1. Previous studies conducted in the vicinity of the Study Area.

Year	*Author(s)*	*Type of Study*
1972	Bevacqua	Reconnaissance
1987	Kennedy	Reconnaissance
1988	Bonk	Reconnaissance
1990	Jensen	Inventory Survey
1991	Jensen and Burgett	Inventory Survey
1992a, b	Rosendahl	Inventory Survey and Research
2002 and 2003	Maly and Maly	Archival and Historical Research, Oral History Interviews
2002	Moore et al.	Inventory Survey
2003	Rechtman	Assessment
2004	Roberts et al.	Archaeological Investigation
2004	Sinoto and Dashiell	Inventory Survey Addendum
2005	Clark and Rechtman	Inventory Survey
2005	Rechtman	Inventory Survey
2006	Rechtman	Field Inspection
2006	Hammatt and Shideler	Field Check and Literature Review
2007	Hammatt and Shideler	Addendum Inventory Survey
2007	Rechtman	Inventory Survey
2008	Corbin	Inventory Survey
2008a	Rechtman	Field Inspection
2008b	Rechtman	Field Inspection
2010	Haun et al.	Assessment
2011	Clark et al.	Inventory Survey
2014	Clark et al.	Inventory Survey
2018	Tam Sing and Barna	Inventory Survey

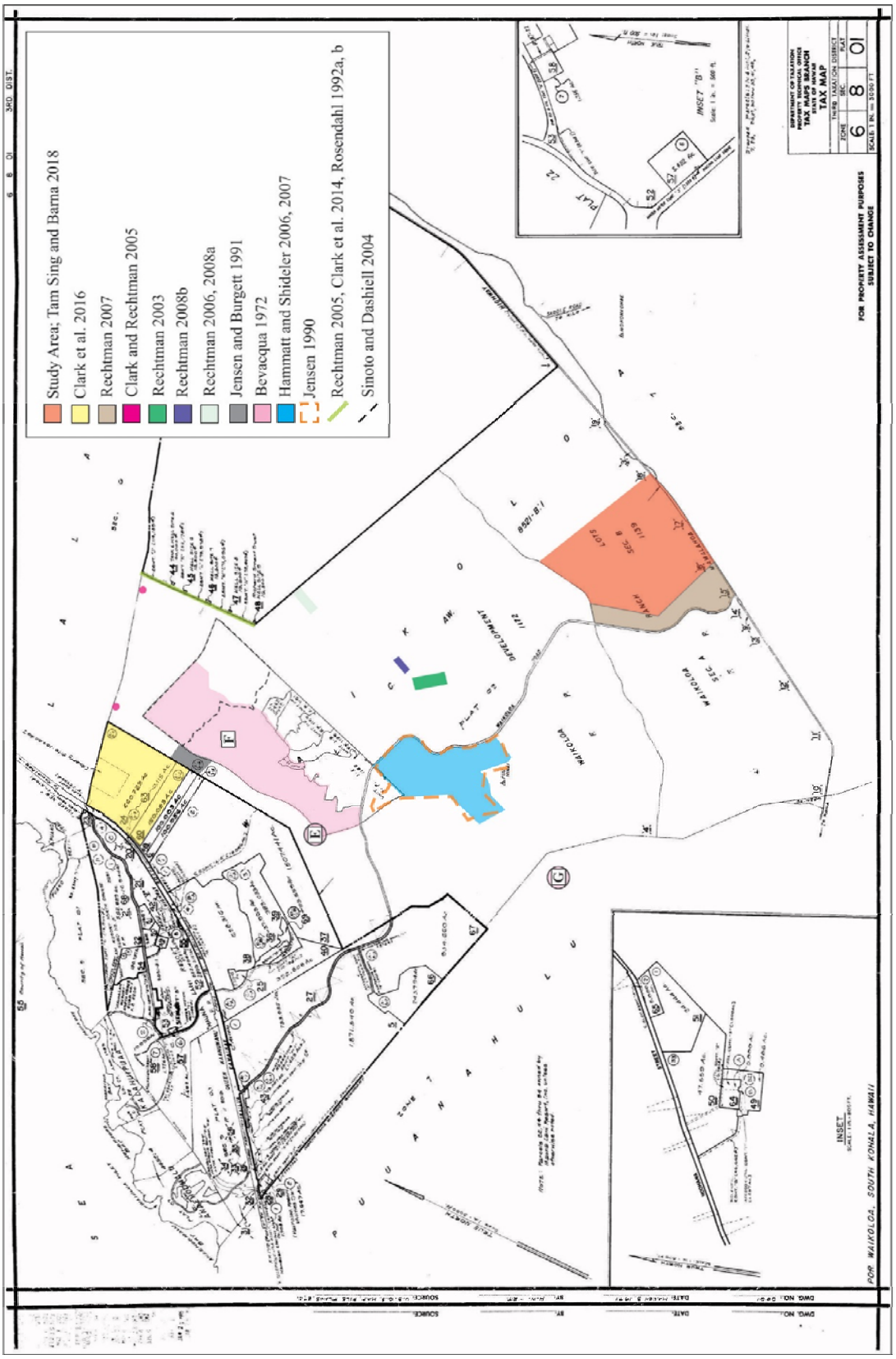


Figure 21. Previous studies in the vicinity of the Study Area.

The B. P. Bishop Museum conducted an archaeological study (Bevacqua 1972)of portions of Waikōloa Ahupua‘a in order to determine the nature and distributions of archaeological sites within areas that were slated for development at that time. Seven large areas dispersed throughout the *ahupua‘a* were examined (Areas A-G) (Figure 22), the most proximate being Areas E, F, and G, all located to the west/southwest of the Study Area (see Figure 21).

An inspection of the roughly 100 by 150-meter area identified as Survey Area E located to the west of the Study Area (see Figure 21) resulted in no findings. Bevacqua (1972) indicated that the majority of the survey area exhibited signs of bulldozer disturbance, however, undisturbed pockets of land were investigated but no sites were identified. As such, no further work was the recommended treatment for this survey area. Survey Area F is adjacent to Survey Area E to the east and located directly west of the Study Area (see Figure 21). Bevacqua (1972:11) relates that this area is composed of a roughly 1.6 by 5-kilometer area of "rolling hills with occasional gullies and lava outcroppings." There were five sites identified within Survey Area F (Sites 17 through 21):

> **Site 17**—a roughly circular stone enclosure, 2.4 meters in diameter
>
> **Site 18**—a C-shaped shelter measuring 1.5 meters across and 1.2 meters deep, with walls 0.6 meter[s] high and 0.5 meters wide; 10 meters NE of the shelter is a cairn, 0.7 meter[s] high and 1.2 meters in base diameter.
>
> **Site 19**—a cairn, 0.8 meter[s] high and 2.0 meters in base diameter
>
> **Site 20**—a cairn, 0.9 meter[s] high and 1.75 meters in base diameter
>
> **Site 21**—a small, badly deteriorated cluster of four C-shaped shelters, a rectangular enclosure, four walls, and a cairn.

In addition to the five aforementioned sites, Bevacqua (1972:12) also noted the presence of "a large number of modern stone walls used as blinds in the hunting of game birds." All of the recorded sites within Survey Area F were evaluated for their significance and no further work was the recommended treatment. Bevacqua's (1972) study also concentrated on a 300-acre area (Survey Area G) situated to the southwest of the study parcels (see Figure 21) and is likely coincident with Jensen's (1990) later survey area. As a result of fieldwork, Bevacqua (1972:12) identified a single archaeological site dubbed Site 22, which is described in detail below:

> Survey Area G is situated slightly N of Puu Hinai, a prominent cinder cone in the center of Waikoloa. The exact location and configuration of this 300-acre parcel of land has not yet been determined by the developers; thus the survey encompasses only the approximate area of the parcel.
>
> The terrain consists of gently rolling, grass-covered hills cut by several dry stream beds. The banks of the streambeds are crowded with *kiawe* trees; there are occasional *wiliwili* and castor-bean trees (*Ricinus communis*).
>
> Only one site (22), located on the S bank of a dry stream bed NE of Puu Hinai was found during the survey. This site had been noted previously by William Barrera and others, but had never been formally reported. The vast majority of the site has been completely inundated by stream-deposited soil, approximately 1.3 meters deep, thus making identification and description exceptionally difficult.
>
> Site 22 consists of a complex of walls, portions of which protrude above the flood plain. The dominant feature is a well-built bifaced wall, 45 meters long, running E-W. At the stream bank, the E end of the wall corners and extends N another 7.1 meters; the W end of the main wall corners and extends N 5.5 meters. East of the main wall an 11-meter long, bifaced wall runs N-S and stands clearly above ground surface.

Bevacqua (1972) indicated that Site 22 possessed excavation potential and therefore recommended subsurface testing of the Site and the general area surrounding it.

In 1990, Paul H. Rosendahl, Ph.D., Inc. (PHRI; Jensen 1990) conducted an Archaeological Inventory Survey (AIS) of approximately 600 acres situated to the west of the Study Area and south of Waikōloa Road (see Figure 21). Fieldwork for Jensen's study consisted of an initial reconnaissance by helicopter, followed by a pedestrian survey of twenty percent of the Study Area at interval spacing of forty meters. Bevaqua's (1972) Site 22 was not encountered during Jensen's (1990) fieldwork; however, Jensen did identify a low stone wall segment built of poorly stacked *pāhoehoe* cobbles and boulders located near ‘Auwaiakeakua Gulch that was designated with a temporary site number T-1. Jensen evaluated Site T-1 to be historically significant under Criterion d and recommended no further work for the site.

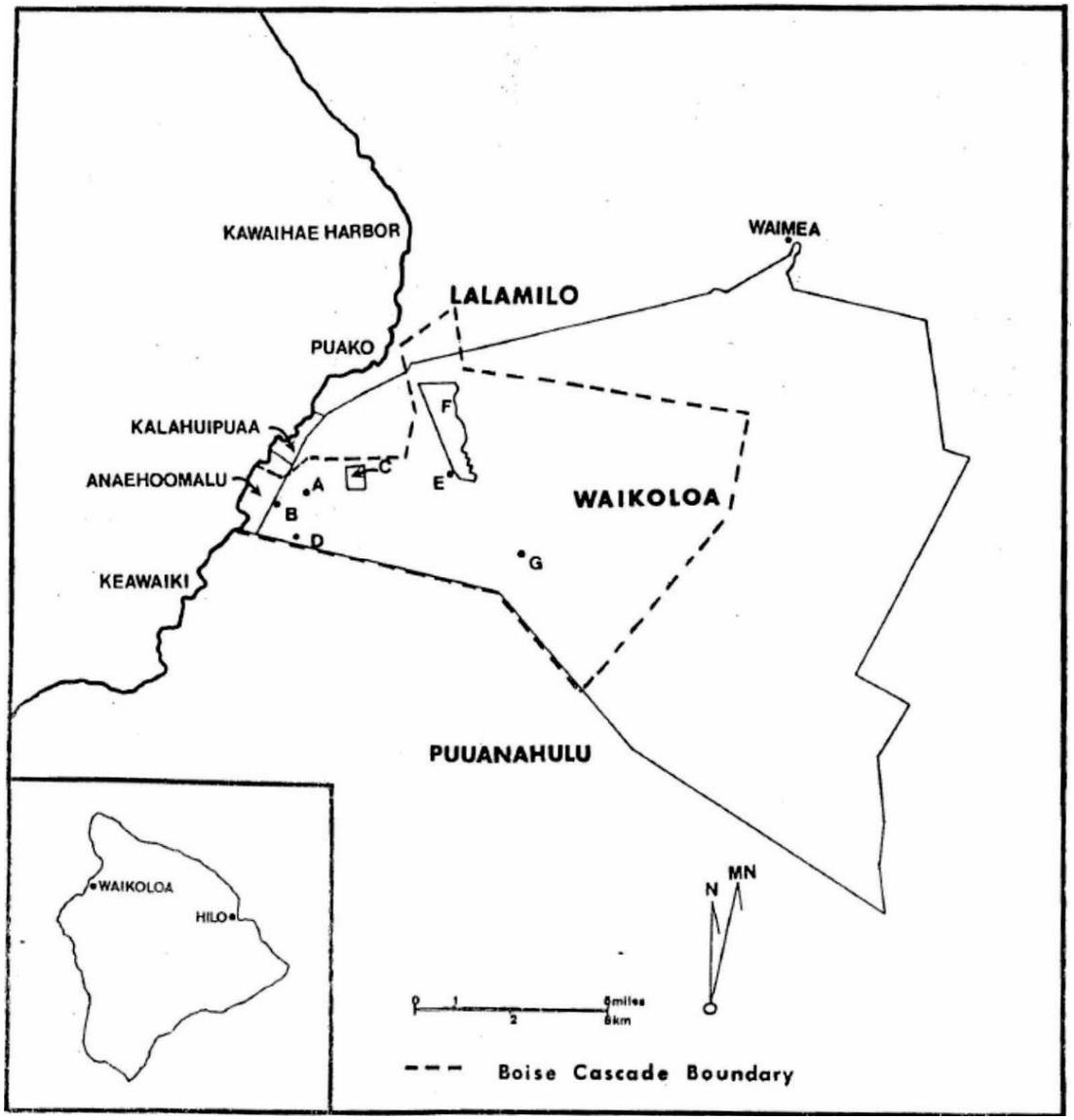


Figure 22. Map showing Survey Areas A through G (Bevacqua 1972:2).

In 1991, PHRI (Jensen and Burgett 1991) conducted an AIS of an approximately 80-acre portion of TMK: (3) 6-8-002:019 located in Waikōloa Ahupua‘a to the northwest of the Study Area (see Figure 21). As a result of the fieldwork, Jensen and Burgett (1991) identified five archaeological sites (State Inventory of Historic Places [SIHP] Sites 15066-15070) containing twenty-two features. The recorded features included three boulder alignments (possible check dams) that span Kamakoa Gulch, terraces on the northwestern bank of Kamakoa Gulch, a wall, and seventeen hunting blinds. Jensen and Burgett (1991) interpret the boulder alignments and terraces within the Kamakoa Gulch drainage channel (Sites 15066, 15067, and 15068) as potential Precontact Period features, suggesting that intermittent water flow within the drainage may have been channeled and stored to provide water for agricultural pursuits along the gulch edges. The low wall (Site 15069), which extended along a meandering course across a flat area between two knolls to the south of Kamakoa Gulch, is described as being similar to the Feature 801 wall excavated previously by Rosendahl (1972) during a different study in the lower portion of Waikōloa Ahupua‘a, and was also interpreted as having a possible agricultural function. The seventeen hunting blinds (Site 15070) consisted of crudely constructed stacked stone structures located within a 150 by 50-meter area to the south of Site 15069. Expended shotgun shells (pre-dating 1965) were found at all of the blinds. The hunting blinds were interpreted as modern features by Jensen and Burgett (1991), who did not consider Site 15070 a historic property requiring further evaluation

Rosendahl (1992a) conducted an AIS of a roughly 2,800-meter-long by 40-meter-wide corridor across a portion of TMK: (3) 6-8-001:001 (see Figure 21). According to Rosendahl (1992a:5), the “area had been extensively disturbed

historically", and as such, no significant cultural resources were identified within the corridor, although he did note the presence of a cattle wall along with "bulldozer berms, and recent trash." Don Hibbard of DLNR-SHPD, cited an earlier correspondence that indicated that the proposed wells were "adjacent to a long historic boundary wall (Site 9012) that divides Waikōloa and has been determined to be significant under criterion 'a' or for its association with events important to broad patterns in Hawaii's history" (Hibbard Letter dated July 1, 1991 on file at SHPD), and did not concur with Rosendahl's findings. In response to the letter, Rosendahl (1992b) conducted additional historical research on the well sites, and as a result construction was allowed to proceed on two of the proposed well (Parker wells No. 1 and 2) and the paved roadway along the *mauka* edge of the Site 9012 wall (Hibbard Letter dated August 26, 1994 on file at SHPD).

In 2002, Kumu Pono Associates (Maly and Maly 2002) conducted detailed archival and historical literature research as well as a series of oral history interviews (Maly and Maly 2003) for lands in the vicinity of Waikiʻi, Waimea. In Maly and Maly's (2003) companion study, interviews were conducted with 15 individuals with longstanding ties to the area and included excerpts from previous oral history studies conducted prior to 2002. This study focused primarily on matters pertaining specifically to the lands of Waikiʻi and the general Waimea region, and meant as a companion study to the preceding archival and historical literature study conducted by Maly and Maly (2002) in 2002. There was a general focus on Parker Ranch, as many of the informants were former ranch employees. The interviewees focused on the recollection of memories from *paniolo* regarding vegetation, ranch animals, ranching and natural geologic landmarks, various paddocks, and transportation routes throughout Waimea.

In 2005, Rechtman Consulting, LLC (Clark and Rechtman 2005) conducted an AIS of two proposed water tank locations to the northwest of the Study Area in a portion of TMK: (3) 6-8-002:019 (see Figure 21). As a result of the study, a single archaeological site (Site 24396) consisting of a C-shaped enclosure (Feature A) and small rock pile (Feature B), were identified. A test unit was excavated within Feature A which yielded no cultural material. It was determined that this feature may have functioned as a temporary habitation shelter during Precontact times. Nearby Feature B was interpreted as a cairn that may have been associated with Feature A, but also potentially may have served as an *ahupuaʻa* boundary or trail marker. Site 24396 were evaluated as significant under Criterion d by Rechtman (2005), and no further work was the recommended treatment for the site.

In 2006, in support of a HRS Chapter 343 environmental impact statement prepared for the Waikōloa Highlands development project, Cultural Surveys Hawaiʻi, Inc. (Hammatt and Shideler 2006) conducted a review of Jensen's (1990) study and a preliminary evaluation of archaeological potential for a 702.28-acre parcel nearly coterminous with the Jensen (1990) Study Area excepting several areas (see Figure 21). Hammatt and Shideler's (2006:12) field check appears to have been limited to a reconnaissance along the edges of ʻAuwaiakeakua Gulch that focused on finding the two sites previously reported in their Study Area:

> The project area was approached from the main Waikoloa Village Road connecting Queen Kaʻahumanu Highway and the upper belt road. It was possible to drive in on an access road supporting the on-going quarry operations at Puʻu Hīnaʻi. The field inspection began by following ʻAuwaiakeakua Gulch from the access road to the base of Puʻu Hīnaʻi. It was thought that the margins of this gulch were particularly likely locales for archaeological sites including Bevaqua's "Site 22" wall feature. The field crew then ascended to the summit of Puʻu Hīnaʻi to better view the landscape of the project area in hopes of observing indications of archaeological sites…Then both sides of the margins of ʻAwuaiakeakua Gulch were explored to the southeast edge of the present Study Area and some distance beyond in search of the Bevacqua Site 22 or any other archaeological features. No archaeological sites were observed in this initial fieldwork.

Hammatt and Schideler (2006) identified Jensen's (1990) Site T-1, approximately 450 meters northeast of Puʻu Hīnaʻi. Concurring with Jensen's assessment of the site and evaluated the site as significant under Criterion d for its information content only and recommended a treatment of no further work. Hammatt and Schideler (2006) interpreted Jensen's Site T-1 as a marker for travelers traversing from the ʻAuwaiakeakua Gulch to the Waimea area. At the time of the survey, Hammatt and Schideler (2006) were unable to locate Bevacqua's Site 22.

One year later in 2007, Cultural Surveys Hawaiʻi, Inc. (Hammatt and Shideler 2007) conducted a field inspection of their previous Study Area (see Figure 21) following a wildfire which burned through much of the landscape. During their fieldwork, a site initially identified by Bevacqua within Survey Area G was identified, having been exposed by the fire. This site was not encountered during the Hammatt and Shideler's (2006) previous investigation of the area, and based upon its location north of Puʻu Hīnaʻi and south of ʻAuwaiakeakua Gulch, it was positively identified to be Site 22. The description for Site 22 was updated by Hammatt and Shideler (2007:6–7) as follows:

> The site basically consists of a soil terrace defined by two bi-faced core-filled walls lying at approximately a right angle to each other designated herein as Features A and B. The shorter but more visible north/south trending Feature A wall forms the western edge of a somewhat pentagon-shaped, relatively-level, soil terrace. The longer but partially buried wall designated Feature B forms the north side of the soil terrace. The southwest portion of the soil terrace is formed by a NW to SE trending *pāhoehoe* ridge. The eastern margin of the soil terrace is less well defined by rising bedrock outcrops and a bulldozed jeep road and fence line.
>
> Designated Feature A is an almost exactly 10 m long, 1.57 cm [sic- meter] wide north/south trending wall. The wall is bi-faced, and constructed of 1 to 3 visible courses of boulders and is core filled with somewhat jumbled angular boulders and cobbles but with a relatively level surface. The workmanship appears particularly good and the wall appears anomalously wide. The north end of the wall appears to be finished or constructed as an end and is separated by a gap of 1.7 m from a small hillock or pu‘u approximately 2.5 m high and 10 m in diameter. The south end of the wall abuts jumbled bedrock at the northwest end of a linear bedrock ridge or small bluff. Both of the long sides of this Feature A wall have piled up against them a fine silt loam sand slope deposited by wind and water. This effectively makes the wall appear quite low measuring only 30 cm high on the west side and 30 to 50 cm high on the east side. These natural low sand ramps and the low aspect of the wall feature make it difficult to discern even at a distance of 10 m. Undoubtedly the grasses that were clearly thick in the vicinity before the recent range fire obscured the feature significantly. On the other hand, from the proper vantage the construction is quite formal.
>
> Designated Feature B is an almost exactly 50 m (164 long) wall that runs west from Waiakeakua [‘Auwaiakeakua] Gulch. At Waiakeakua Gulch the wall appears to have been damaged by erosion as it turns to the ESE slightly following the south bank of the arroyo. What appears to have happened is that the facing has been stripped away by the force of flash floods leaving an exposure of the jumbled core fill on the arroyo bank. The Feature B wall appears to continue quite straight, almost to the north end of the Feature A wall but for much of this length the Feature B wall has been entirely covered by sediment and at no point was the south side of this core filled wall visible. The most discernable portion of this Feature B wall prior to testing was near the center where test unit 2 was excavated where one to two courses of facing were visible with a height of 0 to 20 cm.

In an effort to better determine the nature and extent of Site 22, Hammatt and Shideler (2007) excavated three test units adjacent to the walls of both features. Although no cultural material was observed during excavation, Hammatt and Shideler (2007) were able to expose the base of the wall and better assess the construction methods. While a definitive function for the site could not be determined, Hammatt and Shideler (ibid.:17) indicated that it “clearly serves to retain water and sediment” and opined that it most likely served as an artificially constructed cattle-watering basin. However, it was recommended that further testing in the form of backhoe trenching occur in order to derive a clearer vision of site function.

In 2011, ASM Affiliates (Clark et al. 2016) conducted an AIS of roughly 811 acres within TMKs: (3) 6-8-001:024, 060, and 063 located in the coastal portion of Waikōloa to the northwest of the Study Area (see Figure 21). A total of twenty-one archaeological sites and 158 associated features were identified as a result of the study, eight of which were previously recorded (Clark and Rechtman 2011; Rosendahl 2000; Spear and Chaffee 1994). These sites consisted of two marine shell scatters (Sites 19777 and 19778), the eastern continuation of a linear path (Site 21976), a portion of the old Puakō Sugar Plantation’s wooden flume (Site 28682), a series of rock piles that mark the former route of a World War II-era communications line (Site 28683), a Historic dike complex constructed for flood-control purposes (Site 28684), a circular enclosure containing a rock pile that may have functioned as a Historic hunting blind or skeet shooting area (Site 28685), a C-shape that might have functioned as a Precontact shelter (Site 28686), and a Historic cart road originally identified by Rosendahl (2000) that was reevaluated as a bulldozed road during the Clark et al. (2016) study. Sites newly identified by Clark et al. (2016) (Sites 30071 to 30083) included two C-shaped enclosures interpreted as Precontact Period shelters, three Precontact Period habitation complexes, two modified outcrops interpreted as Precontact Period shelters, a rock pile and modified outcrop that appear to have functioned as a Historic survey station, a short wall interpreted as a Precontact Period shelter, a surface scatter of marine shell, a rock pile with an associated trail segment that may have been a rest area along an old trail route, a complex of features used for Historic Period habitation and agricultural purposes, and a complex of eighty-nine twentieth century hunting blinds built by bird hunters. The Precontact Period sites, mostly indicative of short-term or recurrent habitation, were concentrated in the northern portion of the project area near the Lālāmilo boundary. Clark et al. (2016) suggest, like

Spear and Chaffee (1994) before them, the presence of these site types in that area is evidence of the route of an old trail that once extended along *ahupua'a* boundary.

In 2014, ASM Affiliates (Clark et al. 2014) conducted an AIS for the proposed Lālāmilo Wind Farm Repowering Project in TMKs: (3) 6-6-001:002 (por.), 071, and (3) 6-8-001:001 (por.) located to the northwest of the Study Area (see Figure 21). As a result of the study, three archaeological sites were identified: Site 9012, a late nineteenth/early twentieth century dry-stacked rock wall attributed to Parker Ranch; Site 30109, a World War II military encampment with a possible earlier Historic and/or Precontact component associated with the Camp Tarawa Waikōloa Maneuver Area; and Site 30110, a complex of cairns marking the *ahupua'a* boundary between Waikōloa and Lālāmilo. All of the sites identified during the Clark et al. (2014) study were determined to be significant under Criterion d, and no further work was the recommended treatment.

An AIS was conducted for the current 1,559-acre Study Area by ASM Affiliates (Tam Sing and Barna 2018) (see Figure 21). As a result of the fieldwork, seven newly identified sites (Sites 50-10-12-30919, 30920, 30921, 30922, 30923, 30924, and 30925) comprising eight features were recorded within the Study Area (Table 2 and Figure 23). Four of the sites were identified in Parcel 005, two were in Parcel 006, and one was in Parcel 029. In addition to these sites, numerous discrete rock piles were observed throughout the Study Area. Site 30919 consists of a C-shape enclosure dating to the Precontact Period. Sites 30920 and 30925 are modified outcrops likely dating to the late nineteenth/early twentieth century. Site 30921 is a rectangular enclosure assumed to be Historic in age. Site 30922 is a linear wall, likely Historic in age. Site 30923 is a concrete water tank foundation and associated concrete trough dating to the early to mid-twentieth century, and Site 30924 is a modified depression dating to the early part of the twentieth century and is likely related to the former or current alignment of the Kona-Waimea Belt Road.

The majority of the sites were situated on prominent landforms and were adjacent to 4WD roads/segments of roads and seemed to mark those routes and places. Some of the rock piles were situated on or very near to modern TMK boundaries and were marked either with white spray paint or were supporting a steel pipe from their center. It appears that these ubiquitous features were visual markers associated with past (modern) land use related to traversing and surveying of the property. As such, the rock piles identified during the study, given their uncertain ages and functions, and lack of any clear associations with other archaeological sites, were not assigned an SIHP site number, but were simply plotted on a map (see Figure 23) and their GPS locations recorded. During the course of the fieldwork, Tam Sing and Barna (2018) did not identify evidence of Precontact *mauka-makai* trail systems or later Historic trails within the Study Area, which according to Historic maps, is situated east of known trails (e.g. Waimea-Ke'āmuku and Puakō-Ke'āmuku trails) and well north of the Study Area (e.g. "old trail" along boundary of Waikōloa and Lālāmilo). According to Tam Sing and Barna (2018), all of the identified sites were considered significant under Criterion "d", and no further work was the recommended for six of these sites (Sites 30920, 30921, 30922, 30923, 30924, and 30925). Site 30919, however, was interpreted as significant for the information potential it still retains, and data recovery was the proposed treatment for this site.

Table 2. Archaeological sites recorded during the Tam Sing and Barna (2018) study.

SIHP Site Number	*Features*	*Type*	*Function*	*Age*
50-10-12-30919	1	C-shape	Windbreak shelter	Precontact/Historic
50-10-12-30920	1	Modified outcrop	Hunting blind	Historic
50-10-12-30921	1	Rectangular enclosure	Hunting blind	Historic
50-10-12-30922	1	Wall	Possible hunting blind	Historic
50-10-12-30923	2	Water tank foundation and trough	Ranching	Historic
50-10-12-30924	1	Modified depression	Unknown	Historic
50-10-12-30925	1	Modified outcrop	Windbreak shelter	Historic

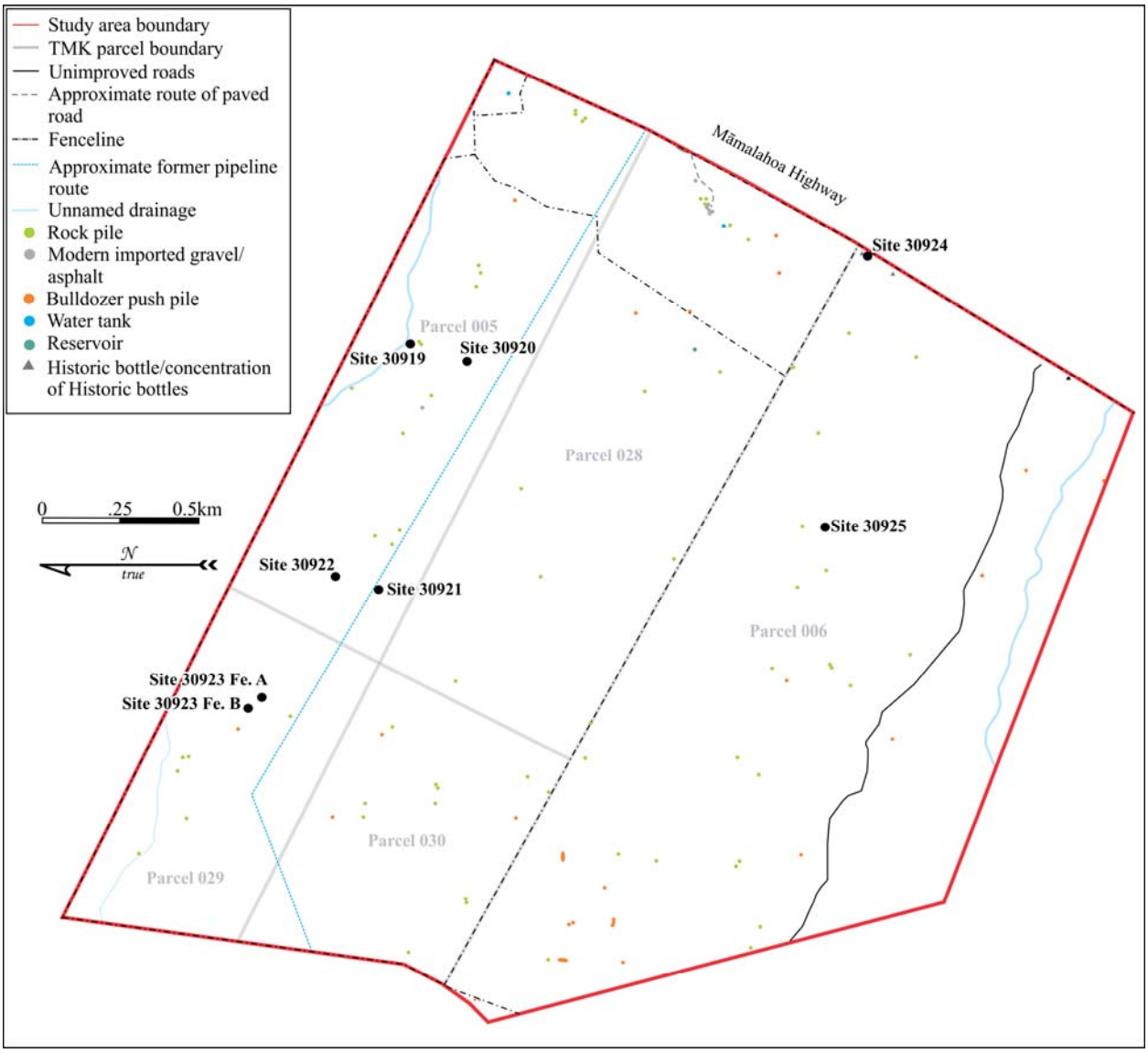


Figure 23. Site location map from Tam Sing and Barna (2018).

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 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.

In an effort to identify individuals knowledgeable about traditional cultural practices and/or uses associated with the subject property, a public notice was submitted to the Office of Hawaiian Affairs (OHA) for publication in their newspaper, *Ka Wai Ola* (Appendix A). The notice appeared in the Kekemapa (December) 2018 issue of the publication. As of the date of the current report, no responses have been received from the public notice. Shane Hoʻopai, the grandson of the late Parker Ranch cowboy (*paniolo*) and Walter Stevens, was contacted on three separate occasions but has not responded to our inquiry to date. Additionally, consultation with William Case, another former Parker Ranch *paniolo*, was attempted. However, after an introductory phone conversation with his daughter Bonnie Pua Case, involvement with the study was declined on his behalf.

GODFREY KAINOA

A phone interview was conducted by Aoloa Santos, B.A. on January 7, 2019 with Godfrey Kainoa, a retired Kahua Ranch Cowboy Supervisor and Livestock Manager. Mr. Kainoa was born in Kohala and now currently resides on Hawaiian Home Lands in Honokoa, Kawaihae. Mr. Kainoa worked for Kahua Ranch for fifteen years but also worked for Parker Ranch for thirty years as a Cowboy, Foreman and a Division Livestock Superintendent for the Keʻāmuku, Kohala and Humuʻula Divisions beginning in the mid 1970s. When asked about his knowledge of the Study Area vicinity, Mr. Kainoa shared that these lands, as he refers to as "Boise 1" were owned by Parker Ranch in the late 1960's and later sold to Boise Cascade/Waikoloa Land Company. Mr. Kainoa, helped steward the lands for Parker Ranch, while running a cow-calf operation for six years. During the time that he worked there, he described the lands as dry and a desert-like environment with strong winds with some rain during the winter. He remembers the land was approximately 10,000 acres of open range mostly covered in *ʻaʻaliʻi* and fountain grass (*Pennisetum seraceum*), which he described to be a nuisance, and recalls the presence of several types of birds including pheasants and francolins. The Filipino laborers would pick out the fountain grass, also called pampus grass, and after doing so they piled rocks to clean up the area so it wouldn't be so rocky for the horses when driving the cattle through the terrain. Additionally, he recalled hearing of a house at nearby Keʻāmuku in the 1940s that the laborers lived in order to maintain and care for the lands. He also noted the abundance of *ēkoa* (*Leucaena leucocephala*), also known as "fake *koa*," as well as redtop grass (*Agrostis gigantean*) and buffalo grass (*Buchloe dactyloides*), vegetation favored by the cattle. Mr. Kainoa shared that Parker Ranch sourced water for the area from Waikiʻi Ranch. However, since the lands were sold, ranchers had to haul their own water for their cattle. He recalled the entire area being a fire hazard and because water was limited he saw many fires ravage the land.

When asked about a large pit with a stacked wall on the western side of the Māmalahoa Highway (Site 30924), he believes the pit is the remnants of the old road that extended from Waimea to Kona. When asked if he knew of any *moʻolelo* of the area he shared that he was never told any *moʻolelo* of the area and shared that the stewards of "Boise 1" (comprising a portion of the current Study Area), have all since passed. During his time working there he did not recall seeing any cultural sites and believes there will not be any direct impact to the area. However, he does feel strongly that the area should be properly cared for and nurtured in the right way. Mr. Kainoa's final thoughts were to encourage the new land owners that they "may they do the right thing for the people and this place."

4. IDENTIFICATION AND MITIGATION OF POTENTIAL CULTURAL IMPACTS

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

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

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

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 for traditional cultural properties, this study will adopt the state criteria for evaluating the significance of historic properties, of which traditional cultural properties are a subset. To be significant the potential historic property or traditional cultural property must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

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

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

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

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

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

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

will be affected or impaired; and third, specify any mitigative actions to be taken to reasonably protect native Hawaiian rights if they are found to exist.

An analysis of the culture-historical background reveals that Waikōloa, though referred to today as an *ahupua'a*, was traditionally considered an *'ili* of the *kalana* of Waimea. The district of Kohala is reknown for its association with being the initial ruling center for the Pili dynasty, the burial place of the *kahuna* Pā'ao, and later as the birthplace of Kamehameha. Furthermore, Waikōloa explicitly figures into the intensive sociopolitical history of Hawai'i Island with its inclusion as the location of several notable battles and its association with ruling chiefs in addition to numerous other distinguished individuals in Hawaiian pre-history.

By the mid 19th century, the population of South Kohala declined rapidly, and historical accounts indicate a pronounced shift from intensive utilization of coastal areas to the more fertile and productive windward areas capable of supporting more stable agricultural pursuits. Traditional subsistence strategies were abandoned in favor of these more productive lands, and much of the population deviated as a result. Through the process established by the 1848 *Māhele 'Āina*, Waikōloa Nui was awarded to the son of Isaac Davis, George Hū'eu. Additionally, a total of nine residential *kuleana* parcels were awarded in Waikōloa, all of which were situated in more *mauka* areas of Waikōloa nearer to Waimea Town, reflective of the settlement shift from agriculturally marginal areas to the windward side of the district. Shortly thereafter, disagreements regarding the boundaries of Waikōloa that began in 1859 arose and spurred the collection of testimony by the Boundary Commission in 1865 through public testimony hearings. Collectively, the hearings shed light on traditional land use in Waikōloa including resource procurement and agricultural pursuits and cultural and geologic places of importance (e.g. caves, resting places, sacrificial/burial grounds, roads/trails, and gulches). The individuals who provided testimony for Waikōloa related that the region was mostly unfertile *pili* land with the exception of a single cultivated area situated in Kapanaolona in close proximity to Pu'u Hīna'i. In spite of its unfruitful landscape, the dry and barren environs of Waikōloa were prime locations for hunting *'uwa'u* and *nēnē* birds. Several of these testimonies also relate that the more inland and interior sectors of Waikōloa were utilized for the collection of *'iliahi*. Although the traditional cultural practices associated with these traditions are no longer actively practiced in Waikōloa, the recognition of their practice and significance reinforces the value of Waikōloa to the Hawaiian people. Furthermore, the presence of important cultural sites in Waikōloa identified in the Boundary Commission testimonies and their association with traditional customs and practices in the area further emphasize Waikōloa's significance as a cultural landscape and its value to the Hawaiian cultural identity.

Further knowledge of the traditional settlement patterns of Waikōloa are derived from a review of the previous archaeological and cultural studies within and in the vicinity of the Study Area. These studies suggest that generally, Precontact archaeological sites are sparse in the intermediate, *pili* lands of Waikōloa which is sandwiched between the more traditionally and intensively utilized coastal and upland resource/habitation areas. Additionally, intensive ranching activities spanning from the late 19th century to the present day have significantly impacted and/or obliterated much of the Precontact archaeological landscape in the vicinity of the Study Area, as has the development of the area to facilitate highly efficient modern-day transportation routes (e.g. Highway 190 and Waikōloa Road) that replaced traditional *mauka-makai* trail systems. The AIS conducted by Tam Sing and Barna (2018) for the Study Area resulted in the identification of seven sites (Sites 50-10-12-30919, -30920, -30921, -30922, -30923, -30924, and -30925) including one modified outcrop, one rectangular enclosure, one wall, a water tank foundation and trough, one modified depression, and one modified outcrop evaluated as significant under Criterion D, and one C-shape evaluated as significant under Criterion D. Additionally, a number of nondescript rock piles were identified, none of which were assigned an SIHP site number due to their ubiquitous nature and disassociation with known archaeological sites, but as a result of consultation conducted for this Cultural Impact Assessment, are identified more specifically as modern clearing piles associated with ranching practices.

CONCLUSION

Given the above consultation and assessment, it is our conclusion that the proposed development of the Nakahili Community on TMKs: (3) 6-8-002:005, 006, 028, 029, and 030 will not result in impacts to any traditionally valued cultural or historical resources nor will it impact any traditional cultural practices or beliefs.

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APPENDIX A.
KA WAI OLA PUBLIC NOTICE

PUBLIC NOTICE

ASM Affiliates is preparing a Cultural Impact Assessment (CIA) for the proposed Nākahili Subdivision located in Waikōloa Ahupua'a, Island of Hawai'i (TMKs: (3) 6-8-002:005, 006, 028, 029, and 030). We are seeking consultation with any community members that might have knowledge of traditional cultural uses of the proposed project area; or who are involved in any ongoing cultural practices that may be occurring on or in the general vicinity of the subject property, which may be impacted by the proposed project. If you have and can share any such information please contact Bob Rechtman brechtman@asmaffiliates.com, or Lauren Tam Sing ltamsing@asmaffiliates.com, phone (808) 969-6066, mailing address ASM Affiliates 507A E. Lanikāula Street, Hilo, HI 96720.

Appendix D

Traffic Impact Analysis Report

TRAFFIC IMPACT ANALYSIS REPORT
NAKAHILI

Waikoloa, Hawaii

DRAFT

January 28, 2019

Prepared for:

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TRAFFIC IMPACT ANALYSIS REPORT

NAKAHILI

Waikoloa, Hawaii

DRAFT

Prepared for

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January 28, 2019

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AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1934

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NAKAHILI

EXECUTIVE SUMMARY

Work Force Developers LLC is proposing Nakahili, a workforce family agricultural community in Waikoloa, Hawaii (hereinafter referred to as the "Project"). The Project site is situated on the western side of Mamalahoa Highway and northwest of Waikoloa Road and consists of approximately 1,559 acres of land identified by Tax Map Key (TMK) numbers: (3) 6-8-002: 005, 006, 028, 029, and 030.

Project Description

The Project will include Neighborhood Commercial and Family Agricultural land uses. The Neighborhood Commercial use will include 300 multi-family (MF) dwelling units with a small retail component, approximately three (3) acres of light industrial use and a small wastewater treatment plan to service the Neighborhood Commercial uses and any single-family (SF) farm dwellings within 1,000 feet of any well sites. The Family Agricultural use will include 858 agricultural lots with single-family (SF) farm dwellings. Future agricultural lot owners, at their own discretion and expense, may elect to build an accessory dwelling unit (ADU) on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), Hawaii County Code (HCC). While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, for the purpose of this report 108 ADUs are anticipated to be constructed within a 20-year time frame. For ADU construction beyond the projected 108 an updated traffic study is recommended. The Project will also include an approximately six-acre "community green" neighborhood park and an approximately 29-acre regional park. For the purposes of this report, construction of the Project is analyzed for three (3) build-out years. See Table ES-1 for the land use breakdown and vehicle trips generated by the Project for each of the three (3) build-out years. At full build-out, access to the Project will be provided via two (2) accesses along Mamalahoa Highway and an additional access off of Waikoloa Road (improvement of an existing dirt road through the neighboring parcel to the southwest).

Future Year 2023 – By 2023 Nakahili is assumed to include the Neighborhood Commercial component, agricultural lots with SF farm dwellings, and the approximately six-acre "community green" neighborhood park all located on the north parcels of the Project site (TMKs (3) 6-8-002: 005, 028, 029, 030). The area projected to be built by 2023 will be accessible by a single access along Mamalahoa Highway.

Future Year 2028 – By 2028 Nakahili is assumed to include the remaining agricultural lots with SF farm dwellings located on the south parcel of the Project site (TMK (3) 6-8-002: 006) as well as the regional park. The area projected to be built by 2028 will be accessible from the north portion of the Project and by a second access along Mamalahoa Highway. In addition, a new collector road (improvement of an existing dirt road through the neighboring parcel to the

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southwest) is proposed between the Project and Waikoloa Road to provide additional access to the Project.

Future Year 2038 – By 2038 potential construction of 108 accessory dwelling units (ADUs) is assumed. Although the ADUs will not be part of the initial Project development, future agricultural lot owners, at their own discretion and expense, may elect to build an accessory dwelling unit (ADU) on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), Hawaii County Code (HCC). While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, for the purpose of this report 108 ADUs are assumed to be built out in 2038. For additional ADU construction beyond the anticipated 108 units an updated traffic study is recommended. Access will be provided by all three (3) previously constructed accesses.

Table ES-1: Nakahili Land Use Summary

Year	Nakahili Land Use	New Project Trips AM (PM)
Future Year 2023	- 449 Agricultural Lots with Single-Family Farm Dwellings - 300 Multi-Family Residential Units with Retail Component - Approximately 3 Acres Light Industrial - Approximately 6-acre “Community Green” Neighborhood Park	468 (572)
Future Year 2028	- 409 Agricultural Lots with Single-Family Farm Dwellings - Approximately 29-acre Regional Park	294 (406)
Future Year 2038	- 108 Accessory Dwellings	52 (64)

Existing and Base Year Traffic Analysis without Nakahili

Existing conditions at major intersections in the Project vicinity were evaluated based on traffic count data collected in September 2018 during the weekday morning (AM) and afternoon (PM) peak hours of traffic. At the time of data collection, traffic volumes in the study area were observed to be on the lower end due to the downturn in tourism on Hawaii Island beginning in May 2018. To account for the lower volumes, through volumes along the studied roadways were adjusted based on Hawaii State Department of Transportation (HDOT) traffic count data collected in 2016. The following adjustments were made to the studied roadways:

- Queen Kaahumanu Highway – Increase by 16%
- Mamalahoa Highway – Increase by 8%
- Waikoloa Road – Increase by 18%
- Daniel K. Inouye Highway – Increase by 1%

Traffic in the Project area was generally observed to be light with minimal delays and queuing experienced. However, queues were observed to form at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection. Delays at this intersection resulted from Paniolo Avenue serving as the single access to the large Waikoloa Village residential area.

In accordance with the County of Hawaii Concurrency requirements (Section 25-2-46, HCC), traffic in the Project area was analyzed at 5, 10 and 20 years into the future. Traffic was forecast to years 2023, 2028 and 2038 without the Project to constitute the Base Year (no build) scenarios. Traffic projections were based on planned roadway improvements and developments anticipated to be completed in the Project area. Roadway improvements and developments were included based on their likeliness to be constructed during the studied time frame. Table ES-2 summarizes the aggregate growth applied to the studied roadways for each of the forecast years.

Table ES-2: Base Year Aggregate Growth

Roadway	2023	2028	2038
Queen Kaahumanu Highway	23%	31%	42%
Mamalahoa Highway	35%	47%	63%
Waikoloa Road	55%	73%	-16% [1]
Daniel K. Inouye Highway	10%	14%	19%
Saddle Road	9%	11%	16%

1. Negative growth rate is a result of traffic rerouted from Waikoloa Road to the planned Daniel K. Inouye Highway Extension (formerly known as the Saddle Road Extension).

Due to the various developments anticipated to be completed in the Project area, traffic is expected to increase over existing conditions by approximately 10-75% (depending on the roadway) by Base Year 2028. Waikoloa Road is expected to see the largest growth as a result of the continued development of the Waikoloa Beach Resort area and Waikoloa Village and its adjacent areas. Improvements at various Waikoloa Road intersections are anticipated to provide adequate capacity in the mid-term for both regional through traffic and local traffic. However, by Base Year 2038, the Daniel K. Inouye Highway extension (previously known as the Saddle Road Extension) is expected to provide a long-term solution with construction of a new route from Mamalahoa Highway to Queen Kaahumanu Highway for regional through traffic parallel to Waikoloa Road. Table ES-3 summarizes the roadway improvements that are planned or are anticipated to be necessary by Base Years 2023, 2028 and 2038 without the Project.

Table ES-3: Roadway Improvements Summary for Years 2023, 2028 and 2038 without Nakahili

Year	Location	Roadway Improvement
Base Year 2023 (Without Project)	Waikoloa Road/Paniolo Avenue/Pua Melia Street	- Install a traffic signal when warranted. - Improvements at this intersection were previously imposed on the Waikoloa Highlands Subdivision project by the State Land Use Commission (LUC). Although a roundabout was previously identified as the preferred mitigation, a traffic signal is recommended based on expected capacity and space requirements. If the project does not move forward, fair share contribution may be required by regional developers for this mitigation. See Table ES-4 for Nakahili pro-rata shares for the peak hours of traffic.
Base Year 2028 (Without Project)	Mamalahoa Highway/Waikoloa Road	- Install a traffic signal when warranted. - A traffic signal is expected to warrant by Base Year 2023 but is not anticipated to be necessary to mitigate long delays until Base Year 2028. - Fair share contribution may be required by regional developers for this mitigation. See Table ES-4 for Nakahili pro-rata shares for the peak hours of traffic.
Base Year 2038 (Without Project)	Daniel K. Inouye Highway Extension	- Extend Daniel K. Inouye Highway from its existing terminus at Mamalahoa Highway to Queen Kaahumanu Highway. - Construction of the extension is a State planned project.

Future Year Traffic Analysis with Nakahili

As summarized in Table ES-1 above, the Project is anticipated to generate 814 (1042) new external vehicular trips during the AM (PM) peak hours of traffic upon full build-out in 2038. The Project is expected to contribute to both local and regional traffic along the studied roadways. Table ES-4 summarizes the Project contribution to traffic at select locations for Future Years 2023, 2028 and 2038.

Based on the Project location, the majority of Project traffic is anticipated to travel on Mamalahoa Highway and Waikoloa Road. Due to the high speeds along Mamalahoa Highway and Waikoloa Road, design elements such as acceleration lanes, deceleration lanes and traffic signals, where applicable, should be considered at the Project accesses. Recommended lane configurations and controls at the accesses are summarized in Table ES-5. Recommendations for acceleration and deceleration lanes are based on guidance provided in A Policy on Geometric Design of Highways and Streets ("Green Book"), published by the American Association of State Highway and Transportation Officials (AASHTO) in 2011. Lane lengths shown in Table ES-5 reflect the highest volume scenario expected at each access based on the 2023, 2028 and 2038 build-out years.

Table ES-4: Nakahili Traffic Contribution[1]

Roadway	2023	2028	2038
Queen Kaahumanu Highway	1%	4%	3%
Mamalahoa Highway	24%	28%	28%
Waikoloa Road	16%	23%	34%
Daniel K. Inouye Highway	10%	15%	14%
Intersection	2023	2028	2038
Mamalahoa Highway/Waikoloa Road	19%	25%	29%
Waikoloa Road/Paniolo Avenue/Pua Melia Street	10%	17%	18%

1. Traffic contribution determined based on percentage of Project-generated traffic versus total future year traffic projections.

As in Base Year conditions, improvements are anticipated along Waikoloa Road to increase capacity in the mid-term prior to the construction of the Daniel K. Inouye Highway extension. A traffic signal at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection is included as mitigation for Base Year 2023 based on a previous condition imposed on the Waikoloa Highlands Subdivision project by the LUC and updated traffic projections. However, based on a November 2018 ruling, the LUC reverted the rural land use classification of the subject parcel back to agricultural. If Waikoloa Highlands Subdivision does not move forward, a traffic signal is still recommended as mitigation for Future Year 2023 with the Project, and construction of the signal may require fair share contributions by regional developers in the area.

Although a single-lane roundabout was previously identified as the preferred mitigation in the LUC conditions, traffic is projected to exceed the available capacity of a single-lane roundabout by Future Year 2028 with the Project. A traffic signal at this intersection would provide adequate capacity during all evaluated build-out years and, therefore, was included as the recommended mitigation at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection. Table ES-6 summarizes the roadway improvements that are anticipated to be necessary by Future Years 2023, 2028 and 2038 with the Project.

With the assumed and recommended regional and Project-specific roadway improvements, traffic in the Project area is expected to operate adequately by 2038 with acceptable levels of service at all study intersections.

Table ES-5: Recommended Access Configuration and Controls for Nakahili

Location	Roadway Improvement
Mamalahoa Highway/North Project Access	- Install a traffic signal when warranted. A traffic signal is expected to warrant by Future Year 2023. - Provide a southbound right-turn deceleration lane → Minimum 175 feet storage and 715 feet deceleration length anticipated. - Provide a northbound left-turn pocket → Minimum 175 feet storage and 715 feet deceleration length anticipated. - Provide an eastbound left-turn pocket → Minimum 175 feet storage anticipated.
Mamalahoa Highway/South Project Access	- Provide stop-control along the South Project Access approach. - Provide a southbound right-turn deceleration lane → Minimum 50 feet storage and 715 feet deceleration length anticipated. - Provide a northbound left-turn pocket → Minimum 100 feet storage and 715 feet deceleration length anticipated. - Provide an eastbound left-turn pocket → Minimum 75 feet storage anticipated. - Provide an eastbound left-turn median acceleration lane → Minimum 1,310 feet acceleration length anticipated. - Provide an eastbound right-turn acceleration lane → Minimum 1,120 feet acceleration length anticipated.
Waikoloa Road/Project Connector Road	- Provide stop-control along the Project Connector Road approach. - Provide a westbound right-turn deceleration lane → Minimum 50 feet storage and 715 feet deceleration length anticipated. - Provide an eastbound left-turn pocket → Minimum 150 feet storage and 715 feet deceleration length anticipated. - Provide a southbound left-turn pocket → Minimum 100 feet storage anticipated. - Provide a southbound left-turn median acceleration lane → Minimum 1,310 feet acceleration length anticipated. - Provide a southbound right-turn acceleration lane → Minimum 770 feet acceleration length anticipated.

1. Acceleration and deceleration lane lengths based on design speeds of 65 miles per hour (mph) along Mamalahoa Highway and Waikoloa Road, 40 mph along the Project Connector Road and 30 mph along the North and South Project Accesses.

2. Acceleration and deceleration lane lengths based on guidance in the AASHTO Green Book. Need for additional taper length and acceleration/deceleration length should be verified upon design.

Table ES-6: Roadway Improvements Summary for Years 2023, 2028 and 2038 with Nakahili

Year	Location	Roadway Improvement
Future Year 2023 (With Project)	Waikoloa Road/Paniolo Avenue/Pua Melia Street	- Install a traffic signal when warranted if not completed as part of the Waikoloa Highlands Subdivision project. - Fair share contribution may be required by regional developers for this mitigation if the Waikoloa Highlands Subdivision does not proceed (See Table ES-4 for Project contribution to traffic).
	Mamalahoa Highway/Waikoloa Road	- Install a traffic signal when warranted. - A traffic signal is expected to warrant by Base Year 2023 but is not anticipated to be necessary to mitigate long delays until Future Year 2023. - Fair share contribution may be required by regional developers for this mitigation (See Table ES-4 for Project contribution to traffic).
	Mamalahoa Highway/North Project Access	- Install a traffic signal when warranted. - A traffic signal is expected to warrant by Future Year 2023. - Additional roadway improvements summarized in Table ES-5.
Future Year 2028 (With Project)	Waikoloa Road/Paniolo Avenue/Pua Melia Street	- Construct an additional eastbound left-turn lane and an exclusive westbound right-turn lane. - Fair share contribution may be required by regional developers for this mitigation (See Table ES-4 for Project contribution to traffic).
	Mamalahoa Highway/South Project Access	- Provide stop-control along the South Project Access approach. - Additional roadway improvements summarized in Table ES-5.
	Waikoloa Road/Project Connector Road	- Provide stop-control along the Project Connector Road approach. - Additional roadway improvements summarized in Table ES-5.
Future Year 2038 (With Project)		- No roadway improvements recommended.

AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
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DRAFT

TRAFFIC IMPACT ANALYSIS REPORT

NAKAHILI

Waikoloa, Hawaii

1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate potential traffic impacts resulting from the proposed Nakahili workforce family agricultural community in Waikoloa, Hawaii (hereinafter referred to as the "Project"). Approvals for Nakahili will be processed under Chapter 201H, Hawai'i Revised Statues (HRS).

1.1 Location

The Nakahili site is identified by Tax Map Key (TMK) numbers: (3) 6-8-002: 005, 006, 028, 029, and 030. The site is situated on the western side of Mamalahoa Highway, also known as Hawaii Belt Road, and northwest of Waikoloa Road. Mamalahoa Highway borders the site on the east. The total site is approximately 1,558 acres. Work Force Developers, LLC is a development entity under contract to acquire the property from the landowners to develop Nakahili. See Figure 1.1 for the Project location.

1.2 Project Description

The Project will include Neighborhood Commercial and Family Agricultural land uses. The Neighborhood Commercial use will include 300 multi-family (MF) dwelling units with a small retail component, approximately three (3) acres of light industrial use and a small wastewater treatment plant to service the Neighborhood Commercial uses and any single-family (SF) farm dwellings within 1,000 feet of any well sites. The Family Agricultural use will include 858 agricultural lots with single-family (SF) farm dwellings. Future agricultural lot owners, at their own discretion and expense, may elect to build an accessory dwelling unit (ADU) on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), Hawaii County Code (HCC). The Project will also include an approximately six-acre "community green" neighborhood park and an approximately 29-acre regional park. At full build-out, access to the Project will be provided via two (2) accesses along Mamalahoa Highway and an additional access off Waikoloa Road (improvement of an existing dirt road through the neighboring parcel to the southwest). For the purposes of this report, and in compliance with

Section 25-2-46, Hawaii County Code (HCC) concurrency requirements, construction of the Project is analyzed for three (3) build-out years: 2023, 2028 and 2038. See Figure 1.2 for the proposed Project site plan.

Build-out by 2023

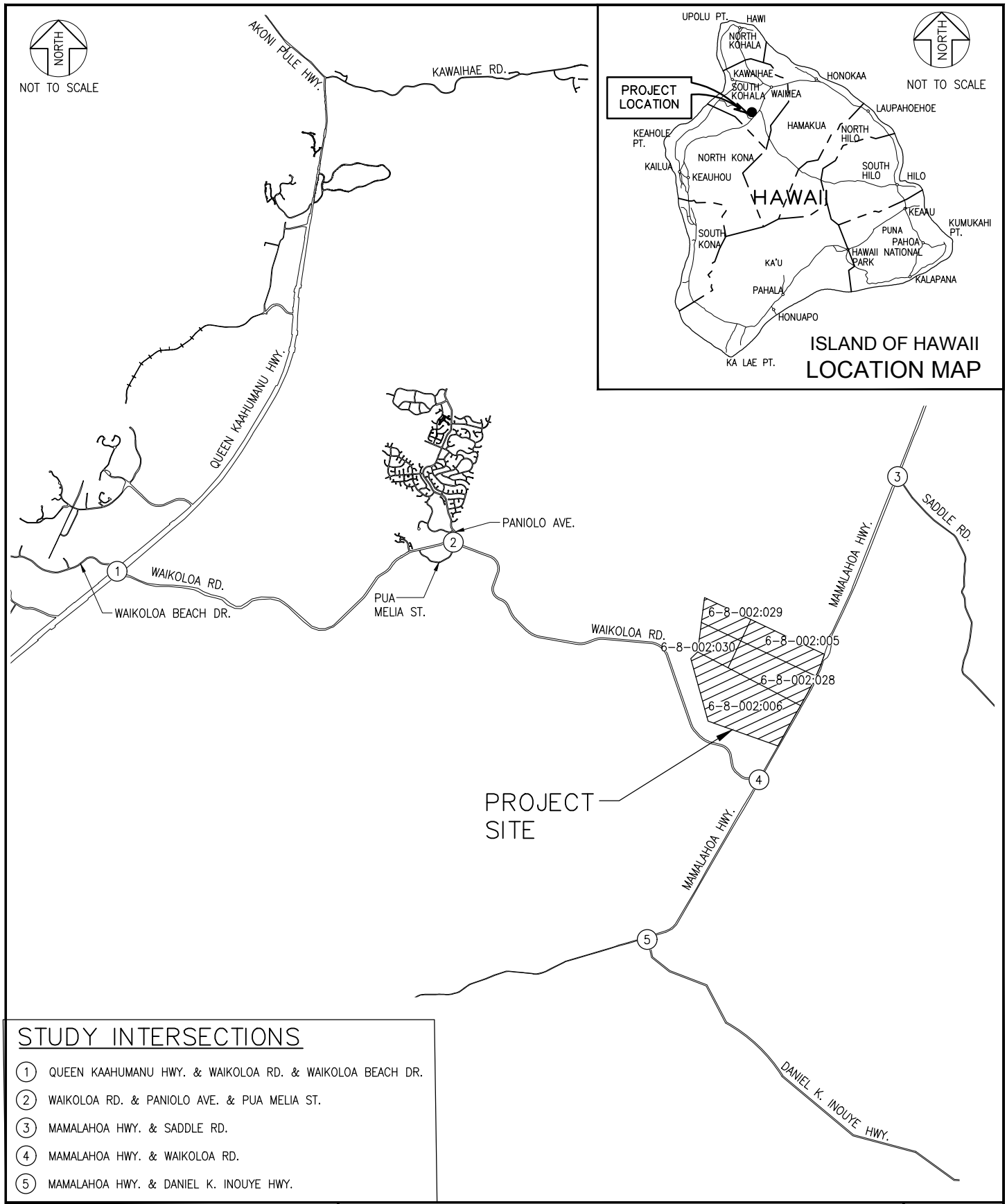
- 449 agricultural lots with SF farm dwellings located on the north parcels (TMKs (3) 6-8-002: 005, 028, 029, 030) of the Project site
- 300 MF dwelling units with retail component in the Neighborhood Commercial area
- Approximately three (3) acres light industrial in the Neighborhood Commercial area
- An approximately six-acre "community green" neighborhood park
- Access will be provided by:
    - An access point along Mamalahoa Highway ("North Project Access")

Build-out by 2028

- 409 agricultural lots with SF farm dwellings located on the south parcel (TMK (3) 6-8-002: 006) of the Project site
- An approximately 29-acre regional park
- Access will be provided by:
    - Previously constructed North Project Access
    - An access point along Mamalahoa Highway ("South Project Access")
    - New Project Connector Road (improvement of an existing dirt road through the neighboring parcel to the southwest) providing access to the Project from Waikoloa Road

Build-out by 2038

- 108 accessory dwelling units (ADUs)
    - Although ADUs will not be part of the initial Project development, future agricultural lot owners, at their own discretion and expense, may elect to build an ADU on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), HCC. While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, for the purpose of this report, 108 ADUs are assumed to be built out in 2038. For additional ADU construction beyond the anticipated 108 units, an updated traffic study is recommended.
- Access will be provided by all three (3) previously constructed accesses.



STUDY INTERSECTIONS

1. QUEEN KAAHUMANU HWY. & WAIKOLOA RD. & WAIKOLOA BEACH DR.
2. WAIKOLOA RD. & PANIOLO AVE. & PUA MELIA ST.
3. MAMALAHOA HWY. & SADDLE RD.
4. MAMALAHOA HWY. & WAIKOLOA RD.
5. MAMALAHOA HWY. & DANIEL K. INOUYE HWY.

NAKAHILI – TIAR

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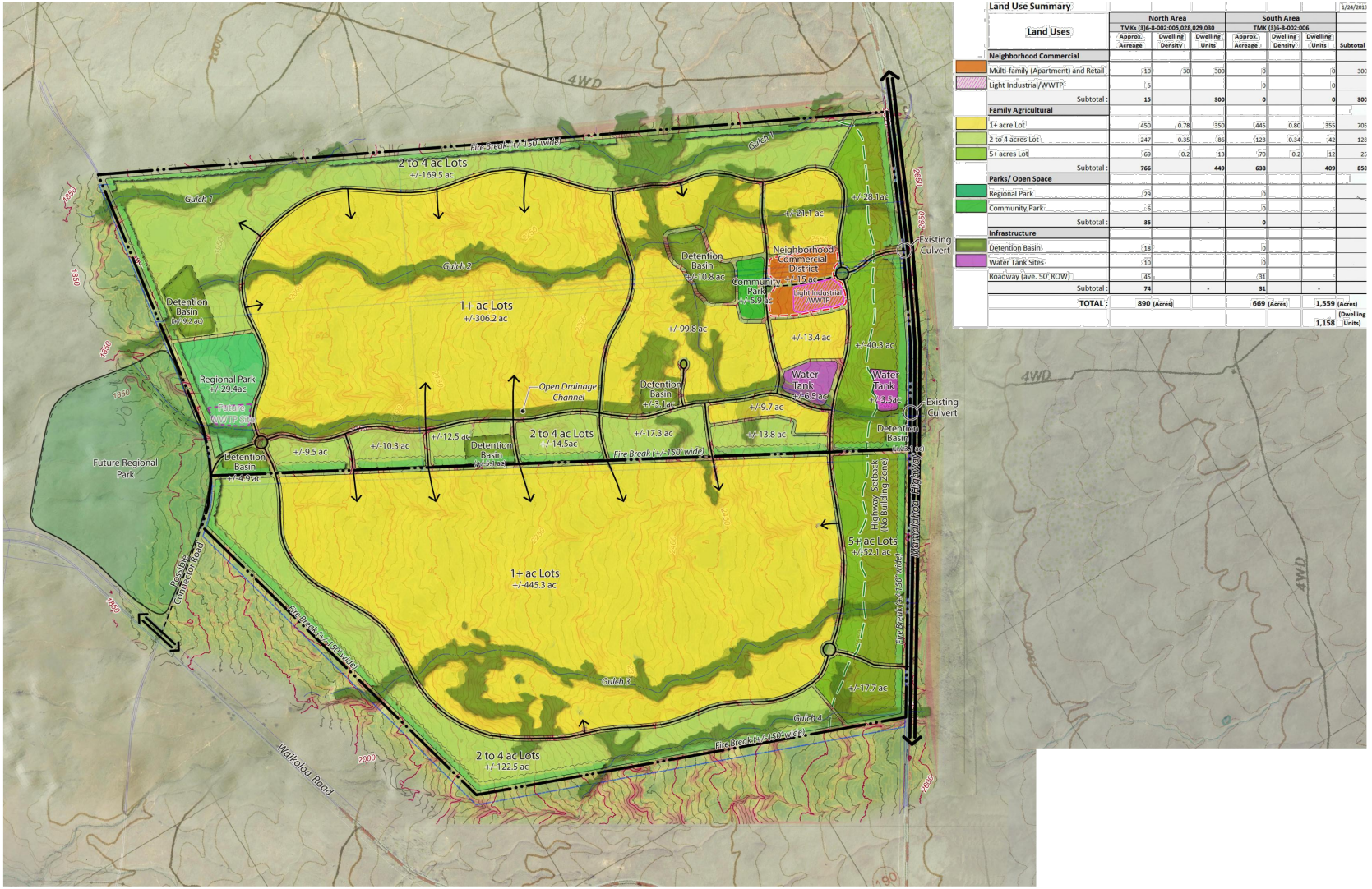
LOCATION MAP

FIGURE 1.1



Land Use Summary 1/24/2015

Land Uses	North Area TMKs (3)6-8-002:005,028,029,030 Approx. Acreage	Dwelling Density	Dwelling Units	South Area TMK (3)6-8-002:006 Approx. Acreage	Dwelling Density	Dwelling Units	Subtotal
Neighborhood Commercial							
Multi-family (Apartment) and Retail	10	30	300	0		0	300
Light Industrial/WWTP	5			0		0	
Subtotal :	**15**		**300**	**0**		**0**	**300**
Family Agricultural							
1+ acre Lot	450	0.78	350	445	0.80	355	705
2 to 4 acres Lot	247	0.35	86	123	0.34	42	128
5+ acres Lot	69	0.2	13	70	0.2	12	25
Subtotal :	**766**		**449**	**638**		**409**	**858**
Parks/ Open Space							
Regional Park	29			0			
Community Park	6			0			
Subtotal :	**35**		**-**	**0**		**-**	
Infrastructure							
Detention Basin	18			0			
Water Tank Sites	10			0			
Roadway (ave. 50' ROW)	45			31			
Subtotal :	**74**		**-**	**31**		**-**	
TOTAL :	**890** (Acres)			**669** (Acres)		**1,559** (Acres)	
						1,158 (Dwelling Units)	

NORTH

NOT TO SCALE

SOURCE: PBR HAWAII & ASSOCIATES, INC.

NAKAHILI – TIAR

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FIGURE 1.2

SITE PLAN

2. METHODOLOGY

2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.
- Traffic projections for Base Years 2023, 2028 and 2038 (without the Project) including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate. These other known developments are projects that are currently under construction or known new/future developments that are anticipated to affect traffic demand and operations within the study area. Three (3) base years were analyzed consistent with the County of Hawaii Concurrency requirements (Section 25-2-46, Hawaii County Code (HCC)).
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for Future Years 2023, 2028 and 2038 (with the Project), which includes Base Year traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations for Base Year as well as Future Year roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by known developments in the region or the Project.

2.2 Intersection Analysis

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, dated 2016, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix B.

Analyses for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.

3. EXISTING CONDITIONS

3.1 Roadway System

The following are brief descriptions of the existing roadways in the vicinity of the Project.

Mamalahoa Highway (Highway 190) – is generally a north-south, two-way, two-lane, undivided State roadway in the vicinity of the Project. Mamalahoa Highway begins in Waimea as a continuation of Hawaii Belt Road at its intersection with Kawaihae Road and travels southwest before turning into Palani Road at its intersection with Queen Kaahumanu Highway in Kailua-Kona. Mamalahoa Highway acts as one of the two main thoroughfares between the Kohala and Kona regions. In the vicinity of the Project, the roadway has a posted speed limit of 55 miles per hour (mph).

Daniel K. Inouye Highway (Route 200) – is generally an east-west, two-way, three-lane, undivided State roadway in the vicinity of the Project. Daniel K. Inouye Highway begins at the outskirts of Hilo and travels west before terminating at its intersection with Mamalahoa Highway. The highway is the sole roadway providing direct access between the east and west sides of the island. Daniel K. Inouye Highway is a realignment of the previous Saddle Road and was completed in 2017. In the vicinity of the Project, the roadway has a posted speed limit of 45 mph.

Saddle Road (Old Route 200) – is generally a north-south, two-way, two-lane, undivided State roadway in the vicinity of the Project. The majority of Saddle Road has been realigned and reconstructed as the new Daniel K. Inouye Highway. The remainder of the old Saddle Road begins just west of Lava Road at Daniel K. Inouye Highway and travels north to Mamalahoa Highway. In the vicinity of the Project, the roadway has a posted speed limit of 45 mph.

Queen Kaahumanu Highway (Route 19) – is generally a north-south, two-way, two-lane, undivided State roadway in the vicinity of the Project. Queen Kaahumanu Highway begins in Kawaihae at its intersection with Akoni Pule Highway and Kawaihae Road and travels south to Kailua-Kona before terminating at its intersection with Palani Road and Mamalahoa Highway. Queen Kaahumanu Highway continues further south of the intersection as Route 11 before turning into Mamalahoa Highway at its intersection with Hualalai Road. In the vicinity of the Project, the roadway has a posted speed limit of 45 mph.

Waikoloa Road – is generally an east-west, two-way, two-lane, undivided County roadway in the vicinity of the Project. The roadway begins to the east at its intersection with Mamalahoa Highway and terminates to the west at its intersection with Queen Kaahumanu Highway where it transitions into Waikoloa Beach Drive. The roadway has a posted speed limit of 35 mph near Waikoloa Village but the posted limit increases to 45 mph near Queen Kaahumanu Highway and 55 mph near Mamalahoa Highway.

Waikoloa Beach Drive – is generally a two-way, two-lane, divided private roadway. The roadway loops through the Waikoloa Beach Resort area, beginning and ending at Queen Kaahumanu Highway with signalized intersections. The roadway has a posted speed limit of 25 mph.

Paniolo Avenue – is generally a north-south, two-way, four-lane, undivided County roadway in the vicinity of the Project. Paniolo Avenue begins to the south at its intersection with Waikoloa Road and Pua Melia Street and travels north through Waikoloa Village before terminating at the

Kamakoa Nui subdivision park. In the vicinity of the Project, the roadway has a posted speed limit of 25 mph.

Pua Melia Street – is generally a two-way, two-lane, undivided County roadway in the vicinity of the Project. Pua Melia Street forms a loop along the southern side of Waikoloa Road with entrances across from Paniolo Avenue and the Paniolo Greens Resort. The roadway has no posted speed limit.

3.2 Site Access

The site has four (4) existing unimproved dirt access points off of Mamalahoa Highway and one existing access through the neighboring parcel to the southwest (TMK (3) 6-8-002: 008), off of Waikoloa Road. All the access ways are currently gated, have a rough surface condition and experience infrequent use.

The existing dirt access road through the parcel to the southwest of the Project will be improved to provide access to the Project. Although there are four (4) existing unimproved access points along Mamalahoa Highway, only two (2) access points are proposed with the Project.

3.3 Sustainable Transportation

3.3.1 Complete Streets

While transportation planning has traditionally focused on automobile travel, recent "Complete Streets" policies also recognize the numerous benefits of encouraging the use of alternative modes of transportation. "Complete Streets" policies encourage the provision of equitable, accessible and safe transportation for all modes.

Hawaii State Senate Bill 718 (2009) required that the Hawaii Department of Transportation (HDOT) and the County transportation departments:

"…adopt a complete streets policy that seeks to reasonably accommodate convenient access and mobility for all users of the public highways within their respective jurisdictions…"

3.3.2 Pedestrian Accessibility

Because the areas in the Project vicinity are largely undeveloped and the nearby roadways are generally high speed highways, pedestrian facilities are not currently available. However, sidewalks are provided along roadways within Waikoloa Village, which is located approximately four (4) miles away from the proposed Project.

Pedestrians were generally not observed along the Project roadways, likely as a result of the limited destinations within a reasonable walking distance. Pedestrians were observed to use facilities provided within both Waikoloa Village and the Waikoloa Beach Resort area. Some pedestrians crossed at the unsignalized crosswalks at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection.

3.3.3 Bicycle Accessibility

In the vicinity of the Project, there are currently bike lanes along Waikoloa Road at the Queen Kaahumanu Highway intersection. These bike lanes extend for approximately a quarter of a

mile east before terminating. However, in general, the majority of roadways in the vicinity of the Project have wide, paved shoulders that can be used by cyclists.

The Bike Plan Hawaii Master Plan was published in 2003 by HDOT and identifies bicycle facilities that are proposed for future implementation. Proposed facilities are assigned a Priority Level ranging from I to III, with Priority Level I planned for near-term completion and Priority Level III planned for long-term completion. An additional Priority Level IV is assigned for bicycle facilities that are contingent on roadway development. In the vicinity of the Project, the following bicycle facilities are identified in the master plan.

- Bike Path – Parallel to Queen Kaahumanu Highway (Priority Level II)
- Signed Shared Roadway – Queen Kaahumanu Highway (Priority Level I)
- Signed Shared Roadway – Mamalahoa Highway (Priority Level II)
- Bike Path – Old Mamalahoa Highway Remnants (Priority Level II)
- Signed Shared Roadway – Saddle Road (Priority Level III)
- Signed Shared Roadway – Waikoloa Road (Priority Level II)

Daniel K. Inouye Highway had not been constructed during the writing of the master plan, and bicycle facilities are not identified along the roadway.

Minimal bicycle activity was observed along the studied roadways, with the majority of observed bicyclists traveling along Queen Kaahumanu Highway. Although paved shoulders were available where bicyclists could travel with some level of separation from vehicles, the high vehicle speeds and winding roadways (notably Waikoloa Road) created less than ideal conditions for bicyclists.

3.3.4 Public Transit

The County of Hawaii Mass Transit Agency (MTA) operates the Hele-On Bus, which serves the most populated areas of the island. In the immediate vicinity of the Project, bus service is provided by the North Kohala-Waimea-Kailua-Kona route which passes the Project along Mamalahoa Highway; however, buses do not stop at or near the Project as there is no nearby bus stop. The route operates one round trip service between North Kohala and Kailua-Kona a day from Monday to Saturday. On Saturday, no stops are made in Waimea. The nearest bus stop to the Project is located in Waikoloa Village. MTA is currently in the process of developing a Transit Master Plan (TMP) to improve transit services across the island. The draft TMP (dated January 2018) does not identify any new routes or stops in the immediate vicinity of the Project. However, it recommends modifying the North Kohala-Waimea-Kailua-Kona route to provide Saturday service to Waimea and additional flex service (prearranged pick-up and or drop-off at locations deviating from the marked route by up to three quarters of a mile) as needed.

3.4 Existing Traffic Volumes

The hourly turning movement data utilized in this report were collected on September 18, 2018 and September 19, 2018. Based on the proximity to the proposed Project site, the following intersections were studied in the existing conditions scenario.

- [1] Mamalahoa Highway/Daniel K. Inouye Highway (unsignalized)

- [2] Mamalahoa Highway/Waikoloa Road (unsignalized)
- [3] Mamalahoa Highway/Saddle Road (unsignalized)
- [4] Waikoloa Road/Paniolo Avenue/Pua Melia Street (unsignalized)
- [5] Waikoloa Road/Queen Kaahumanu Highway (signalized)

Based on the count data, it was determined that the AM peak hour of traffic occurs between 7:30 AM and 8:30 AM and the PM peak hour of traffic occurs between 3:30 PM and 4:30 PM. The turning movement count data is included in Appendix A.

3.5 Existing Traffic Conditions Observations and Analysis

The observations and analysis described below are based on prevailing observations during the time at which the data was collected. Hereinafter, observations that are expressed as ongoing and current shall represent the conditions that prevailed at the time at which the data was collected.

3.5.1 Regional Analysis

Queen Kaahumanu Highway and Mamalahoa Highway provide regional connectivity between Kohala to the north and Kailua-Kona to the south. Volumes were observed to be higher in the southbound direction towards Kailua-Kona during the AM peak hour of traffic and higher in the northbound direction towards Kohala during the PM peak hour. Daniel K. Inouye Highway provides regional connectivity between Hilo to the east and Kona to the west. The old Saddle Road alignment was observed to carry minimal traffic compared to the new Daniel K. Inouye Highway alignment. Traffic was observed to be higher from Hilo during the AM peak hour and higher towards Hilo during the PM peak hour. Traffic along the major thoroughfares in the vicinity of the Project was generally light with free flow conditions observed along all roadways. However, it should be noted that at the time of data collection, traffic volumes in the study area were likely on the lower end due to the downturn in tourism on Hawaii Island beginning in May 2018.[1]

3.5.2 Existing Intersection Analysis

All intersections were generally observed to operate adequately with no major delays to any movements, with the exception of the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection which will be discussed further below. As noted above, observed volumes are likely lower than normal conditions due to the decrease in tourism experienced prior to data collection. In order to account for the lower volumes, through volumes along the studied roadways were adjusted based on Hawaii State Department of Transportation (HDOT) traffic count data collected in 2016. The following adjustments were made to the studied roadways:

- Queen Kaahumanu Highway – Increase by 16%
- Mamalahoa Highway – Increase by 8%
- Waikoloa Road – Increase by 18%

[1] Based on the Hawaii Department of Business, Economic Development & Tourism (DBEDT) monthly visitor statistics (http://dbedt.hawaii.gov/visitor/tourism/).

- Daniel K. Inouye Highway – Increase by 1%

No adjustments were made along Saddle Road as traffic along this roadway was not determined to be negatively affected by the lower visitor volumes.

Operations at the study intersections with the volume adjustments above are described further below.

[1] Mamalahoa Highway/Daniel K. Inuoye Highway

This intersection operates satisfactorily during both peak hours of traffic with all movements operating at LOS B or better. Turning movements from Daniel K. Inouye Highway onto Mamalahoa Highway benefit from left and right-turn acceleration lanes along the highway.

[2] Mamalahoa Highway/Waikoloa Road

This intersection operates satisfactorily during both peak hours of traffic with all movements operating at LOS C or better. Adequate gaps in through traffic along Mamalahoa Highway were available for vehicles on Waikoloa Road to complete turning movements with minimal delays.

[3] Mamalahoa Highway/Saddle Road

This intersection operates satisfactorily during both peak hours of traffic with all movements operating at LOS A. Volumes along Saddle Road were light due to vehicles favoring the Daniel K. Inouye Highway alignment. Vehicles were observed to complete turning movements with minimal delays.

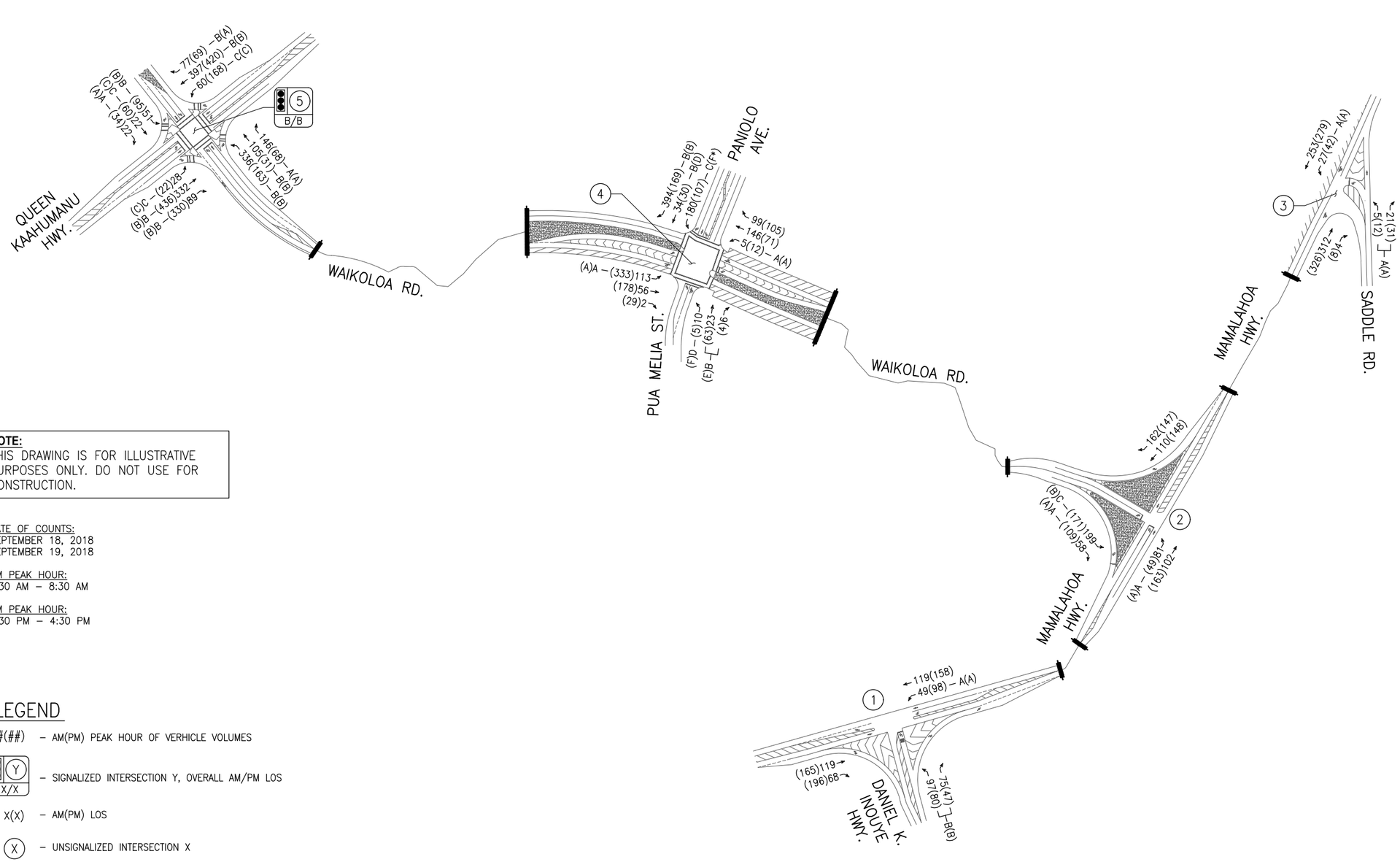
[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

During the PM peak hour of traffic, the southbound left-turn operates at LOS F and overcapacity, and the northbound movements operate at LOS E/F. Volumes at this intersection are high as Paniolo Avenue provides the only access to Waikoloa Village, and Waikoloa Road provides the main connection between Queen Kaahumanu Highway and Mamalahoa Highway. Left-turn and right-turn queues of up to eight (8) vehicles were observed along Paniolo Avenue during the AM peak hour of traffic and left-turn queues of up to four (4) vehicles were observed along Paniolo Avenue during the PM peak hour.

[5] Queen Kaahumanu Highway/Waikoloa Road

This intersection operates satisfactorily during both peak hours of traffic with all movements operating at LOS C or better. Volumes are high as Queen Kaahumanu Highway acts as the main thoroughfare between the Kohala and Kona regions. However, adequate capacity is provided at the intersection with the traffic signal.

Figure 3.1 illustrates the existing lane configurations, volumes and LOS for the study intersection movements. Table 3.1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Appendix C



NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

DATE OF COUNTS:
SEPTEMBER 18, 2018
SEPTEMBER 19, 2018

AM PEAK HOUR:
7:30 AM – 8:30 AM

PM PEAK HOUR:
3:30 PM – 4:30 PM

LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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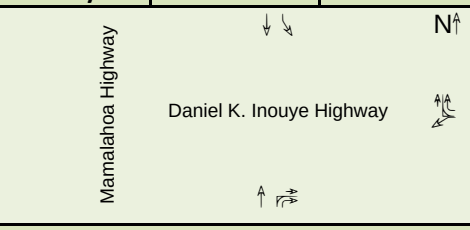
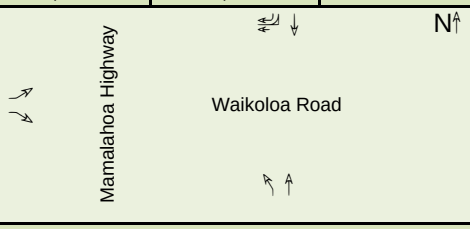
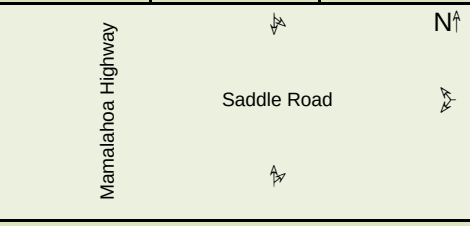
EXISTING TRAFFIC CONDITIONS LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

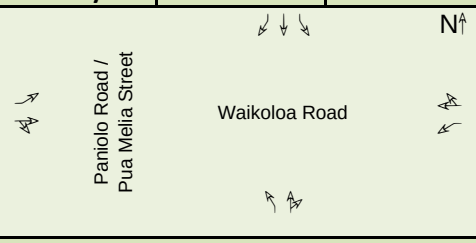
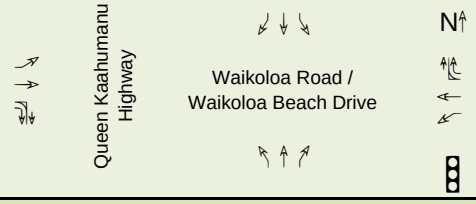
FIGURE 3.1

Table 3.1: Existing Conditions Level of Service Summary

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Existing Conditions (AM / PM) HCM Delay	v/c Ratio	LOS
1	**Mamalahoa Highway & Daniel K. Inouye Highway** *Discussion:* *This intersection operates satisfactorily during both peak hours of traffic due to the exclusive turning lanes along Mamalahoa Highway and acceleration lanes for turning traffic from Daniel K. Inouye Highway.*			
		B 0.15 11	**/ / /**	**B 0.16 13**
	WB LT/RT	11 / 13	0.15 / 0.16	B / B
	SB LT	8 / 8	0.04 / 0.08	A / A
2	**Mamalahoa Highway & Waikoloa Road** *Discussion:* *This intersection operates satisfactorily during both peak hours of traffic. Adequate gaps in through traffic along Mamalahoa Highway were observed.*			
		C 0.38 15	**/ / /**	**B 0.34 15**
	NB LT	8 / 8	0.06 / 0.04	A / A
	EB LT	15 / 15	0.38 / 0.34	C / B
	EB RT	9 / 10	0.07 / 0.13	A / A
3	**Mamalahoa Highway & Saddle Road** *Discussion:* *This intersection operates satisfactorily during both peak hours of traffic. Volumes along Saddle Road were observed to be low due to vehicles preferring to use the Daniel K. Inouye Highway alignment.*			
		A 0.03 9	**/ / /**	**A 0.05 9**
	WB LT/RT	9 / 9	0.03 / 0.05	A / A
	SB LT/TH	8 / 8	0.02 / 0.04	A / A

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

Table 3.1: Existing Conditions Level of Service Summary Continued

	Intersection 🚦 Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Existing Conditions (AM / PM) HCM Delay	v/c Ratio	LOS
4	**Waikoloa Road & Paniolo Avenue & Pua Melia Street** *Discussion:* *Turning movements at this intersection were observed to be high due to the large number of residences within Waikoloa Village. The southbound left-turn operates at LOS F and overcapacity and the northbound approach operates at LOS E/F during the PM peak hour.*			
		D / / F*	**/ / /**	**0.08 / 1.26** **35 / 264**
	NB LT	35 / 50	0.08 / 0.06	D / F
	NB TH/RT	14 / 48	0.07 / 0.48	B / E
	EB LT	8 / 9	0.1 / 0.26	A / A
	WB LT	7 / 8	0 / 0.01	A / A
	SB LT	23 / 264	0.5 / 1.26	C / F*
	SB TH	15 / 35	0.09 / 0.21	B / D
	SB RT	14 / 10	0.52 / 0.2	B / B
5	**Queen Kaahumanu Highway & Waikoloa Road & Waikoloa Beach Drive** *Discussion:* *This intersection operates satisfactorily.*			
		B / / B	**/ / /**	**- / -** **16 / 17**
	NB LT	29 / 31	0.47 / 0.5	C / C
	NB TH	17 / 17	0.69 / 0.75	B / B
	NB RT	13 / 12	0.06 / 0.23	B / B
	EB LT	18 / 19	0.15 / 0.26	B / B
	EB TH	20 / 23	0.13 / 0.38	C / C
	EB RT	0 / 0	0 / 0	A / A
	WB LT	13 / 18	0.54 / 0.4	B / B
	WB TH	14 / 20	0.23 / 0.13	B / B
	WB RT	0 / 0	0 / 0	A / A
	SB LT	27 / 26	0.6 / 0.76	C / C
	SB TH	16 / 11	0.74 / 0.55	B / B
	SB RT	12 / 8	0.05 / 0.05	B / A

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

4. BASE YEAR SCENARIOS

In compliance with the Hawaii County Code concurrency requirements (Section 25-2-46, HCC) which state: "The TIAR shall include projections for future growth in traffic, for a minimum of five, ten and twenty years, and shall include other approved or proposed development that is expected to impact the project area, with reasonable assumptions about the build-out of such development"; the years 2023, 2028 and 2038 were studied to reflect the build-out of the Project. Inclusion of other approved or proposed developments is discussed in the following sections.

4.1 Defacto Growth Rate

The Hawaii Department of Transportation (HDOT) Travel Demand Forecasting Model (TDFM) provides traffic projections across the island of Hawaii up to year 2035. The forecasting model uses population forecasts from the Hawaii County General Plan to distribute households and vehicular trips across predetermined Traffic Analysis Zones (TAZs) based upon existing TAZ household distributions.

Because the TDFM does not take into account future land uses and developments, the projections were adjusted as necessary to reflect planned developments in South Kohala and the neighboring regions.

Based on adjusted projections, annual growth rates of 1.3%, 0.5%, 1.1% and 0.9% along Mamalahoa Highway, Daniel K. Inouye Highway/Saddle Road, Waikoloa Road and Queen Kaahumanu Highway, respectively, were applied to existing 2018 traffic volumes to determine Base Year conditions.

4.2 Traffic Forecasts for Known Developments

Although the defacto growth rates described in Section 4.1 take into account future developments, traffic projections from all known background projects in the vicinity of the Project at the time of this study were added to the existing roadway network to account for intersection turning movements. Trips from the following known developments were added to the existing traffic data to reflect Base Year conditions. The completion dates for each of the background developments were based on the best available information at the time this report. Where build-out information was not available, completion dates were estimated based on anticipated approval and construction schedules.

1. Ainamalu – This project is located in the Waikoloa Beach Resort area Makai of Queen Kaahumanu Highway. The project proposes to develop 350 single-family homes and 60 condominiums along with a community club and swimming pool. Sale of Phase I, consisting of 40 single-family homes, is almost complete and construction of the phase is ongoing. There is currently no advertised build-out year for the project, but completion of all phases is anticipated by 2023.
2. Kilohana Kai Phase II – This project is located at the northern edge of Waikoloa Village. Phase II of Kilohana Kai consists of 84 residential lots. Several of the lots have been sold with residences already constructed and occupied. Of the Phase II lots, approximately 20% are currently occupied. Full occupation of the remaining lots is anticipated to occur by 2023.

3. Waikoloa Village Makai Vistas – This project is located at the northern end of Waikoloa Village just south of the Kilohana Kai subdivision. The Waikoloa Village Makai Vistas proposes to construct 31 single-family homes within a new gated community. Construction of the homes has begun, and full occupation of the development is anticipated to occur by 2023.

4. Waikoloa Plaza – This project is located at the southwest corner of Waikoloa Road/Paniolo Avenue/Pua Melia Street. The proposed Waikoloa Plaza, formerly known as the Waikoloa Village Town Center, is a 130,000 square-foot shopping center with space for 35 retailers. Completion of the shopping center component is planned in 2020.

5. Waikoloa Regional Library – This project is currently proposed near the Waikoloa Village Post Office located along Pua Melia Street. The proposed site for the library is on 1.6 acres of land currently owned by the developer of Waikoloa Plaza. Initial plans are for an 11,000 square-foot library with approximately 50 parking spaces. There is currently no known build-out year for the project. However, Capital Improvement Project (CIP) funds for land acquisition for the library have been secured for Fiscal Year 2019, and completion is anticipated by 2023.

6. Waikoloa Highlands Subdivision – This project is located across from Waikoloa Village along the south side of Waikoloa Road. The Waikoloa Highlands Subdivision proposes to develop 398 one-acre residential lots in two (2) phases. The project area was previously reclassified in 2008 from an agricultural to rural land use. The State of Hawaii Land Use Commission (LUC) imposed a series of conditions on the developers, to be completed by June 10, 2018, in order to maintain the rural land use classification. On November 28, 2018 the LUC voted to revert the land use back to agricultural because the subdivision was not substantially developed since the reclassification. Despite the ruling by the LUC, the developer may continue to pursue the project through possible amendments to the initial rezoning ordinance or through appeal. It was conservatively assumed that the project would ultimately be constructed with the first phase of the project completed by 2023 and the remainder completed by 2028.

The following developments were not included in Base Year projections.

1. Hapuna Beach Redevelopment – The Hapuna Beach Redevelopment encompasses the Hapuna Estates, Hapuna Beach Residences and Hapuna Beach Villa projects. The developments are located north of the Project area along both sides of Queen Kaahumanu Highway. In total, the redevelopment will provide a total of 84 single-family homes, 18 duplex units, 126 condominiums and a luxury villa. Additional traffic generated by the Hapuna Beach Redevelopment is assumed to be accounted for in the defacto growth rate.

2. Villages of Aina Lea – This project is located Mauka of Queen Kaahumanu Highway to the north of Waikoloa Road. The project was first proposed and approved in 1989, but has been subject to several legal disputes since then. Initial plans for the Villages of Aina Lea included approximately 790 single-family residential lots, 1,047 multi-family residential units, 125 mixed-use residential units, up to 500 affordable or workforce housing units, a golf course, a commercial village, a mixed-use core, parks and open space and related infrastructure. Due to the legal and financial issues surrounding this project, it was assumed that the project and any related roadway improvements would not be completed within the Project timeframe.

4.2.1 Trip Generation

The Institute of Transportation Engineers (ITE) publishes a book based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms and associations. This publication, titled Trip Generation, 10th Edition, provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables. The independent variables can range from Dwelling Units (DU) for single-family detached homes to Gross Floor Area (GFA) for commercial or office development.

Trip generation for the above background projects were assumed based on the project TIARs when available. If a TIAR did not generate traffic for the development or if a TIAR was never completed, trips were manually generated using trip generation rates contained in the Trip Generation, 10th Edition as described above.

4.2.2 Trip Reductions

Due to the proposed land uses of some of the background projects, trip reductions as described below were applied to specific projects to more accurately reflect the projections.

4.2.2.1 Pass-By Trip Reduction

Pass-by trip reductions were applied to the various developments where applicable. These developments will be located along major arterials, and as a result, a percentage of existing users are expected to take short detours into the various project sites on their way to their destinations. Estimations for pass-by trip reductions were based upon information within the ITE Trip Generation Handbook, 3rd Edition or on the developments respective TIARs.

See Table 4.1 for applied trip generation volumes per project after all above reductions are applied. Figure 4.1 shows the locations of the background developments.

4.3 Background Roadway Projects

The following improvements in the studied region were assumed as part of the Base Year roadway conditions.

4.3.1 Base Year 2023

- Queen Kaahumanu Highway/Kawaihae Road Intersection Improvements – Intersection improvements include widening the intersection to provide a northbound right-turn lane, eastbound right-turn lane and an extended westbound left-turn pocket. Construction of the improvements was completed in late 2018 after traffic count data was collected.

4.3.2 Base Year 2028

- No roadway improvements are anticipated by Base Year 2028.

4.3.3 Base Year 2038

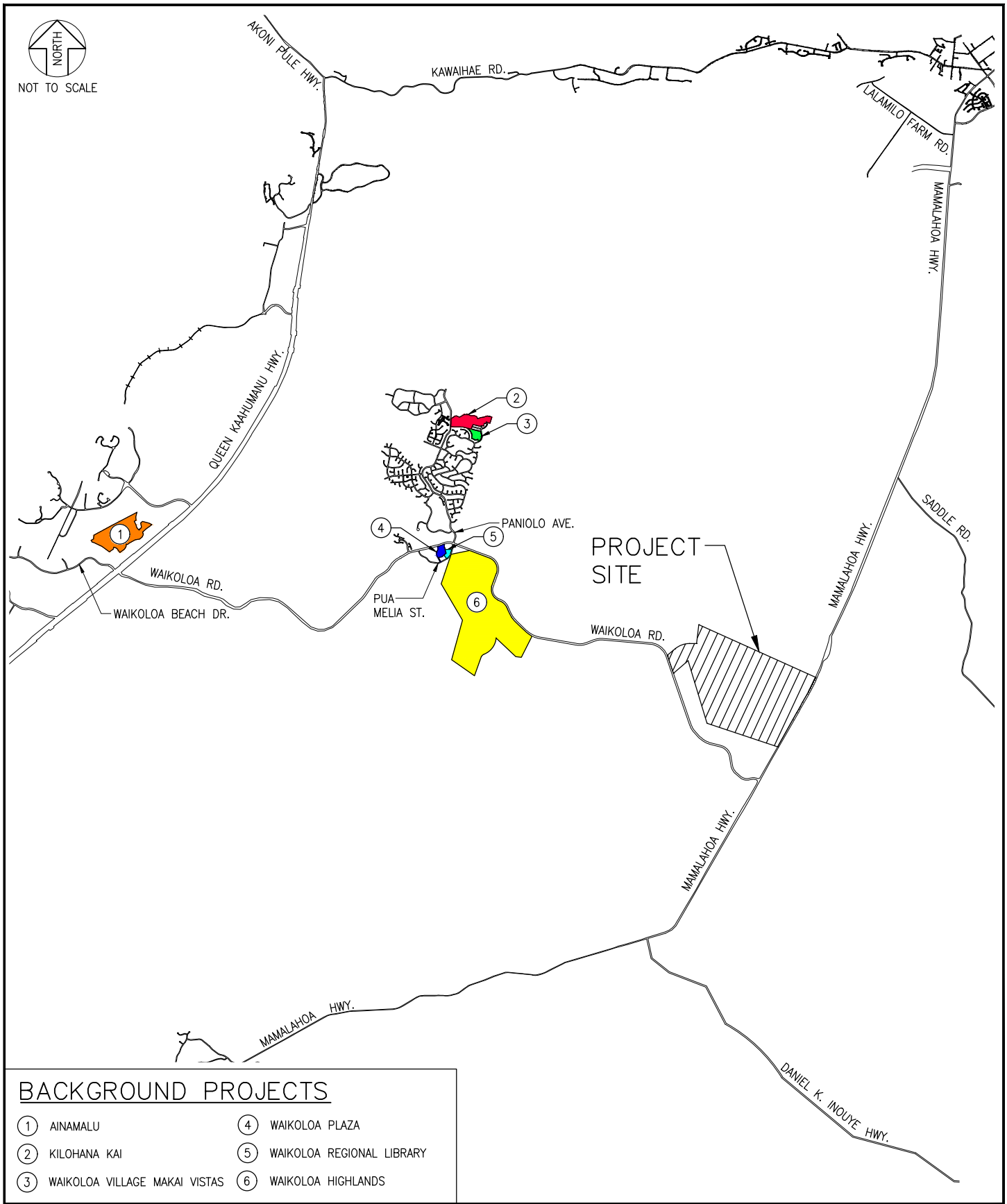
- Daniel K. Inouye Highway Extension – The previously named Saddle Road Extension proposes to extend Daniel K. Inouye Highway from Mamalahoa Highway to Queen Kaahumanu Highway. The extension is currently in the design phase with three (3) potential alignments being evaluated. Funding has been secured for final design and preliminary right-of-way (ROW) acquisition. The Draft Environmental Impact Statement

(DEIS) for the Saddle Road Extension evaluates roadway conditions with the completed extension for 2035, consistent with the District of Hawaii Long Range Development Plan (LRDP). Therefore, this report assumes the extension will be completed for Year 2038.

4.3.4 Roadway Improvements Not Included

- Kawaihae Bypass Road – The Kawaihae Bypass Road was proposed to alleviate traffic along Kawaihae Road and passing through Waimea. In 2016, the bypass road was put on hold indefinitely in order to prioritize the Daniel K. Inouye Highway Extension. A "mini" Kawaihae Bypass Road connecting Mamalahoa Highway to Kawaihae Road near Mahua Street was being evaluated in place of the full bypass road. However, the status of the shorter bypass road is unknown at this time. The Kawaihae Bypass Road is identified in the County of Hawaii General Plan (CHGP) and the South Kohala Community Development Plan (SKCDP) and may still be completed in the future.
- Paniolo Avenue Extension – The extension proposes to extend Paniolo Avenue from its existing terminus in Waikoloa Village to Kawaihae Road and Queen Kaahumanu Highway. The goal of the extension is to provide an additional access to and from Waikoloa Village. Although the improvement is identified in the CHGP and SKCDP, no plans or funding have been secured for the extension.

The roadway improvements assumed to be completed in the study region are shown in Figure 4.2. For the Daniel K. Inouye Highway Extension, in lieu of a final design, the alignment shown is based on the available popular public opinion at the time of this report.



BACKGROUND PROJECTS

1. AINAMALU
2. KILOHANA KAI
3. WAIKOLOA VILLAGE MAKAI VISTAS
4. WAIKOLOA PLAZA
5. WAIKOLOA REGIONAL LIBRARY
6. WAIKOLOA HIGHLANDS

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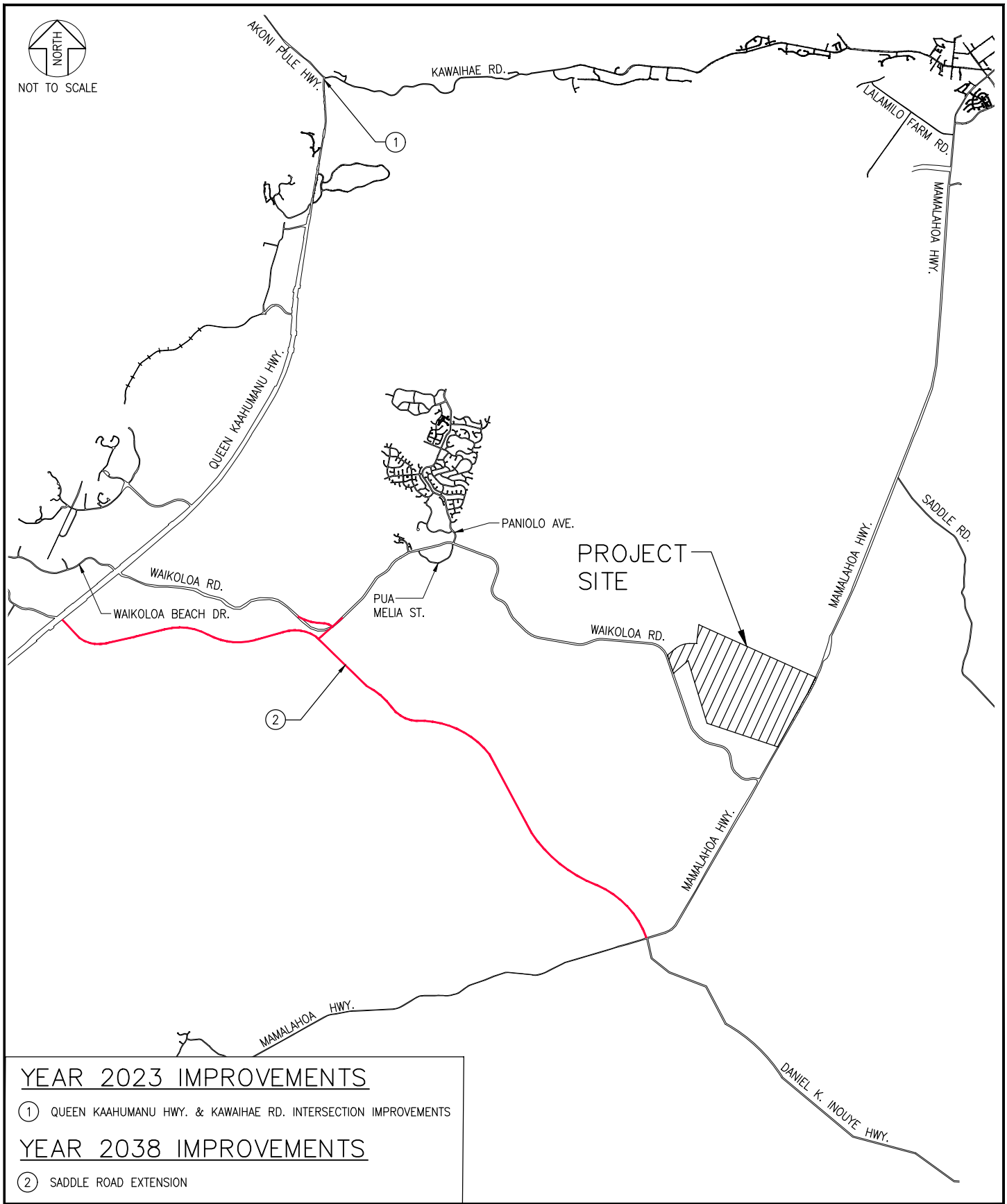
BACKGROUND DEVELOPMENTS

FIGURE 4.1

Table 4.1: Background Development Trip Generation

Year	Development	Independent Variable	AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Base Year 2023	**Ainamalu**	410 SF/MF DU	69	206	275	231	136	367
	Kilohana Kai Phase II	84 SF DU	13	39	52	43	26	69
	Waikoloa Village Makai Vistas	31 SF DU	7	20	27	21	13	34
	Waikoloa Plaza	130,000 Sq. Ft. Retail	135	82	217	254	280	534
	Waikoloa Regional Library	11,000 Sq. Ft. Library	4	1	5	41	45	86
	Waikoloa Highlands (Phase 1)	149 SF DU	28	84	112	94	56	150
	Base Year 2023 New Net External Trips		256	432	688	684	556	1240
Base Year 2028	**Waikoloa Highlands (Phase 2)**	249 SF DU	47	140	187	158	93	251
	Base Year 2028 New Net External Trips		47	140	187	158	93	251



YEAR 2023 IMPROVEMENTS

(1) QUEEN KAAHUMANU HWY. & KAWAIHAE RD. INTERSECTION IMPROVEMENTS

YEAR 2038 IMPROVEMENTS

(2) SADDLE ROAD EXTENSION

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ROADWAY IMPROVEMENTS

FIGURE 4.2

4.4 Base Year 2023 Analysis

It is anticipated that by Base Year 2023 without the Project, traffic will have increased over existing conditions due to the development in Waikoloa and the greater South Kohala region. Actual growth within the study region may vary based upon the approval process of the various background projects. Despite growth in the region, the majority of study intersections are expected to operate similar to existing conditions.

4.4.1 Base Year 2023 Intersection Analysis

The following intersections are expected to experience major changes in operation during either peak hour of traffic by Base Year 2023 compared to existing conditions.

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

By Base Year 2023, this intersection is expected to experience large increases in traffic since Paniolo Avenue serves as the single access to and from Waikoloa Village and Waikoloa Road serves as the main connection between Queen Kaahumanu Highway and Mamalahoa Highway. Various movements at the intersection are expected to operate at LOS F and overcapacity conditions during both peak hours of traffic. Recommended mitigative measures at this intersection are discussed in Section 4.4.2.

Figure 4.3 illustrates the Base Year 2023 forecast traffic volumes and LOS for the study intersection movements. Table 4.2 summarizes the Base Year 2023 LOS at the study intersections compared to existing conditions. LOS worksheets are provided in Appendix C.

4.4.2 Base Year 2023 with Mitigation Intersection Analysis

The following physical improvements are recommended by Base Year 2023:

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

- Construct a traffic signal when warranted.

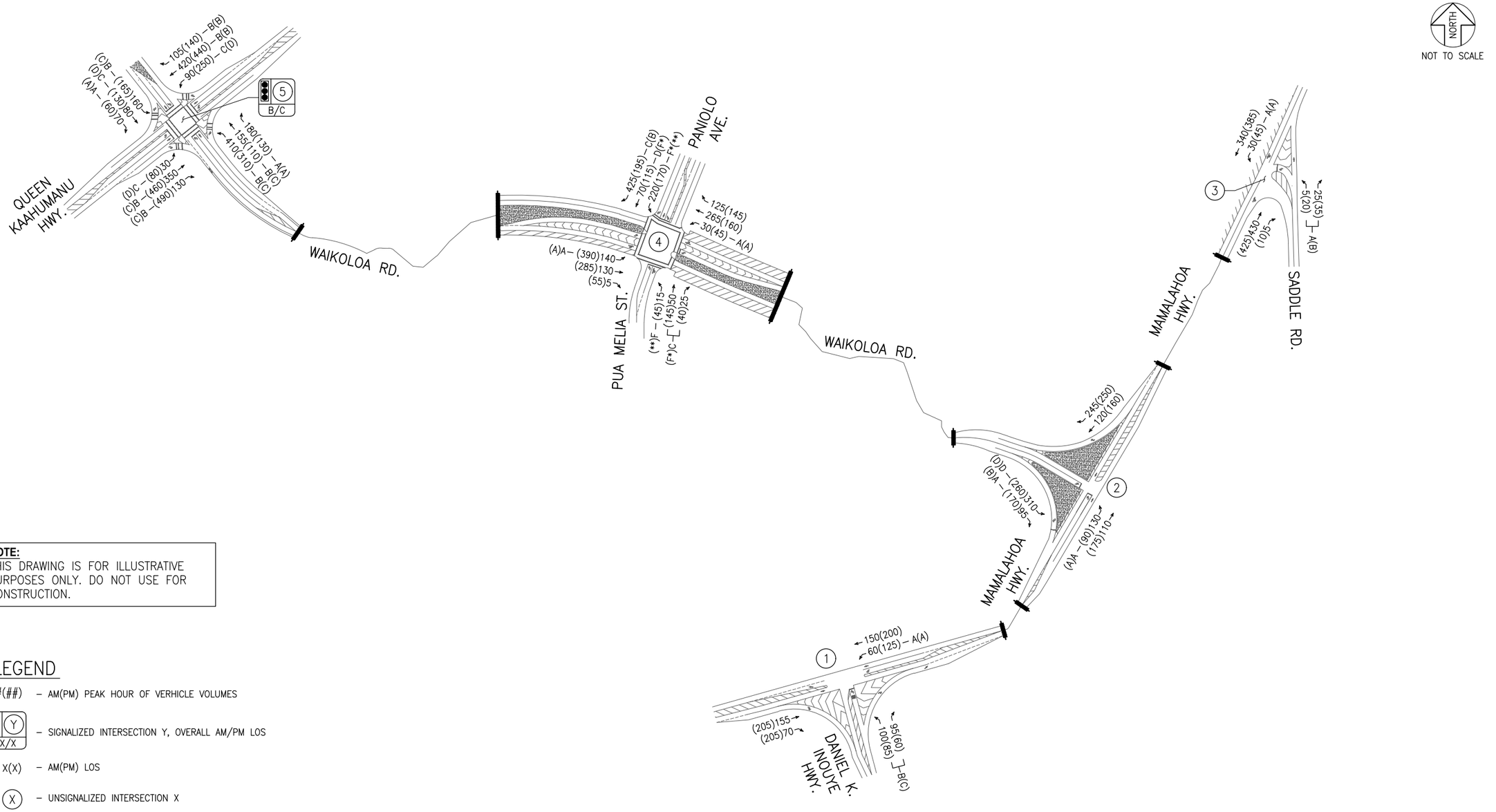
Although a single-lane roundabout at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection was previously required to satisfy LUC conditions for the Waikoloa Highlands Subdivision, a traffic signal was assumed as mitigation for Base Year 2023. Based on the Manual on Uniform Traffic Control Devices (MUTCD) Warrant 2, Four-Hour Vehicular Volume, a traffic signal is expected to warrant at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection by Base Year 2023. Traffic signal warrants are included in Appendix D.

With the proposed traffic signal, all movements at the intersection are expected to operate at LOS D or better. Although a single-lane roundabout is expected to initially operate adequately, the roundabout is expected to operate at overcapacity conditions beyond Base Year 2023. Additionally, due to developments located at the northwest and southwest corners of the intersection, construction of bypass lanes to provide additional capacity at the roundabout may not be feasible. Therefore, based on current traffic projections, the traffic signal was assumed to be the preferred alternative.

As stated in Section 4.2, the Waikoloa Highlands Subdivision parcel was reverted back to agricultural land use following a November 2018 LUC ruling. Based on the ruling, the developer may or may not continue to pursue the project further and may be subject to new conditions if it

proceeds. As a result, Waikoloa Highlands Subdivision may not be required to construct improvements at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection, and pro-rata share contributions by regional developers in the area may be required for construction. Pro-rata shares at this intersection are discussed further in Section 5.3.2.

Figure 4.4 illustrates the Base Year 2023 with mitigation forecast traffic volumes and LOS for the study intersection movements. Table 4.2 summarizes the Base Year 2023 with mitigation LOS at the study intersections compared to Base Year 2023 without mitigation. LOS worksheets are provided in Appendix C.



NOTE:
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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

Y / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

X – UNSIGNALIZED INTERSECTION X

** – COMPUTATION NOT DEFINED IN SYNCHRO

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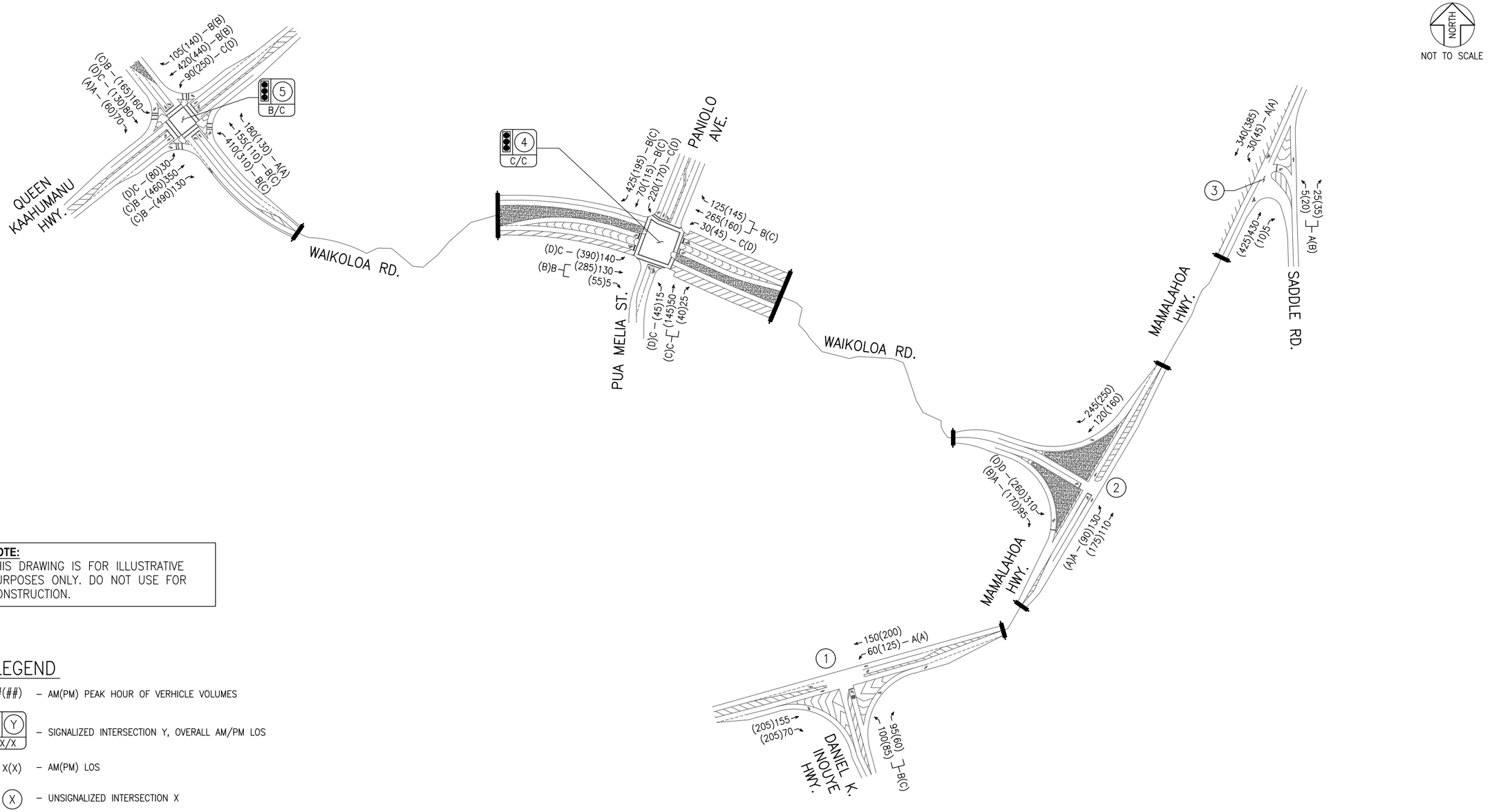
FIGURE 4.3

BASE YEAR 2023 TRAFFIC CONDITIONS LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS



NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

Y / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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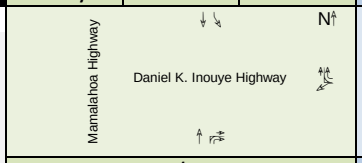
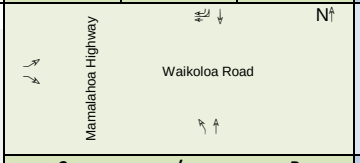
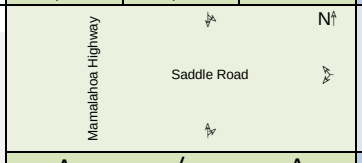
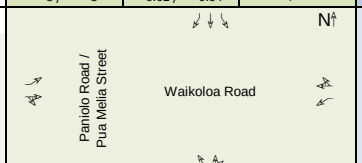
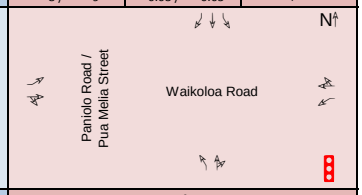
BASE YEAR 2023 (WITH MITIGATION) TRAFFIC CONDITIONS LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

FIGURE 4.4

Table 4.2: Existing Conditions, Base Year 2023 and Base Year 2023 with Mitigation Level of Service Summary

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS [X / X] DELAY [X / X]	Existing Conditions (AM / PM)			Base Year 2023 (AM / PM)			Base Year 2023 with Mitigation (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1	**Mamalahoa Highway & Daniel K. Inouye Highway** *Discussion: This intersection is expected to continue operating satisfactorily.*				See Existing			See Existing		
		B / B **0.15 / 0.16** **11.1 / 13.0**			**B / C** **0.17 / 0.21** **11.9 / 15.1**			**B / C** **0.17 / 0.21** **11.9 / 15.1**		
	WB LT/RT	11 / 13	0.15 / 0.16	B / B	12 / 15	0.17 / 0.21	B / C	12 / 15	0.17 / 0.21	B / C
	SB LT	8 / 8	0.04 / 0.08	A / A	8 / 8	0.05 / 0.1	A / A	8 / 8	0.05 / 0.1	A / A
2	**Mamalahoa Highway & Waikoloa Road** *Discussion: This intersection is expected to experience an increase in turning volumes due to the projected development in the study area but will continue to operate satisfactorily.*				See Existing			See Existing		
		C / B **0.38 / 0.34** **15.3 / 14.9**			**D / D** **0.73 / 0.62** **31.6 / 25.0**			**D / D** **0.73 / 0.62** **31.6 / 25.0**		
	NB LT	8 / 8	0.06 / 0.04	A / A	8 / 8	0.1 / 0.07	A / A	8 / 8	0.1 / 0.07	A / A
	EB LT	15 / 15	0.38 / 0.34	C / B	32 / 25	0.73 / 0.62	D / D	32 / 25	0.73 / 0.62	D / D
	EB RT	9 / 10	0.07 / 0.13	A / A	9 / 10	0.11 / 0.21	A / B	9 / 10	0.11 / 0.21	A / B
3	**Mamalahoa Highway & Saddle Road** *Discussion: This intersection is expected to continue operating at conditions similar to existing.*				See Existing			See Existing		
		A / A **0.03 / 0.05** **9.3 / 9.0**			**A / B** **0.05 / 0.08** **9.5 / 10.5**			**A / B** **0.05 / 0.08** **9.5 / 10.5**		
	WB LT/RT	9 / 9	0.03 / 0.05	A / A	10 / 11	0.05 / 0.08	A / B	10 / 11	0.05 / 0.08	A / B
	SB LT/TH	8 / 8	0.02 / 0.04	A / A	8 / 9	0.03 / 0.05	A / A	8 / 9	0.03 / 0.05	A / A
4	**Waikoloa Road & Paniolo Avenue & Pua Melia Street** *Discussion: This intersection is expected to experience a large increase in volumes due to the projected development in the study area. By Base Year 2023, various movements are expected to operate at overcapacity conditions. A traffic signal is expected to warrant by Base Year 2023.* *Mitigative Measures: Install a traffic signal when warranted. With a signal, all movements are expected to operate at LOS D or better.*				See Existing					
		D / F* 0.08 / 1.26 34.7 / 264.2			**F* / F* 1.34 / 2.48 237.4 / 784.2**			**C / C - / - 20.2 / 31.8**		
	NB LT	35 / 50	0.08 / 0.06	D / F	152 / **	0.42 / **	F / **	33 / 41	0.45 / 0.63	C / D
	NB TH/RT	14 / 48	0.07 / 0.48	B / E	22 / 784	0.27 / 2.48	C / F*	22 / 30	0.32 / 0.64	C / C
	EB LT	8 / 9	0.1 / 0.26	A / A	9 / 10	0.13 / 0.35	A / A	28 / 50	0.76 / 0.92	C / D
	EB TH/RT							11 / 15	0.21 / 0.46	B / B
	WB LT	7 / 8	0 / 0.01	A / A	8 / 8	0.02 / 0.04	A / A	30 / 41	0.51 / 0.63	C / D
	WB TH/RT							19 / 30	0.77 / 0.8	B / C
	SB LT	23 / 264	0.5 / 1.26	C / F*	237 / **	1.34 / **	F* / **	25 / 36	0.79 / 0.8	C / D
	SB TH	15 / 35	0.09 / 0.21	B / D	26 / 503	0.31 / 1.79	D / F*	15 / 21	0.16 / 0.27	B / C
	SB RT	14 / 10	0.52 / 0.2	B / B	20 / 11	0.67 / 0.27	C / B	16 / 20	0.32 / 0.13	B / C

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.
3. " ** " indicates computation not defined in Synchro due to overcapacity conditions.

Table 4.2: Existing Conditions, Base Year 2023 and Base Year 2023 with Mitigation Level of Service Summary Continued

	Intersection	Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Existing Conditions (AM / PM)			Base Year 2023 (AM / PM)			Base Year 2023 with Mitigation (AM / PM)		
			HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
5	**Queen Kaahumanu Highway & Waikoloa Road & Waikoloa Beach Drive** *Discussion:* *This intersection is expected to experience increases in traffic due to the projected developments in the study area but will continue to operate satisfactorily.*					See Existing			See Existing		
			B - 16.1	**/ / /**	**B - 16.7**	**B - 19.3**	**/ / /**	**C - 27.4**	**B - 19.3**	**/ / /**	**C - 27.4**
		NB LT	29 / 31	0.47 / 0.5	C / C	32 / 47	0.51 / 0.76	C / D	32 / 47	0.51 / 0.76	C / D
		NB TH	17 / 17	0.69 / 0.75	B / B	20 / 28	0.72 / 0.82	B / C	20 / 28	0.72 / 0.82	B / C
		NB RT	13 / 12	0.06 / 0.23	B / B	15 / 21	0.08 / 0.33	B / C	15 / 21	0.08 / 0.33	B / C
		EB LT	18 / 19	0.15 / 0.26	B / B	19 / 28	0.38 / 0.42	B / C	19 / 28	0.38 / 0.42	B / C
		EB TH	20 / 23	0.13 / 0.38	C / C	26 / 40	0.51 / 0.72	C / D	26 / 40	0.51 / 0.72	C / D
		EB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
		WB LT	13 / 18	0.54 / 0.4	B / B	15 / 25	0.68 / 0.71	B / C	15 / 25	0.68 / 0.71	B / C
		WB TH	14 / 20	0.23 / 0.13	B / B	18 / 29	0.38 / 0.35	B / C	18 / 29	0.38 / 0.35	B / C
		WB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
		SB LT	27 / 26	0.6 / 0.76	C / C	34 / 38	0.77 / 0.85	C / D	34 / 38	0.77 / 0.85	C / D
		SB TH	16 / 11	0.74 / 0.55	B / B	19 / 18	0.77 / 0.58	B / B	19 / 18	0.77 / 0.58	B / B
		SB RT	12 / 8	0.05 / 0.05	B / A	13 / 13	0.08 / 0.09	B / B	13 / 13	0.08 / 0.09	B / B

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.
3. " ** " indicates computation not defined in Synchro due to overcapacity conditions.

4.5 Base Year 2028 Analysis

It is anticipated that by Base Year 2028 without the Project, traffic will have increased over Base Year 2023 conditions due to the continued development of Waikoloa and the greater South Kohala region. Actual growth within the study region may vary based upon the approval process of the various background projects.

4.5.1 Base Year 2028 Intersection Analysis

The following intersections are expected to experience major changes in operation during either peak hour of traffic by Base Year 2028 compared to Base Year 2023 with mitigation.

[2] Mamalahoa Highway/Waikoloa Road

As volumes along Waikoloa Road are projected to increase with the new developments in the area, turning movements onto Mamalahoa Highway are also expected to increase. The eastbound left-turn movement is anticipated to operate at LOS F during the AM peak hour of traffic by Base Year 2028. Recommended mitigative measures at this intersection are discussed in Section 4.5.2.

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

Because Paniolo Avenue provides the sole access to Waikoloa Village, the intersection is expected to continue serving large residential volumes. During the PM peak hour of traffic, all left-turn movements are expected to operate at LOS E. However, because the intersection is anticipated to operate under capacity with overall LOS D or better, no mitigation is proposed.

Figure 4.5 illustrates the Base Year 2028 forecast traffic volumes and LOS for the study intersection movements. Table 4.3 summarizes the Base Year 2028 LOS at the study intersections compared to Base Year 2023 with mitigation conditions. LOS worksheets are provided in Appendix C.

4.5.2 Base Year 2028 with Mitigation Intersection Analysis

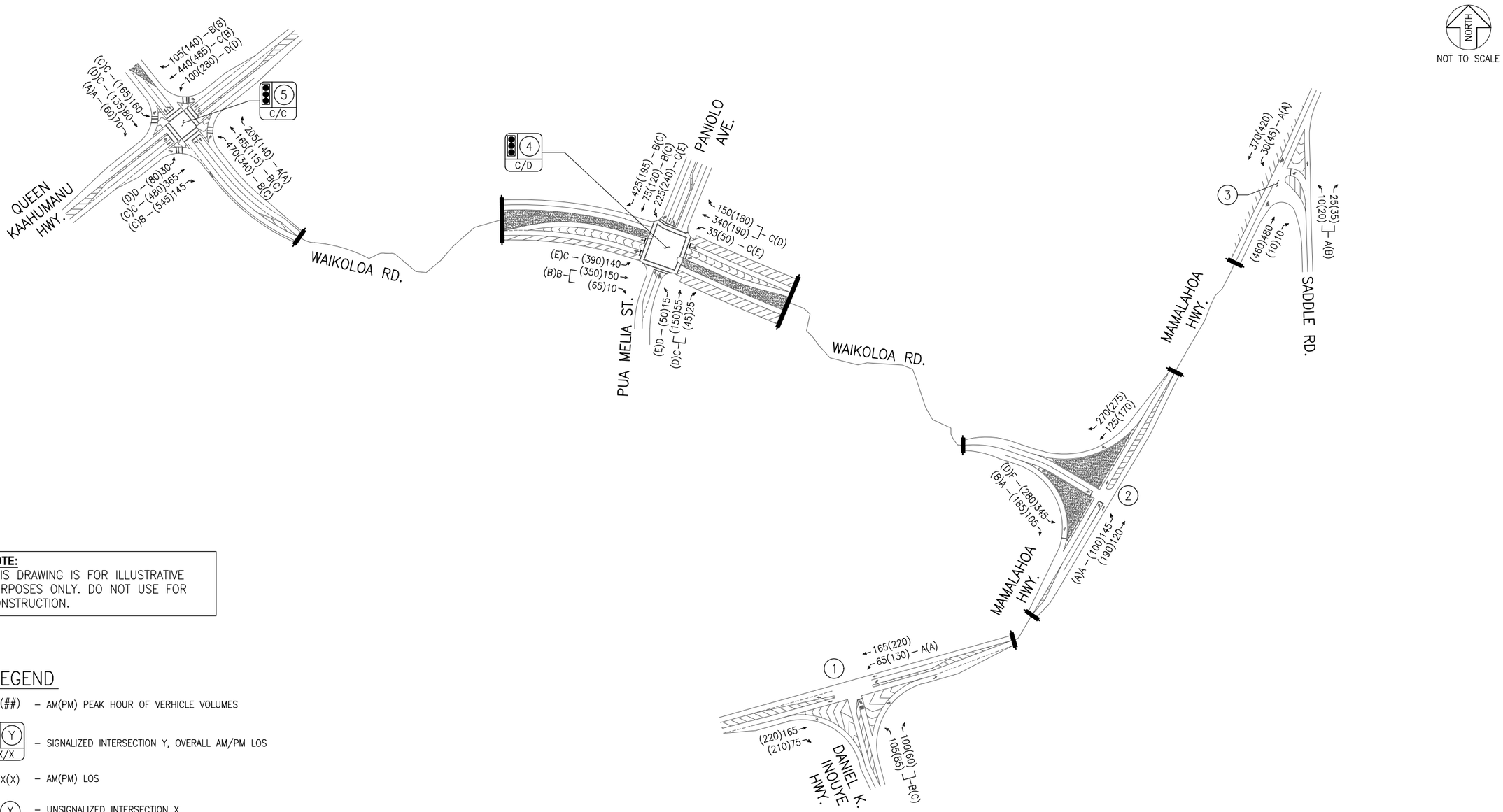
The following physical improvements are recommended by Base Year 2028:

[2] Mamalahoa Highway/Waikoloa Road

- Construct a traffic signal when warranted.

Based on the MUTCD 70% Four-Hour Vehicular Volume warrant, a traffic signal is expected to warrant at the Mamalahoa Highway/Waikoloa Road intersection as early as Base Year 2023. Traffic signal warrants are included in Appendix D. The traffic signal should be installed when warranted and necessary to mitigate long delays or overcapacity conditions. With the proposed traffic signal, the intersection is expected to operate with all movements at LOS B or better. Because this improvement is not currently funded, regional developers in the area may be required to pay pro-rata share contributions to construct the traffic signal. Pro-rata shares at this intersection are discussed further in Section 5.3.2.

Figure 4.6 illustrates the Base Year 2028 with mitigation forecast traffic volumes and LOS for the study intersection movements. Table 4.3 summarizes the Base Year 2028 with mitigation LOS at the study intersections compared to Base Year 2028 without mitigation. LOS worksheets are provided in Appendix C.



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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

Y / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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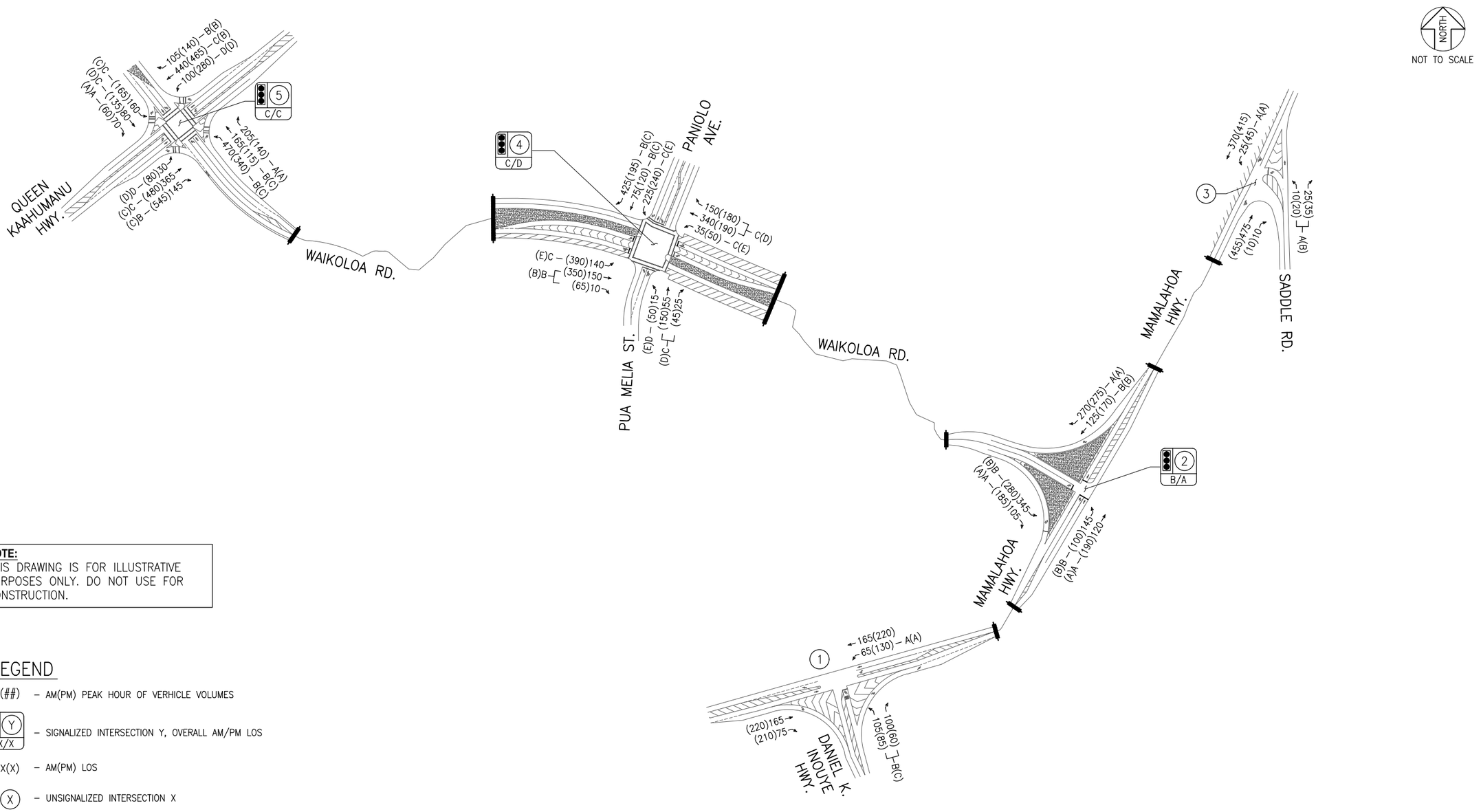
FIGURE 4.5

BASE YEAR 2028 TRAFFIC CONDITIONS LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS



NOTE:
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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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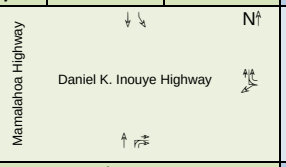
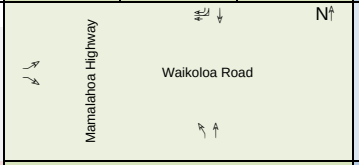
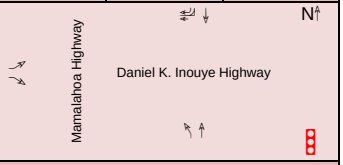
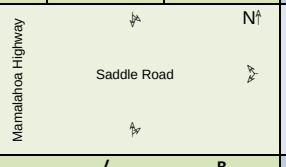
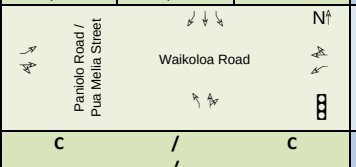
BASE YEAR 2028 (WITH MITIGATION) TRAFFIC CONDITIONS LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

FIGURE 4.6

Table 4.3: Base Year 2023 with Mitigation, Base Year 2028 and Base Year 2028 with Mitigation Level of Service Summary

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Base Year 2023 with Mitigation (AM / PM)			Base Year 2028 (AM / PM)			Base Year 2028 with Mitigation (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1	**Mamalahoa Highway & Daniel K. Inouye Highway** *Discussion: This intersection is expected to continue operating at conditions similar to Base Year 2023.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		B / C 0.17 / 0.21 11.9 / 15.1			B / C 0.19 / 0.22 12.3 / 15.8			B / C 0.19 / 0.22 12.3 / 15.8		
	WB LT/RT	12 / 15	0.17 / 0.21	B / C	12 / 16	0.19 / 0.22	B / C	12 / 16	0.19 / 0.22	B / C
	SB LT	8 / 8	0.05 / 0.1	A / A	8 / 8	0.05 / 0.11	A / A	8 / 8	0.05 / 0.11	A / A
2	**Mamalahoa Highway & Waikoloa Road** *Discussion: This intersection is expected to experience an increase in turning volumes due to the projected development in the study area. The EB LT is expected to operate at LOS F during the AM peak hour of traffic by Base Year 2028.* *Mitigative Measures: A traffic signal is expected to warrant at this intersection as early as Base Year 2023 due to the high volumes using Waikoloa Road as a major thoroughfare. A signal should be installed when warranted.*				See Base Year 2023 with Mitigation					
		D / D 0.73 / 0.62 31.6 / 25.0			F / D 0.89 / 0.72 51.6 / 32.7			B / A - / - 11.2 / 9.6		
	NB LT	8 / 8	0.1 / 0.07	A / A	8 / 8	0.11 / 0.08	A / A	16 / 14	0.71 / 0.59	B / B
	NB TH							5 / 5	0.16 / 0.25	A / A
	EB LT	32 / 25	0.73 / 0.62	D / D	52 / 33	0.89 / 0.72	F / D	12 / 11	0.74 / 0.7	B / B
	EB RT	9 / 10	0.11 / 0.21	A / B	10 / 11	0.13 / 0.24	A / B	8 / 8	0.07 / 0.13	A / A
	SB TH							11 / 11	0.42 / 0.52	B / B
	SB RT							0 / 0	0 / 0	A / A
3	**Mamalahoa Highway & Saddle Road** *Discussion: This intersection is expected to continue operating at conditions similar to Base Year 2023.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		A / B 0.05 / 0.08 9.5 / 10.5			A / B 0.05 / 0.09 9.9 / 11.2			A / B 0.05 / 0.09 9.9 / 11.2		
	WB LT/RT	10 / 11	0.05 / 0.08	A / B	10 / 11	0.05 / 0.09	A / B	10 / 11	0.05 / 0.09	A / B
	SB LT/TH	8 / 9	0.03 / 0.05	A / A	9 / 9	0.03 / 0.05	A / A	9 / 9	0.03 / 0.05	A / A
4	**Waikoloa Road & Paniolo Avenue & Pua Melia Street** *Discussion: Due to this intersection providing the sole access to Waikoloa Village, by Base Year 2028, all left-turn movements are expected to operate at LOS E during the PM peak hour of traffic. However, all movements will continue to operate at under capacity conditions.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		C / C - / - 20.2 / 31.8			C / D - / - 22.5 / 42.0			C / D - / - 22.5 / 42.0		
	NB LT	33 / 41	0.45 / 0.63	C / D	38 / 58	0.46 / 0.75	D / E	38 / 58	0.46 / 0.75	D / E
	NB TH/RT	22 / 30	0.32 / 0.64	C / C	27 / 40	0.41 / 0.7	C / D	27 / 40	0.41 / 0.7	C / D
	EB LT	28 / 50	0.76 / 0.92	C / D	31 / 59	0.77 / 0.93	C / E	31 / 59	0.77 / 0.93	C / E
	EB TH/RT	11 / 15	0.21 / 0.46	B / B	11 / 18	0.22 / 0.53	B / B	11 / 18	0.22 / 0.53	B / B
	WB LT	30 / 41	0.51 / 0.63	C / D	34 / 58	0.54 / 0.75	C / E	34 / 58	0.54 / 0.75	C / E
	WB TH/RT	19 / 30	0.77 / 0.8	B / C	21 / 44	0.83 / 0.87	C / D	21 / 44	0.83 / 0.87	C / D
	SB LT	25 / 36	0.79 / 0.8	C / D	29 / 57	0.81 / 0.88	C / E	29 / 57	0.81 / 0.88	C / E
	SB TH	15 / 21	0.16 / 0.27	B / C	18 / 26	0.18 / 0.24	B / C	18 / 26	0.18 / 0.24	B / C
	SB RT	16 / 20	0.32 / 0.13	B / C	19 / 24	0.29 / 0.1	B / C	19 / 24	0.31 / 0.1	B / C

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

Table 4.3: Base Year 2023 with Mitigation, Base Year 2028 and Base Year 2028 with Mitigation Level of Service Summary Continued

	Intersection / Signalized: Overall LOS / Unsignalized TWSC: Critical Movement LOS / LOS [X / X] / DELAY [X / X]	Base Year 2023 with Mitigation (AM / PM)			Base Year 2028 (AM / PM)			Base Year 2028 with Mitigation (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
5	**Queen Kaahumanu Highway & Waikoloa Road & Waikoloa Beach Drive** *Discussion:* *As in Base Year 2023, traffic is anticipated to continue to increase at this intersection due to development in the region. However, the intersection will continue to operate satisfactorily by Base Year 2028.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		B - 19.3	/ /	C - 27.4	C - 21.3	/ /	C - 32.8	C - 21.3	/ /	C - 32.4
	NB LT	32 / 47	0.51 / 0.76	C / D	35 / 54	0.53 / 0.76	D / D	35 / 54	0.53 / 0.77	D / D
	NB TH	20 / 28	0.72 / 0.82	B / C	22 / 33	0.76 / 0.85	C / C	22 / 33	0.76 / 0.85	C / C
	NB RT	15 / 21	0.08 / 0.33	B / C	16 / 26	0.12 / 0.44	B / C	16 / 26	0.09 / 0.45	B / C
	EB LT	19 / 28	0.38 / 0.42	B / C	22 / 34	0.4 / 0.44	C / C	22 / 34	0.4 / 0.44	C / C
	EB TH	26 / 40	0.51 / 0.72	C / D	29 / 48	0.55 / 0.76	C / D	29 / 48	0.55 / 0.76	C / D
	EB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	WB LT	15 / 25	0.68 / 0.71	B / C	17 / 31	0.74 / 0.78	B / C	17 / 31	0.74 / 0.78	B / C
	WB TH	18 / 29	0.38 / 0.35	B / C	19 / 34	0.37 / 0.34	B / C	19 / 34	0.37 / 0.34	B / C
	WB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	SB LT	34 / 38	0.77 / 0.85	C / D	36 / 51	0.77 / 0.88	D / D	36 / 47	0.77 / 0.88	D / D
	SB TH	19 / 18	0.77 / 0.58	B / B	21 / 20	0.79 / 0.59	C / B	21 / 20	0.79 / 0.59	C / B
	SB RT	13 / 13	0.08 / 0.09	B / B	14 / 15	0.07 / 0.09	B / B	14 / 15	0.07 / 0.09	B / B

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

4.6 Base Year 2038 Analysis

It is anticipated that by Base Year 2038 without the Project, traffic will have increased over Base Year 2028 conditions due to the continued development of Waikoloa and the greater South Kohala region. Actual growth within the study region may vary based upon the approval process of the various background projects.

4.6.1 Base Year 2038 Intersection Analysis

The following intersections are expected to experience major changes in operation during either peak hour of traffic by Base Year 2038 compared to Base Year 2028 with mitigation conditions.

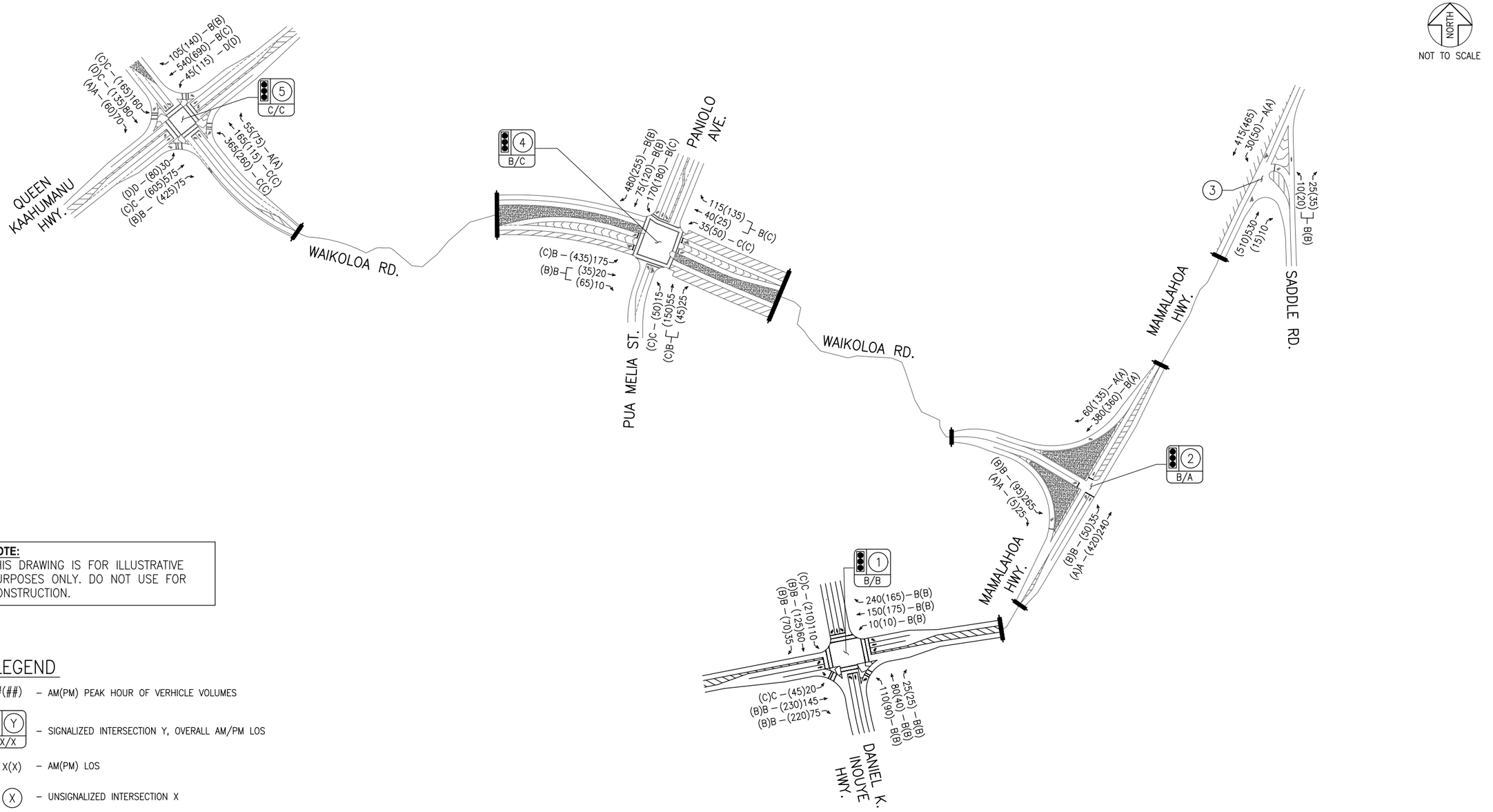
[1] Mamalahoa Highway/Daniel K. Inouye Highway

With the proposed extension of Daniel K. Inouye Highway to Queen Kaahumanu Highway, several intersection improvements including the construction of a traffic signal and exclusive turning lanes on all approaches were assumed. Regional traffic currently using Waikoloa Road is expected to shift to Daniel K. Inouye Highway with the extension. Although volumes at the intersection are anticipated to increase, the traffic signal is expected to provide adequate capacity along all approaches, and all movements are expected to operate at LOS C or better.

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

As stated above, with the extension of Daniel K. Inouye Highway, regional traffic is expected to shift from Waikoloa Road to the extension. With the reduced traffic along Waikoloa Road, operations at this intersection are expected to improve. All approaches are anticipated to operate at LOS B or better during both peak hours of traffic by Base Year 2038.

Figure 4.7 illustrates the Base Year 2038 forecast traffic volumes and LOS for the study intersection movements. Table 4.4 summarizes the Base Year 2038 LOS at the study intersections compared to Base Year 2028 with mitigation. LOS worksheets are provided in Appendix C.



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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

Y / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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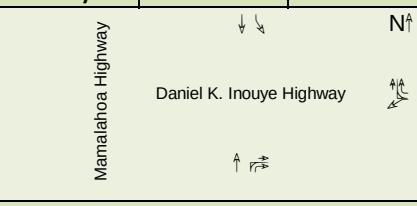
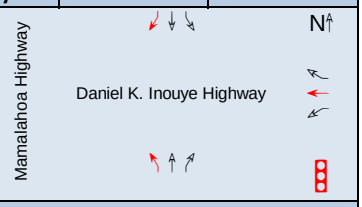
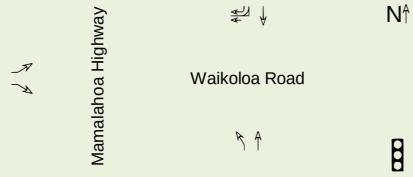
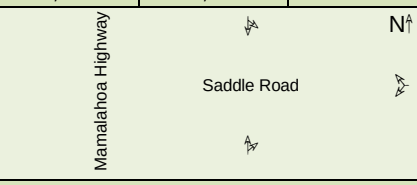
BASE YEAR 2038 TRAFFIC CONDITIONS LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

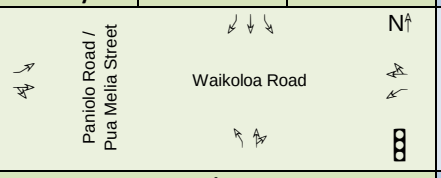
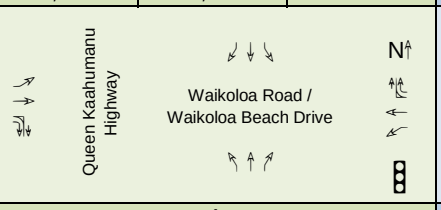
FIGURE 4.7

Table 4.4: Base Year 2028 with Mitigation and Base Year 2038 Level of Service Summary

	Intersection 🚦 Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Base Year 2028 with Mitigation (AM / PM) HCM Delay	v/c Ratio	LOS	Base Year 2038 (AM / PM) HCM Delay	v/c Ratio	LOS
1	**Mamalahoa Highway & Daniel K. Inouye Highway** *Discussion: With the extension of Dainel K. Inouye Highway to Queen Kaahumanu Highway, intersection improvements including a traffic signal were assumed at this interection. With the assumed improvements, the intersection is expected to operate satisfactorily.*						
	Mitigative Measures: Installation of a traffic signal at this interection was assumed along with exclusive turning lanes on all approaches as part of the Daniel K. Inouye Highway extension.	**B** **0.19** **12.3**	**/** **/** **/**	**C** **0.22** **15.8**	**B** **-** **15.3**	**/** **/** **/**	**B** **-** **17.6**
	NB LT				21 / 26	0.51 / 0.46	C / C
	NB TH				15 / 17	0.54 / 0.65	B / B
	NB RT				13 / 13	0.07 / 0.15	B / B
	EB LT				21 / 26	0.69 / 0.79	C / C
	EB TH				15 / 17	0.27 / 0.46	B / B
	EB RT				14 / 15	0 / 0.05	B / B
	WB LT				16 / 18	0.5 / 0.45	B / B
	WB TH				13 / 16	0.28 / 0.19	B / B
	WB LT/RT	12 / 16	0.19 / 0.22	B / C			
	WB RT				12 / 16	0 / 0.01	B / B
	SB LT	8 / 8	0.05 / 0.11	A / A	14 / 16	0.05 / 0.05	B / B
	SB TH				12 / 12	0.37 / 0.34	B / B
	SB RT				11 / 10	0.12 / 0.07	B / B
2	**Mamalahoa Highway & Waikoloa Road** *Discussion: This intersection is expected to continue operating satisfactorily as in Base Year 2028 with Mitigation conditions. Volumes to and from Waikoloa Road are anticipated to decrease with the alternate route provided by the Daniel K. Inouye Highway extension.*				See Base Year 2028 with Mitigation		
		B **-** **11.2**	**/** **/** **/**	**A** **-** **9.6**	**B** **-** **10**	**/** **/** **/**	**A** **-** **6.6**
	NB LT	16 / 14	0.71 / 0.59	B / B	18 / 14	0.47 / 0.48	B / B
	NB TH	5 / 5	0.16 / 0.25	A / A	4 / 3	0.27 / 0.44	A / A
	EB LT	12 / 11	0.74 / 0.7	B / B	14 / 13	0.74 / 0.55	B / B
	EB RT	8 / 8	0.07 / 0.13	A / A	9 / 10	0.01 / 0.01	A / A
	SB TH	11 / 11	0.42 / 0.52	B / B	11 / 8	0.7 / 0.63	B / A
	SB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
3	**Mamalahoa Highway & Saddle Road** *Discussion: This intersection is expected to continue operating satisfactorily.*				See Base Year 2028 with Mitigation		
		A **0.05** **9.9**	**/** **/** **/**	**B** **0.09** **11.2**	**B** **0.05** **10.3**	**/** **/** **/**	**B** **0.11** **12.5**
	WB LT/RT	10 / 11	0.05 / 0.09	A / B	10 / 13	0.05 / 0.11	B / B
	SB LT/TH	9 / 9	0.03 / 0.05	A / A	9 / 9	0.03 / 0.05	A / A

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.

Table 4.4: Base Year 2028 with Mitigation and Base Year 2038 Level of Service Summary Continued

	Intersection 🚦 Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Base Year 2028 with Mitigation (AM / PM) HCM Delay	 v/c Ratio	 LOS	Base Year 2038 (AM / PM) HCM Delay	 v/c Ratio	 LOS
4	**Waikoloa Road & Paniolo Avenue & Pua Melia Street** *Discussion: This intersection is expected to improve with the Daniel K. Inouye Highway extension providing an alternate route for through traffic between Queen Kaahumanu Highway and Mamalahoa Highway.*				See Base Year 2028 with Mitigation		
		C - 22.5	**/ / /**	**D - 42.0**	**B - 16.2**	**/ / /**	**C - 24.5**
	NB LT	38 / 58	0.46 / 0.75	D / E	26 / 33	0.44 / 0.6	C / C
	NB TH/RT	27 / 40	0.41 / 0.7	C / D	15 / 23	0.27 / 0.61	B / C
	EB LT	31 / 59	0.77 / 0.93	C / E	19 / 27	0.74 / 0.87	B / C
	EB TH/RT	11 / 18	0.22 / 0.53	B / B	11 / 13	0.06 / 0.1	B / B
	WB LT	34 / 58	0.54 / 0.75	C / E	22 / 33	0.49 / 0.6	C / C
	WB TH/RT	21 / 44	0.83 / 0.87	C / D	15 / 25	0.25 / 0.21	B / C
	SB LT	29 / 57	0.81 / 0.88	C / E	20 / 29	0.75 / 0.78	B / C
	SB TH	18 / 26	0.18 / 0.24	B / C	11 / 16	0.17 / 0.25	B / B
	SB RT	19 / 24	0.31 / 0.1	B / C	12 / 16	0.39 / 0.16	B / B
5	**Queen Kaahumanu Highway & Waikoloa Road & Waikoloa Beach Drive** *Discussion: This intersection is anticipated to continue operating satisfactorily with some improvements to intersection delay as the Daniel K. Inouye Highway extension is expected to lower turning volumes to and from Waikoloa Road.*				See Base Year 2028 with Mitigation		
		C - 21.3	**/ / /**	**C - 32.4**	**C - 21.4**	**/ / /**	**C - 25.4**
	NB LT	35 / 54	0.53 / 0.77	D / D	39 / 47	0.54 / 0.76	D / D
	NB TH	22 / 33	0.76 / 0.85	C / C	21 / 22	0.83 / 0.8	C / C
	NB RT	16 / 26	0.09 / 0.45	B / C	12 / 15	0.05 / 0.27	B / B
	EB LT	22 / 34	0.4 / 0.44	C / C	24 / 28	0.42 / 0.43	C / C
	EB TH	29 / 48	0.55 / 0.76	C / D	33 / 40	0.57 / 0.73	C / D
	EB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	WB LT	17 / 31	0.74 / 0.78	B / C	20 / 26	0.7 / 0.67	C / C
	WB TH	19 / 34	0.37 / 0.34	B / C	25 / 32	0.49 / 0.42	C / C
	WB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	SB LT	36 / 47	0.77 / 0.88	D / D	39 / 44	0.61 / 0.77	D / D
	SB TH	21 / 20	0.79 / 0.59	C / B	18 / 22	0.76 / 0.86	B / C
	SB RT	14 / 15	0.07 / 0.09	B / B	12 / 12	0.07 / 0.09	B / B

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.

5. FUTURE YEAR SCENARIOS

5.1 Background

The Project proposes to develop Neighborhood Commercial and Family Agricultural land uses on currently agricultural zoned land located on the northwest corner of the Mamalahoa Highway/Waikoloa Road intersection. The proposed Project components and their build-out years are described further below.

Build-out by 2023

- 449 agricultural lots with single-family (SF) farm dwellings located on the north parcels (TMKs (3) 6-8-002: 005, 028, 029, 030) of the Project site
- 300 multi-family (MF) dwelling units with retail component in the Neighborhood Commercial area
- Approximately three (3) acres light industrial in the Neighborhood Commercial area
- An approximately six-acre “community green” neighborhood park
- Access will be provided by:
    - An access point along Mamalahoa Highway (“North Project Access”)

Build-out by 2028

- 409 agricultural lots with SF farm dwellings located on the south parcel (TMK (3) 6-8-002: 006) of the Project site
- An approximately 29-acre regional park
- Access will be provided by:
    - Previously constructed North Project Access
    - An access point along Mamalahoa Highway (“South Project Access”)
    - New Project Connector Road (improvement of an existing dirt road through the neighboring parcel to the southwest) providing access to the Project from Waikoloa Road

Build-out by 2038

- 108 accessory dwelling units (ADUs)
    - Although ADUs will not be part of the initial Project development, future agricultural lot owners, at their own discretion and expense, may elect to build an ADU on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), HCC. While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, for the purpose of this report 108 ADUs are assumed to be built out in 2038. For additional ADU construction beyond the anticipated 108 units an updated traffic study is recommended.
- Access will be provided by all three (3) previously constructed accesses.

5.2 Travel Demand Estimations

5.2.1 Trip Generation

The Institute of Transportation Engineers (ITE) publishes a book based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms, and associations. This publication, titled Trip Generation Manual, 10th Edition, provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables. The independent variables can range from Dwelling Units (DU) for single-family detached homes to Square Feet Gross Floor Area (SF GFA) for commercial or office development. These trip rates/formulae and their associated directional distributions were used to estimate the increase in the number of vehicular trips generated by the proposed Project. The rates selected were based on the land use description. ADUs were assumed to generate trips similar to Low-Rise Multifamily Housing for the purposes of this report.

See Tables 5.1 and 5.2 for Trip Generation formulae and projections for the Project.

5.2.2 Trip Distribution and Assignment

Trips generated by the Project were assigned throughout the study area generally based upon existing travel patterns and the Hawaii Department of Transportation (HDOT) Travel Demand Forecasting Model (TDFM). The following approximate trip distributions were assumed:

- 4 percent to/from North Kohala
- 68 percent to/from South Kohala
- 6 percent to/from Hamakua
- 1 percent to/from North Hilo
- 6 percent to/from South Hilo
- 2 percent to/from Puna
- 1 percent to/from Kau
- 12 percent to/from North Kona
- 1 percent to/from South Kona

The traffic generated by the Project was added to the forecast Base Year traffic volumes to constitute the traffic volumes for Future Year with the Project traffic conditions.

Table 5.1: Trip Generation Rates

Land Use	Independent Variable	AM Peak Hour		PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Single-Family Detached Housing (210)	DU	[a]	25%	[b]	63%
Low-Rise Multifamily Housing (220)	DU	[c]	23%	[d]	63%
Mid-Rise Residential w/ 1st Floor Commercial (231)	DU	0.30	28%	0.36	70%
Public Park (411)	Acres	0.02	59%	[g]	55%
General Light Industrial (110)	SF GFA	[j]	88%	[k]	13%

[a] T=0.71(X)+4.80
[b] Ln(T)=0.96Ln(X)+0.20
[c] Ln(T)=0.95Ln(X)-0.51
[d] Ln(T)=0.89Ln(X)-0.02
[g] T=0.06(X)+22.60
[j] Ln(T)=0.74Ln(X)+0.39
[k] Ln(T)=0.69Ln(X)+0.43

Table 5.2: Project-Generated Trips

	Land Use	Independent Variable	AM Peak Hour			PM Peak Hour		
			Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
Future Year 2023	Single-Family Farm Dwelling Agricultural Lot (210)	449 DU	81	241	321	264	155	419
	Multi-Family Residential with Retail (231)	300 DU	25	65	90	76	32	108
	Future Year 2023 Subtotal		156	313	468	346	226	572
Future Year 2028	Single-Family Farm Dwelling Agricultural Lot (210)	409 DU	73	219	293	240	141	381
	Regional Park (411)	29.8 Acres	1	0	1	14	11	25
	Future Year 2028 Subtotal		74	219	294	254	152	406
Future Year 2038	Accessory Dwelling Unit (220)	108 DU	12	40	52	40	24	64
	Future Year 2038 Subtotal		12	40	52	40	24	64
Total Net External Project Trips			242	572	814	640	402	1042

5.3 Future Year 2023 with Project Analysis

By Future Year 2023, the Project is projected to generate a total of 468 (572) net external trips during the AM (PM) peak hour of traffic. The projected growth in traffic is expected along major roadways in the study area. Figure 5.1 illustrates the Future Year 2023 Project-generated trip distribution.

5.3.1 Future Year 2023 with Project Intersection Analysis

It is anticipated that by Future Year 2023 with the Project, traffic will increase compared to Base Year 2023 conditions without the Project due to the projected growth, most notably along Waikoloa Road and Mamalahoa Highway. The following intersections are expected to experience major changes in operation during either peak hour of traffic by Future Year 2023 with the Project compared to Base Year 2023 without the Project conditions.

[2] Mamalahoa Highway/Waikoloa Road

By Future Year 2023 with the Project, the eastbound left-turn movement is expected to operate at LOS F during both peak hours of traffic and at overcapacity conditions during the PM peak hour of traffic. Recommended mitigative measures at this intersection are discussed in Section 5.3.2.

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

By Future Year 2023 with the Project, the intersection is expected to operate adequately, assuming that a traffic signal is constructed at the intersection by Base Year 2023. Improvements at this intersection are dependent upon the Waikoloa Highlands Subdivision project. As noted in Section 4.4.2, if the project does not move forward, a traffic signal is still recommended based on operations at the intersection. Construction of the traffic signal as part of Future Year 2023 mitigation is discussed further in Section 5.3.2.

[7] Mamalahoa Highway/North Project Access

The North Project Access along Mamalahoa Highway is proposed to provide sole access to the Project for Future Year 2023. Exclusive turning/deceleration lanes are proposed along Mamalahoa Highway as well as exclusive turning lanes along the Project access. Based on projected Project volumes and the MUTCD 70% Four-Hour Vehicular Volume Warrant, a traffic signal is expected to warrant by Future Year 2023. Traffic signal warrants are included in Appendix D. With a traffic signal, the intersection is expected to operate with all movements at LOS B or better.

Figure 5.2 illustrates the Future Year 2023 with Project forecast traffic volumes and LOS for the study intersection movements. Table 5.3 summarizes the Future Year 2023 with Project LOS at the study intersections compared to Base Year 2023 without Project. LOS worksheets are provided in Appendix C.

5.3.2 Future Year 2023 with Mitigation Intersection Analysis

The following physical improvements are recommended by Future Year 2023:

[2] Mamalahoa Highway/Waikoloa Road

- Construct a traffic signal when warranted.

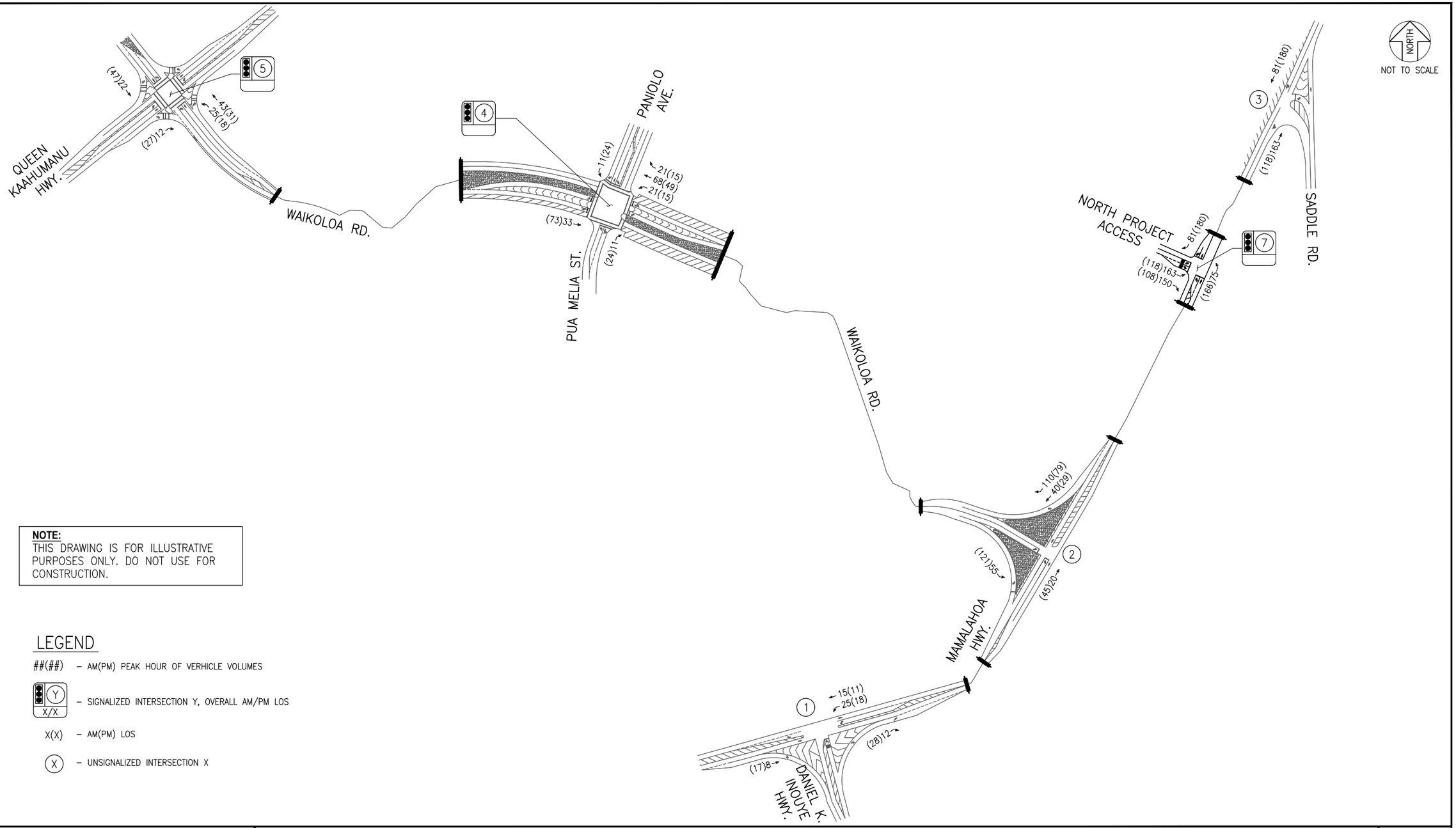
Based on the MUTCD 70% Four-Hour Vehicular Volume warrant, a traffic signal is expected to warrant at the Mamalahoa Highway/Waikoloa Road intersection as early as Base Year 2023. Traffic signal warrants are included in Appendix D. The traffic signal should be installed when warranted and necessary to mitigate long delays or overcapacity conditions. With the proposed traffic signal, the intersection is expected to operate with all movements at LOS B or better. Because this improvement is not currently funded, regional developers in the area may be required to pay pro-rata share contributions to construct the traffic signal. At full build-out, the Project's pro-rata share of peak hour traffic is expected to be approximately 29% at the Mamalahoa Highway/Waikoloa Road intersection.

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

- Construct a traffic signal when warranted if not constructed by Base Year 2023 without the Project.

Construction of the traffic signal was assumed to occur in Base Year 2023 without the Project. However, in the event that the Waikoloa Highlands Subdivision project does not move forward and is not required to construct improvements at the intersection, the signal is still recommended for Future Year 2023 with the Project. If improvements are not constructed with the Waikoloa Highlands Subdivision, regional developers in the area may be required to pay pro-rata share contributions to construct improvements. As noted in Section 4.4.2, although a roundabout was previously identified as the preferred mitigation, a traffic signal was assumed to be more feasible based on capacity and space requirements. At full build-out, the Project's pro-rata share of peak hour traffic is expected to be approximately 18% at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection.

Figure 5.3 illustrates the Future Year 2023 with Project with mitigation forecast traffic volumes and LOS for the study intersection movements. Table 5.3 summarizes the Future Year 2023 with Project with mitigation LOS at the study intersections compared to Future Year 2023 with Project without mitigation. LOS worksheets are provided in Appendix C.



NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

NAKAHILI – TIAR

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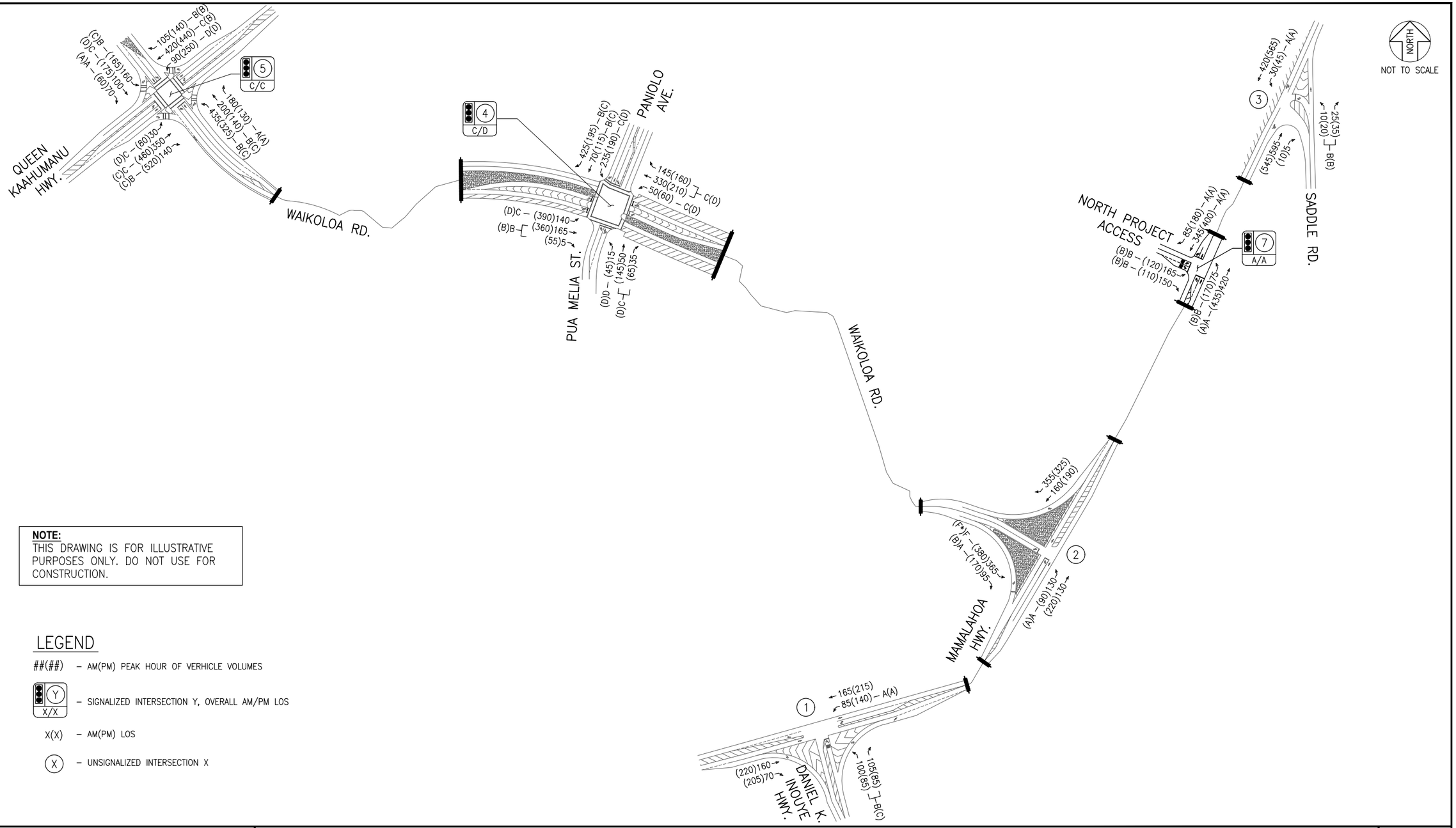
FUTURE YEAR 2023 PROJECT ONLY TRAFFIC

FIGURE 5.1



NOTE:
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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

NAKAHILI – TIAR

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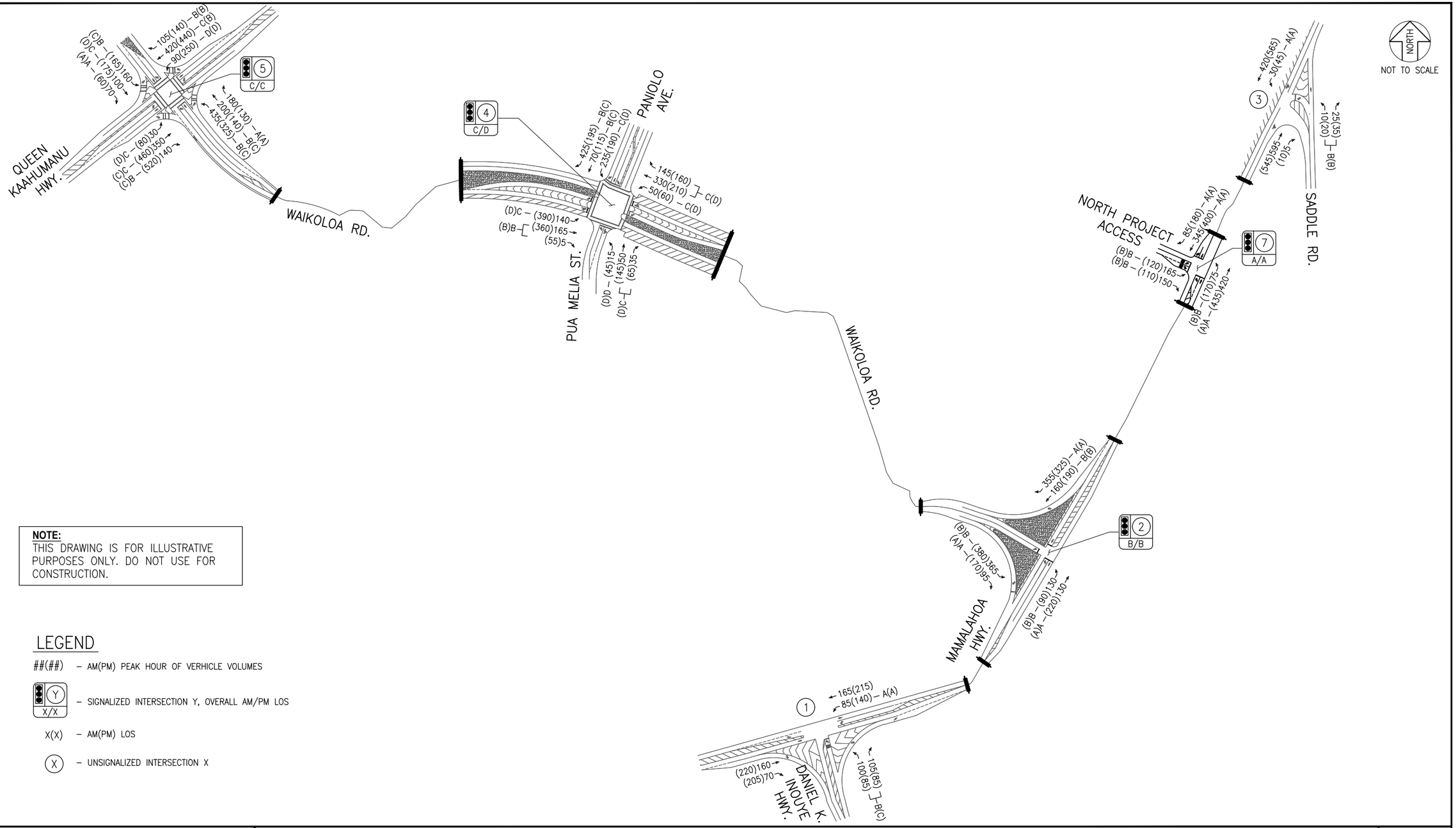
FUTURE YEAR 2023 LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

FIGURE 5.2



NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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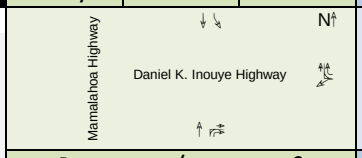
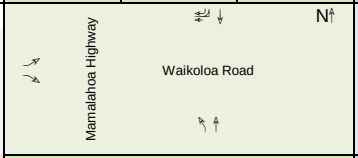
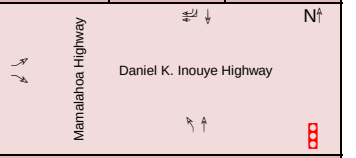
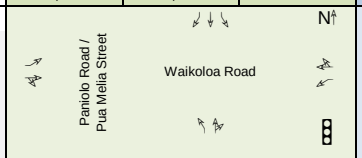
FUTURE YEAR 2023 (WITH MITIGATION) LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

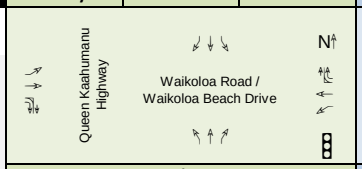
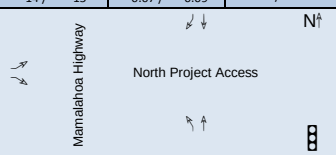
FIGURE 5.3

Table 5.3: Base Year 2023 with Mitigation, Future Year 2023 and Future Year 2023 with Mitigation Level of Service Summary

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Base Year 2023 with Mitigation (AM / PM)			Future Year 2023 with Project (AM / PM)			Future Year 2023 with Project with Mitigation (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1	**Mamalahoa Highway & Daniel K. Inouye Highway** *Discussion: This intersection is expected to continue operating at conditions similar to Base Year 2023.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		B / C	**/**	**B / C**	**B / C**	**/**	**B / C**	**B / C**	**/**	**B / C**
		0.17 / 0.21	**/**		**0.19 / 0.23**	**/**		**0.19 / 0.23**	**/**	
		11.9 / 15.1	**/**		**12.9 / 16.5**	**/**		**12.9 / 16.5**	**/**	
	WB LT/RT	12 / 15	0.17 / 0.21	B / C	13 / 17	0.19 / 0.23	B / C	13 / 17	0.19 / 0.23	B / C
	SB LT	8 / 8	0.05 / 0.1	A / A	8 / 8	0.07 / 0.12	A / A	8 / 8	0.07 / 0.12	A / A
2	**Mamalahoa Highway & Waikoloa Road** *Discussion: This intersection is expected to experience an increase in turning volumes due to the Project. The EB LT is expected to operate at LOS F and overcapacity during the PM peak hour by Future Year 2023 with the Project.* *Mitigative Measures: A traffic signal is expected to warrant at this intersection as early as Base Year 2023 due to the high volumes using Waikoloa Road as a major thoroughfare. A signal should be installed when warranted.*				See Base Year 2023 with Mitigation					
		D / D	**/**	**D / D**	**F / F***	**/**	**F / F***	**B / B**	**/**	**B / B**
		0.73 / 0.62	**/**		**0.95 / 1.02**	**/**		**- / -**	**/**	
		31.6 / 25.0	**/**		**63.3 / 81.6**	**/**		**11.3 / 10.5**	**/**	
	NB LT	8 / 8	0.1 / 0.07	A / A	8 / 8	0.1 / 0.07	A / A	16 / 16	0.68 / 0.59	B / B
	NB TH							5 / 6	0.18 / 0.3	A / A
	EB LT	32 / 25	0.73 / 0.62	D / D	63 / 82	0.95 / 1.02	F / F*	12 / 11	0.75 / 0.75	B / B
	EB RT	9 / 10	0.11 / 0.21	A / B	10 / 11	0.12 / 0.22	A / B	7 / 8	0.06 / 0.11	A / A
	SB TH							12 / 12	0.53 / 0.57	B / B
	SB RT							0 / 0	0 / 0	A / A
3	**Mamalahoa Highway & Saddle Road** *Discussion: This intersection is expected to continue operating at conditions similar to Base Year 2023.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		A / B	**/**	**B / B**	**B / B**	**/**	**B / B**	**B / B**	**/**	**B / B**
		0.05 / 0.08	**/**		**0.06 / 0.13**	**/**		**0.06 / 0.13**	**/**	
		9.5 / 10.5	**/**		**10.8 / 14.3**	**/**		**10.8 / 14.3**	**/**	
	WB LT/RT	10 / 11	0.05 / 0.08	A / B	11 / 14	0.06 / 0.13	B / B	11 / 14	0.06 / 0.13	B / B
	SB LT/TH	8 / 9	0.03 / 0.05	A / A	9 / 9	0.04 / 0.05	A / A	9 / 9	0.04 / 0.05	A / A
4	**Waikoloa Road & Paniolo Avenue & Pua Melia Street** *Discussion: Due to this intersection providing the sole access to Waikoloa Village, by Future Year 2023 with the Project, the southbound approach is anticipated to operate at LOS E during the AM peak hour of traffic and the eastbound approach is anticipated to operate at LOS E during the PM peak hour. No mitigation is proposed as all approaches are expected to operate under capacity.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		C / C	**/**	**C / D**	**C / D**	**/**	**D / D**	**C / D**	**/**	**D / D**
		20.2 / 31.8	**/**		**22.5 / 37.5**	**/**		**22.5 / 37.5**	**/**	
	NB LT	33 / 41	0.45 / 0.63	C / D	37 / 52	0.46 / 0.69	D / D	37 / 52	0.46 / 0.69	D / D
	NB TH/RT	22 / 30	0.32 / 0.64	C / C	26 / 37	0.38 / 0.71	C / D	26 / 37	0.38 / 0.71	C / D
	EB LT	28 / 50	0.76 / 0.92	C / D	31 / 53	0.76 / 0.92	C / D	31 / 53	0.76 / 0.92	C / D
	EB TH/RT	11 / 15	0.21 / 0.46	B / B	12 / 17	0.24 / 0.53	B / B	12 / 17	0.24 / 0.53	B / B
	WB LT	30 / 41	0.51 / 0.63	C / D	34 / 55	0.61 / 0.77	C / D	34 / 55	0.61 / 0.77	C / D
	WB TH/RT	19 / 30	0.77 / 0.8	B / C	20 / 40	0.82 / 0.86	C / D	20 / 40	0.82 / 0.86	C / D
	SB LT	25 / 36	0.79 / 0.8	C / D	29 / 47	0.81 / 0.84	C / D	29 / 47	0.81 / 0.84	C / D
	SB TH	15 / 21	0.16 / 0.27	B / C	17 / 25	0.16 / 0.25	B / C	17 / 25	0.16 / 0.25	B / C
	SB RT	16 / 20	0.32 / 0.13	B / C	18 / 24	0.28 / 0.11	B / C	18 / 24	0.28 / 0.11	B / C

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

Table 5.3: Base Year 2023 with Mitigation, Future Year 2023 and Future Year 2023 with Mitigation Level of Service Summary Continued

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Base Year 2023 with Mitigation (AM / PM)			Future Year 2023 with Project (AM / PM)			Future Year 2023 with Project with Mitigation (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
5	**Queen Kaahumanu Highway & Waikoloa Road & Waikoloa Beach Drive** *Discussion: Traffic is anticipated to continue to operate satisfactorily by Future Year 2023 with the Project.*				See Base Year 2023 with Mitigation			See Base Year 2023 with Mitigation		
		B - 19.3	/ /	C - 27.4	C - 20.2	/ /	C - 30.3	C - 20.2	/ /	C - 30.3
	NB LT	32 / 47	0.51 / 0.76	C / D	34 / 51	0.52 / 0.76	C / D	34 / 51	0.52 / 0.76	C / D
	NB TH	20 / 28	0.72 / 0.82	B / C	21 / 31	0.73 / 0.83	C / C	21 / 31	0.73 / 0.83	C / C
	NB RT	15 / 21	0.08 / 0.33	B / C	15 / 25	0.09 / 0.42	B / C	15 / 25	0.09 / 0.42	B / C
	EB LT	19 / 28	0.38 / 0.42	B / C	20 / 30	0.38 / 0.41	B / C	20 / 30	0.38 / 0.41	B / C
	EB TH	26 / 40	0.51 / 0.72	C / D	28 / 44	0.58 / 0.79	C / D	28 / 44	0.58 / 0.79	C / D
	EB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	WB LT	15 / 25	0.68 / 0.71	B / C	16 / 28	0.71 / 0.76	B / C	16 / 28	0.71 / 0.76	B / C
	WB TH	18 / 29	0.38 / 0.35	B / C	19 / 31	0.46 / 0.38	B / C	19 / 31	0.46 / 0.38	B / C
	WB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	SB LT	34 / 38	0.77 / 0.85	C / D	36 / 42	0.77 / 0.86	D / D	36 / 42	0.77 / 0.86	D / D
	SB TH	19 / 18	0.77 / 0.58	B / B	20 / 20	0.78 / 0.59	C / B	20 / 20	0.78 / 0.59	C / B
	SB RT	13 / 13	0.08 / 0.09	B / B	14 / 15	0.07 / 0.09	B / B	14 / 15	0.07 / 0.09	B / B
7	**Mamalahoa Highway & North Project Access** *Discussion: The North Project Access is expected to be the sole Project access for the first phase of the Project. With a traffic signal, the intersection is expected to operate satisfactorily.* *Mitigative Measures: A traffic signal is expected to warrant at this intersection by Future Year 2023 with the Project.*							See Future Year 2023 with Project		
					A - 8	/ /	A - 8.8	A - 8	/ /	A - 8.8
	NB LT				15 / 17	0.54 / 0.74	B / B	15 / 17	0.54 / 0.74	B / B
	NB TH				4 / 3	0.44 / 0.4	A / A	4 / 3	0.44 / 0.4	A / A
	EB LT				14 / 17	0.67 / 0.64	B / B	14 / 17	0.67 / 0.64	B / B
	EB RT				10 / 12	0.12 / 0.07	B / B	10 / 12	0.12 / 0.07	B / B
	SB TH				9 / 9	0.6 / 0.65	A / A	9 / 9	0.6 / 0.65	A / A
	SB RT				6 / 7	0.06 / 0.11	A / A	6 / 7	0.06 / 0.11	A / A

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

5.4 Future Year 2028 with Project Analysis

By Future Year 2028, the Project is projected to generate a cumulative total of 762 (978) net external trips during the AM (PM) peak hour of traffic. The projected growth in traffic is expected along major roadways in the study area. Figure 5.4 illustrates the Future Year 2028 cumulative Project-generated trip distribution.

5.4.1 Future Year 2028 with Project Intersection Analysis

It is anticipated that by Future Year 2028 with the Project, traffic will increase compared to Future Year 2023 with the Project with mitigation due to the continued growth in the area from the Project and other background developments. The following intersections are expected to experience major changes in operation during either peak hour of traffic by Future Year 2028 with the Project compared to Future Year 2023 with the Project with mitigation conditions.

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

During the PM peak hour of traffic, the eastbound left-turn and shared westbound through/right-turn movements are expected to operate at overcapacity conditions. The remaining left-turn movements are expected to operate at LOS E. Recommended mitigative measures at this intersection are discussed in Section 5.4.2.

[6] Mamalahoa Highway/South Project Access

Construction of the South Project Access along Mamalahoa Highway is proposed with build-out of the Project by 2028. Exclusive turning/deceleration lanes are proposed along Mamalahoa Highway as well as exclusive turning lanes along the Project access. In addition, acceleration lanes for both the left and right-turn movements from the access onto the highway are proposed to alleviate delay for the minor movements. With the proposed lane configuration, the intersection is expected to operate with all movements at LOS C or better.

[8] Waikoloa Road/Project Connector Road

Construction of the Project Connector Road off of Waikoloa Road is proposed with build-out of the Project by 2028. The Project Connector Road will utilize the existing dirt road through the parcel to the southwest of the Project with improvements. A portion of Future Year 2023 trips using the North Project Access are expected to reroute to the connector road once it is improved. Exclusive turning/deceleration lanes are proposed along Waikoloa Road as well as exclusive turning lanes along the Project Connector Road. In addition, acceleration lanes for both the left and right-turn movements from the connector road onto Waikoloa Road are proposed to alleviate delay for the minor movements. With the proposed lane configuration, the southbound left-turn is expected to operate at LOS E during the PM peak hour. Although the vehicles are anticipated to experience some delays exiting the Project, based on the MUTCD 70% Four-Hour Vehicular Volume Warrant, a traffic signal is not expected to warrant at the intersection with the proposed lane configuration. Traffic signal warrants are included in Appendix D.

Figure 5.5 illustrates the Future Year 2028 with Project forecast traffic volumes and LOS for the study intersection movements. Table 5.4 summarizes the Future Year 2028 with Project LOS at the study intersections compared to Future Year 2023 with Project with mitigation. LOS worksheets are provided in Appendix C.

5.4.2 Future Year 2028 with Mitigation Intersection Analysis

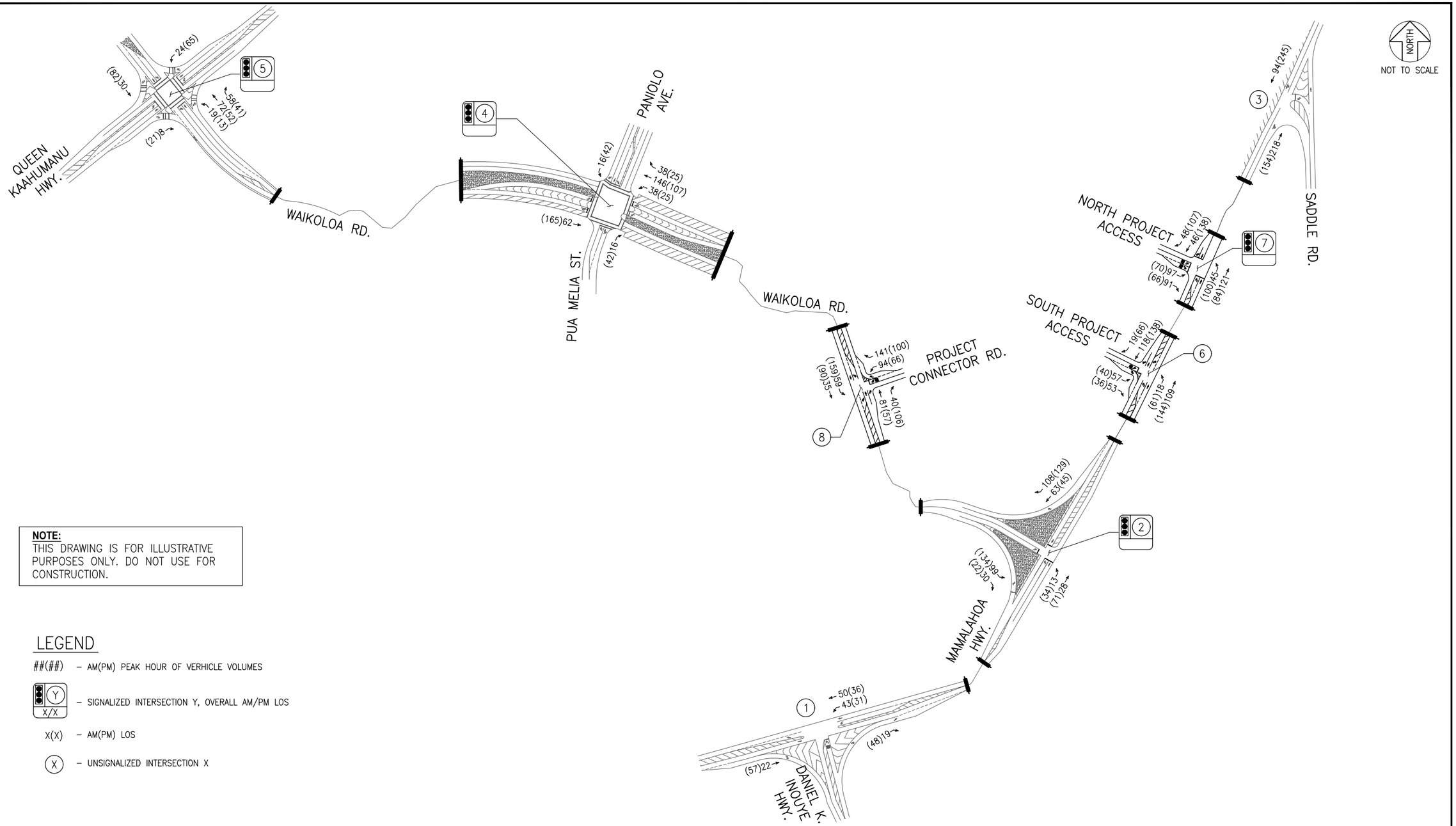
The following physical improvements are recommended by Future Year 2028:

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

- Construct an additional eastbound left-turn lane.
- Construct an exclusive westbound right-turn lane.

By Future Year 2028 with the Project, the eastbound and westbound movements serving Paniolo Avenue and Waikoloa Village are expected to operate at overcapacity conditions. Providing an additional eastbound left-turn lane and an exclusive right-turn lane are expected to provide adequate capacity for the high volume movements. With the proposed intersection improvements, all movements are expected to operate at LOS D or better during both peak hours of traffic. As with previous improvements at this intersection, regional developers in the area may be required to pay pro-rata share contributions to construct the improvements. At full build-out, the Project's pro-rata share of peak hour traffic is expected to be approximately 18% at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection.

Figure 5.6 illustrates the Future Year 2028 with Project with mitigation forecast traffic volumes and LOS for the study intersection movements. Table 5.4 summarizes the Future Year 2028 with Project with mitigation LOS at the study intersections compared to Future Year 2028 with Project without mitigation. LOS worksheets are provided in Appendix C.



NOTE:
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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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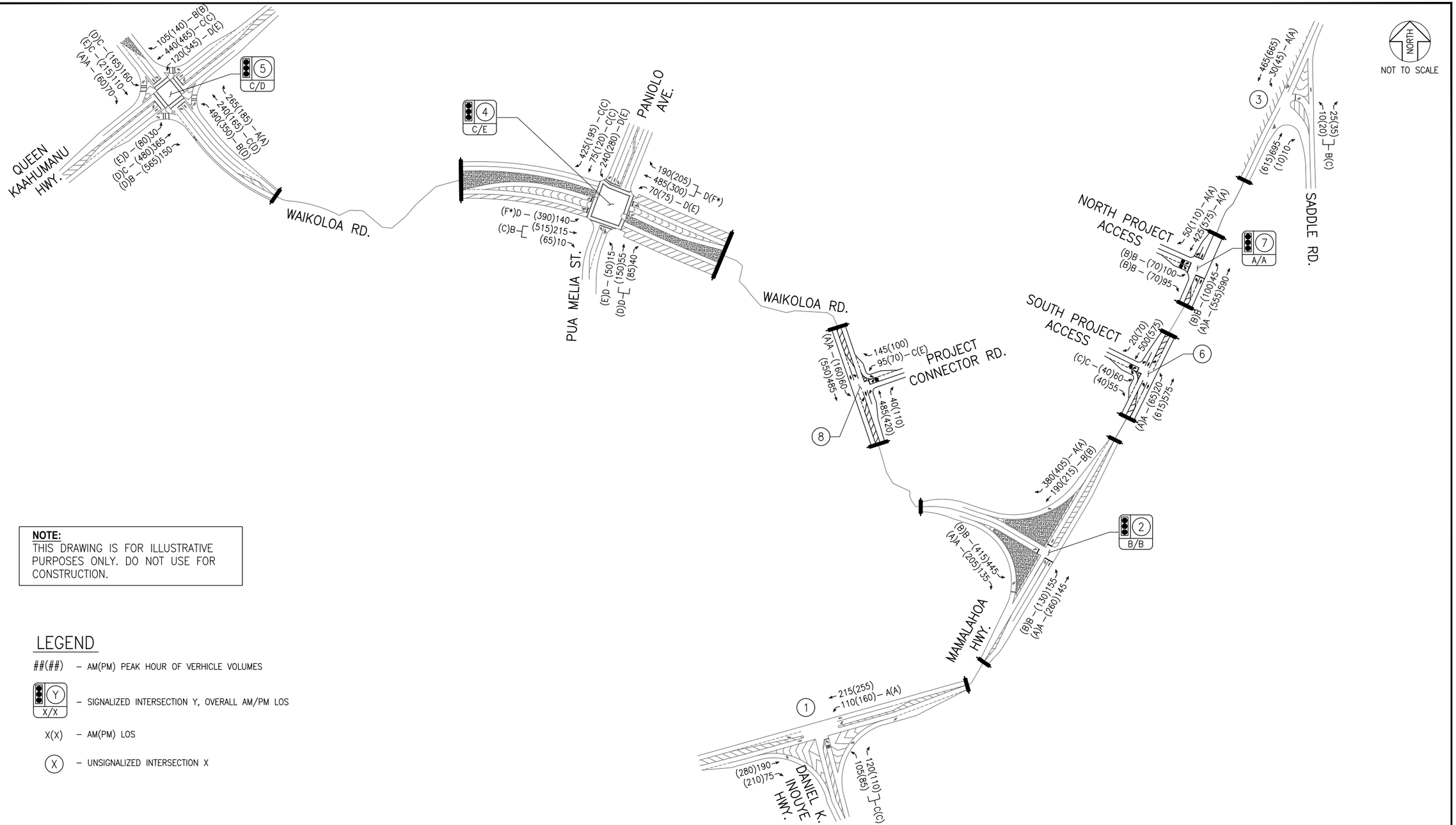
FUTURE YEAR 2028 PROJECT ONLY CUMULATIVE TRAFFIC

FIGURE 5.4



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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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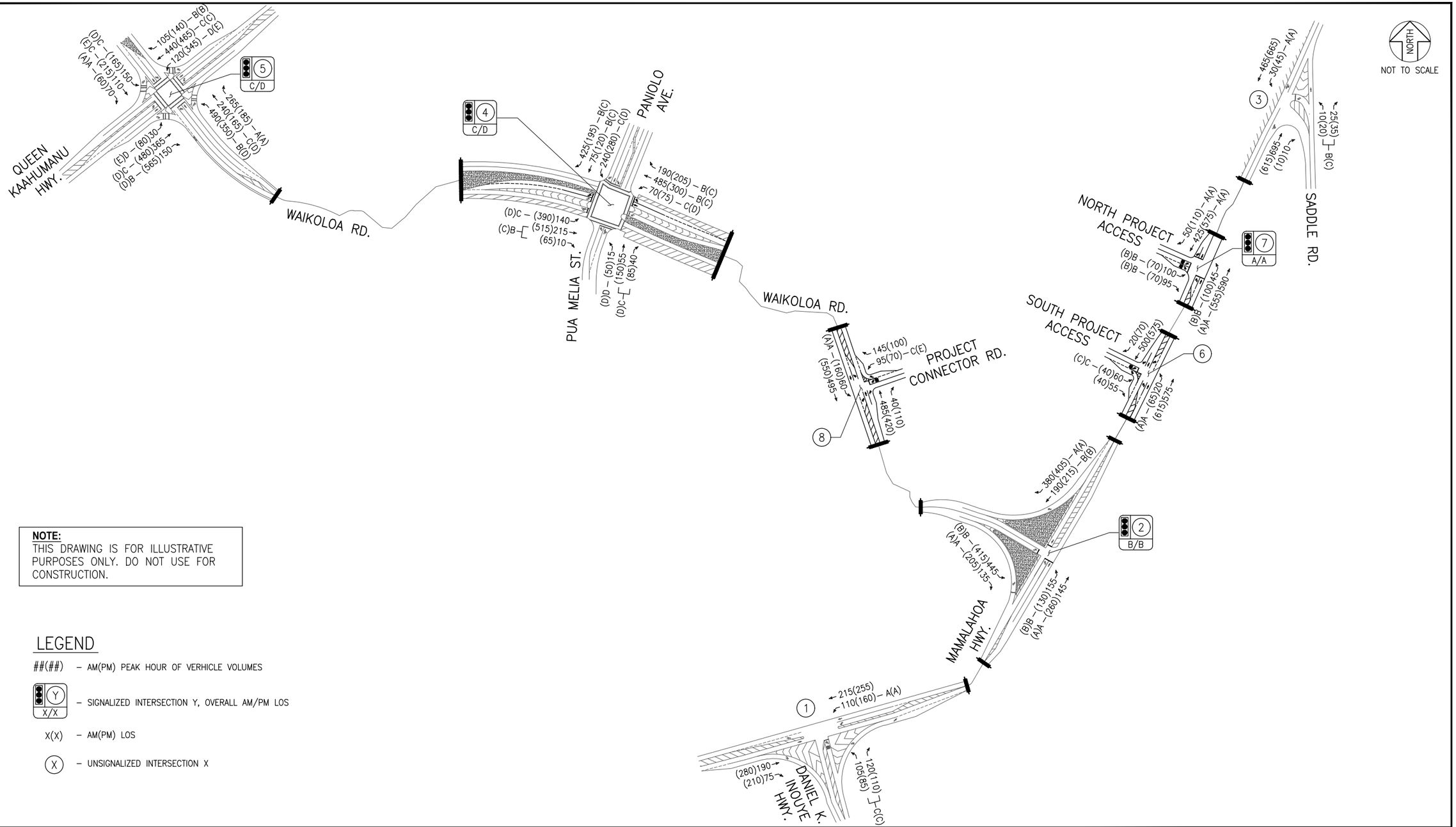
FUTURE YEAR 2028 LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

FIGURE 5.5



NOTE:
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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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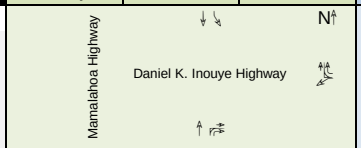
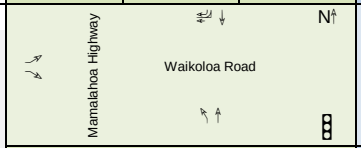
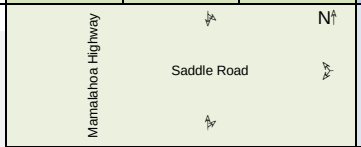
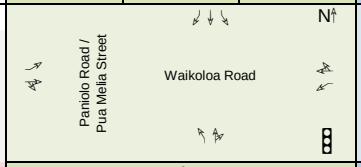
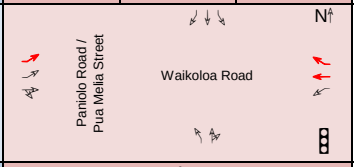
FUTURE YEAR 2028 (WITH MITIGATION) LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

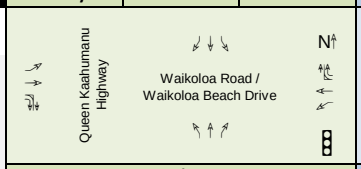
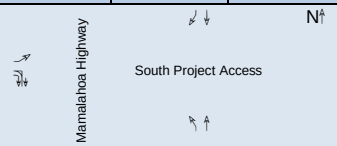
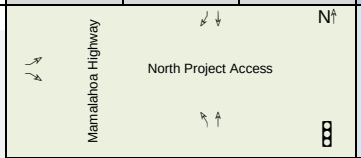
FIGURE 5.6

Table 5.4: Future Year 2023 with Project with Mitigation, Future Year 2028 with Project and Future Year 2028 with Project with Mitigation Level of Service Summary

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Future Year 2023 with Project with Mitigation (AM / PM) HCM Delay	v/c Ratio	LOS	Future Year 2028 with Project (AM / PM) HCM Delay	v/c Ratio	LOS	Future Year 2028 with Project with Mitigation (AM / PM) HCM Delay	v/c Ratio	LOS
1	**Mamalahoa Highway & Daniel K. Inouye Highway** *Discussion: This intersection is expected to continue operating at conditions similar to Future Year 2023 with Project with Mitigation.*				See Future Year 2023 with Project with Mitigation			See Future Year 2023 with Project with Mitigation		
		B 0.19 12.9	**/ / /**	**C 0.23 16.5**	**C 0.24 15.1**	**/ / /**	**C 0.28 19.7**	**C 0.24 15.1**	**/ / /**	**C 0.28 19.7**
	WB LT/RT	13 / 17	0.19 / 0.23	B / C	15 / 20	0.24 / 0.28	C / C	15 / 20	0.24 / 0.28	C / C
	SB LT	8 / 8	0.07 / 0.12	A / A	8 / 8	0.09 / 0.14	A / A	8 / 8	0.09 / 0.14	A / A
2	**Mamalahoa Highway & Waikoloa Road** *Discussion: With the propsed traffic signal at this intersection, all movements will continue to operate satisfactorily.*				See Future Year 2023 with Project with Mitigation			See Future Year 2023 with Project with Mitigation		
		B - 11.3	**/ / /**	**B - 10.5**	**B - 13.1**	**/ / /**	**B - 11.8**	**B - 13.1**	**/ / /**	**B - 11.8**
	NB LT	16 / 16	0.68 / 0.59	B / B	19 / 19	0.75 / 0.72	B / B	19 / 19	0.75 / 0.72	B / B
	NB TH	5 / 6	0.18 / 0.3	A / A	6 / 7	0.2 / 0.35	A / A	6 / 7	0.2 / 0.35	A / A
	EB LT	12 / 11	0.75 / 0.75	B / B	13 / 13	0.8 / 0.78	B / B	13 / 13	0.8 / 0.78	B / B
	EB RT	7 / 8	0.06 / 0.11	A / A	8 / 8	0.08 / 0.12	A / A	8 / 8	0.08 / 0.12	A / A
	SB TH	12 / 12	0.53 / 0.57	B / B	15 / 14	0.6 / 0.62	B / B	15 / 14	0.6 / 0.62	B / B
	SB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
3	**Mamalahoa Highway & Saddle Road** *Discussion: This intersection is expected to continue operating at conditions similar to Future Year 2023 with Project with Mitigation.*				See Future Year 2023 with Project with Mitigation			See Future Year 2023 with Project with Mitigation		
		B 0.06 10.8	**/ / /**	**B 0.13 14.3**	**B 0.07 11.8**	**/ / /**	**C 0.18 17.9**	**B 0.07 11.8**	**/ / /**	**C 0.18 17.9**
	WB LT/RT	11 / 14	0.06 / 0.13	B / B	12 / 18	0.07 / 0.18	B / C	12 / 18	0.07 / 0.18	B / C
	SB LT/TH	9 / 9	0.04 / 0.05	A / A	9 / 9	0.04 / 0.05	A / A	9 / 9	0.04 / 0.05	A / A
4	**Waikoloa Road & Paniolo Avenue & Pua Melia Street** *Discussion: By Future Year 2028 with the Project, several movements are expected to operate at overcapacity conditions during the PM peak hour due to the high volumes entering and exiting Waikoloa Village.* *Mitigative Measures: Provide an additional eastbound left-turn lane and an exclusive westbound right-turn lane to provide adeqate capacity into Waikoloa Village.*				See Future Year 2023 with Project with Mitigation					
		C - 22.5	**/ / /**	**D - 37.5**	**C - 33.4**	**/ / /**	**E - 73.0**	**C - 20.3**	**/ / /**	**D - 37.3**
	NB LT	37 / 52	0.46 / 0.69	D / D	48 / 68	0.48 / 0.77	D / E	36 / 54	0.46 / 0.72	D / D
	NB TH/RT	26 / 37	0.38 / 0.71	C / D	38 / 47	0.54 / 0.77	D / D	26 / 37	0.44 / 0.73	C / D
	EB LT	31 / 53	0.76 / 0.92	C / D	41 / 164	0.79 / 1.22	D / F*	26 / 43	0.54 / 0.83	C / D
	EB TH/RT	12 / 17	0.24 / 0.53	B / B	12 / 31	0.27 / 0.79	B / C	13 / 34	0.35 / 0.89	B / C
	WB LT	34 / 55	0.61 / 0.77	C / D	49 / 62	0.77 / 0.78	D / E	33 / 52	0.69 / 0.77	C / D
	WB TH							18 / 27	0.79 / 0.59	B / C
	WB TH/RT	20 / 40	0.82 / 0.86	C / D	36 / 80	0.93 / 1.01	D / F*			
	WB RT							12 / 23	0.14 / 0.12	B / C
	SB LT	29 / 47	0.81 / 0.84	C / D	41 / 72	0.85 / 0.92	D / E	27 / 52	0.8 / 0.89	C / D
	SB TH	17 / 25	0.16 / 0.25	B / C	24 / 27	0.19 / 0.22	C / C	16 / 21	0.17 / 0.21	B / C
	SB RT	18 / 24	0.28 / 0.11	B / C	26 / 26	0.34 / 0.1	C / C	17 / 20	0.31 / 0.11	B / C

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

Table 5.4: Future Year 2023 with Project with Mitigation, Future Year 2028 with Project and Future Year 2028 with Project with Mitigation Level of Service Summary Continued

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Future Year 2023 with Project with Mitigation (AM / PM)			Future Year 2028 with Project (AM / PM)			Future Year 2028 with Project with Mitigation (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
5	**Queen Kaahumanu Highway & Waikoloa Road & Waikoloa Beach Drive** *Discussion: Traffic is anticipated to continue to operate satisfactorily by Future Year 2028 with the Project. However, during the PM peak hour of traffic, various left-turn and minor street movements are expected to operate at LOS E.*				See Future Year 2023 with Project with Mitigation			See Future Year 2023 with Project with Mitigation		
		C - 20.2	**/ /**	**C - 30.3**	**C - 23.5**	**/ /**	**D - 49.7**	**C - 23.5**	**/ /**	**D - 49.7**
	NB LT	34 / 51	0.52 / 0.76	C / D	39 / 72	0.54 / 0.79	D / E	39 / 72	0.54 / 0.79	D / E
	NB TH	21 / 31	0.73 / 0.83	C / C	25 / 48	0.79 / 0.88	C / D	25 / 48	0.79 / 0.88	C / D
	NB RT	15 / 25	0.09 / 0.42	B / C	18 / 38	0.1 / 0.58	B / D	18 / 38	0.1 / 0.58	B / D
	EB LT	20 / 30	0.38 / 0.41	B / C	23 / 42	0.41 / 0.44	C / D	23 / 42	0.41 / 0.44	C / D
	EB TH	28 / 44	0.58 / 0.79	C / D	32 / 79	0.63 / 0.89	C / E	32 / 79	0.63 / 0.89	C / E
	EB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	WB LT	16 / 28	0.71 / 0.76	B / C	20 / 53	0.78 / 0.89	B / D	20 / 53	0.78 / 0.89	B / D
	WB TH	19 / 31	0.46 / 0.38	B / C	21 / 43	0.5 / 0.41	C / D	21 / 43	0.5 / 0.41	C / D
	WB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	SB LT	36 / 42	0.77 / 0.86	D / D	37 / 80	0.78 / 0.94	D / E	37 / 80	0.78 / 0.94	D / E
	SB TH	20 / 20	0.78 / 0.59	C / B	22 / 25	0.78 / 0.56	C / C	22 / 25	0.78 / 0.56	C / C
	SB RT	14 / 15	0.07 / 0.09	B / B	15 / 19	0.07 / 0.08	B / B	15 / 19	0.07 / 0.08	B / B
6	**Mamalahoa Highway & South Project Access** *Discussion: The South Project Access is expected to operate satisfactorily.*							See Future Year 2028 with Project		
	Mitigative Measures: Accleration and deceleration lanes are recommended at the South Project Access.				**C 0.17 16**	**/ /**	**C 0.14 18.9**	**C 0.17 16**	**/ /**	**C 0.14 18.9**
	NB LT				9 / 9	0.02 / 0.08	A / A	9 / 9	0.02 / 0.08	A / A
	EB LT				16 / 19	0.17 / 0.14	C / C	16 / 19	0.17 / 0.14	C / C
7	**Mamalahoa Highway & North Project Access** *Discussion: The North Project Access is expected to continue operating satisfactorily as in Future Year 2023 with Project with Mitigation. Volumes at the North Project Access are expected to decrease with the new Project Connector Road access along Waikoloa Road.*				See Future Year 2023 with Project with Mitigation			See Future Year 2023 with Project with Mitigation		
		A - 8	**/ /**	**A - 8.8**	**A - 6.5**	**/ /**	**A - 7.1**	**A - 6.5**	**/ /**	**A - 7.1**
	NB LT	15 / 17	0.54 / 0.74	B / B	16 / 19	0.48 / 0.64	B / B	16 / 19	0.48 / 0.64	B / B
	NB TH	4 / 3	0.44 / 0.4	A / A	4 / 3	0.57 / 0.47	A / A	4 / 3	0.57 / 0.47	A / A
	EB LT	14 / 17	0.67 / 0.64	B / B	14 / 18	0.57 / 0.55	B / B	14 / 18	0.57 / 0.55	B / B
	EB RT	10 / 12	0.12 / 0.07	B / B	11 / 14	0.05 / 0.02	B / B	11 / 14	0.05 / 0.02	B / B
	SB TH	9 / 9	0.6 / 0.65	A / A	8 / 8	0.63 / 0.71	A / A	8 / 8	0.63 / 0.71	A / A
	SB RT	6 / 7	0.06 / 0.11	A / A	5 / 5	0.04 / 0.08	A / A	5 / 5	0.04 / 0.08	A / A
8	**Waikoloa Road & Project Connector Road** *Discussion: The southbound left-turn is expected to operate at LOS E during the PM peak hour even with an acceleration lane. However, a traffic signal is not expected to warrant, and no mitigation is recommended.*							See Future Year 2028 with Project		
	Mitigative Measures: Acceleration and deceleration lanes are recommended at the Project Connector Road.				**C 0.28 18.4**	**/ /**	**E 0.40 35.8**	**C 0.28 18.4**	**/ /**	**E 0.40 35.8**
	EB LT				9 / 9	0.07 / 0.18	A / A	9 / 9	0.07 / 0.18	A / A
	SB LT				18 / 36	0.28 / 0.4	C / E	18 / 36	0.28 / 0.4	C / E

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

5.5 Future Year 2038 with Project Analysis

By Future Year 2038, the Project is projected to generate a cumulative total of 814 (1042) net external trips during the AM (PM) peak hour of traffic. The projected growth in traffic is expected along major roadways in the study area. Figure 5.7 illustrates the Future Year 2038 cumulative Project-generated trip distribution.

5.5.1 Future Year 2038 with Project Intersection Analysis

It is anticipated that by Future Year 2038 with the Project, traffic will increase compared to Future Year 2028 with the Project with mitigation due to the continued growth in the area from the Project. The following intersections are expected to experience major changes in operation during either peak hour of traffic by Future Year 2038 with the Project compared to Future Year 2028 with the Project with mitigation conditions.

[1] Mamalahoa Highway/Daniel K. Inouye Highway

With the proposed Daniel K. Inouye Highway extension, a traffic signal was assumed to be constructed at the intersection. With the extension and traffic signal, the intersection is expected to operate with all movements at LOS C or better.

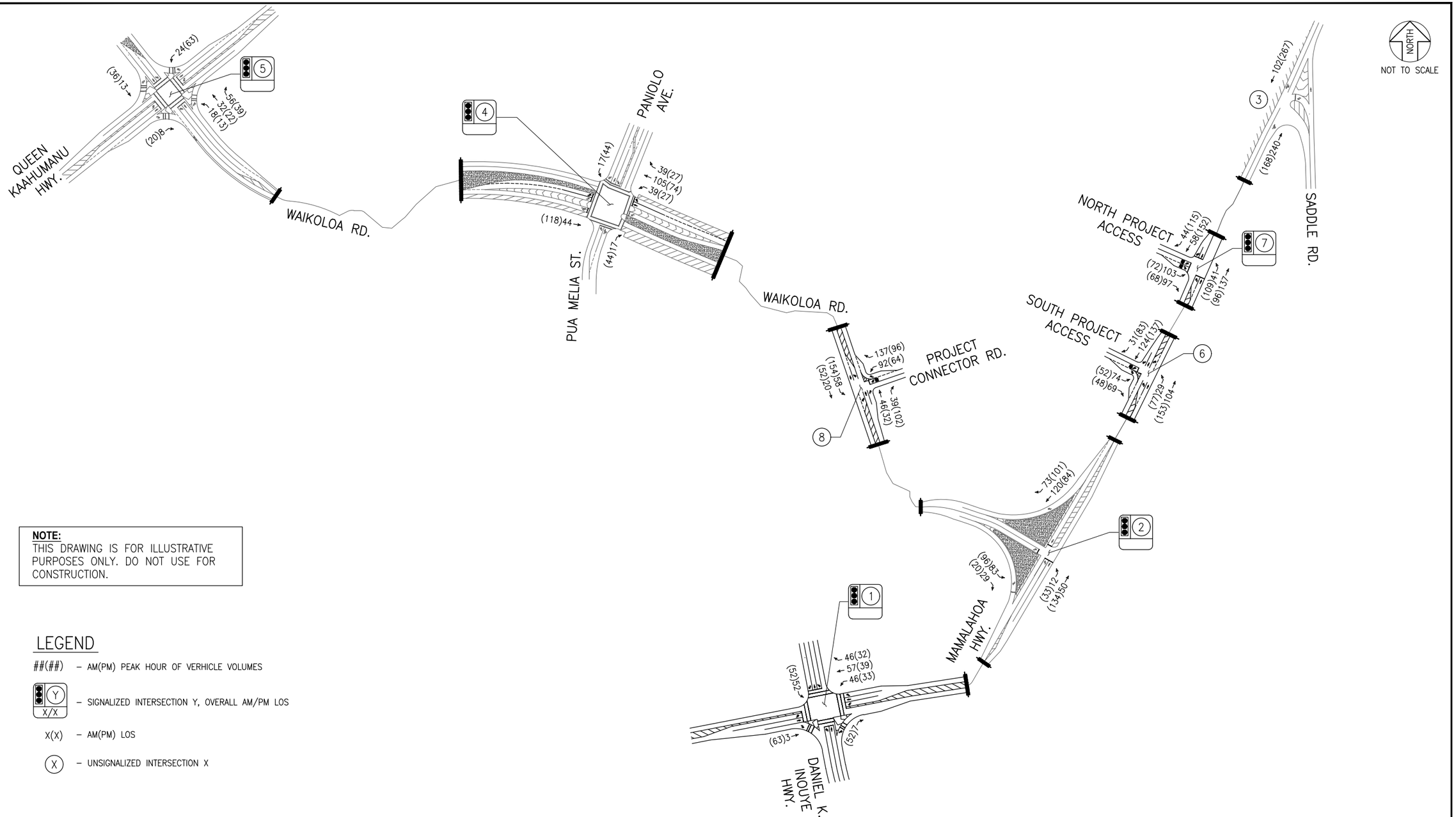
[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

With the proposed Daniel K. Inouye Highway extension, regional traffic currently using Waikoloa Road will be diverted to Daniel K. Inouye Highway. With the diversion of traffic, the intersection will operate with all movements under capacity at LOS C or better during both peak hours of traffic.

[8] Waikoloa Road/Project Connector Road

As stated above, with the proposed Daniel K. Inouye Highway extension, traffic along Waikoloa Road is expected to decrease as regional traffic is diverted to the more direct Daniel K. Inouye Highway. With the diverted traffic, all movements are expected to operate at LOS C or better during both peak hours of traffic.

Figure 5.8 illustrates the Future Year 2038 with Project forecast traffic volumes and LOS for the study intersection movements. Table 5.5 summarizes the Future Year 2038 with Project LOS at the study intersections compared to Future Year 2028 with Project with mitigation. LOS worksheets are provided in Appendix C.



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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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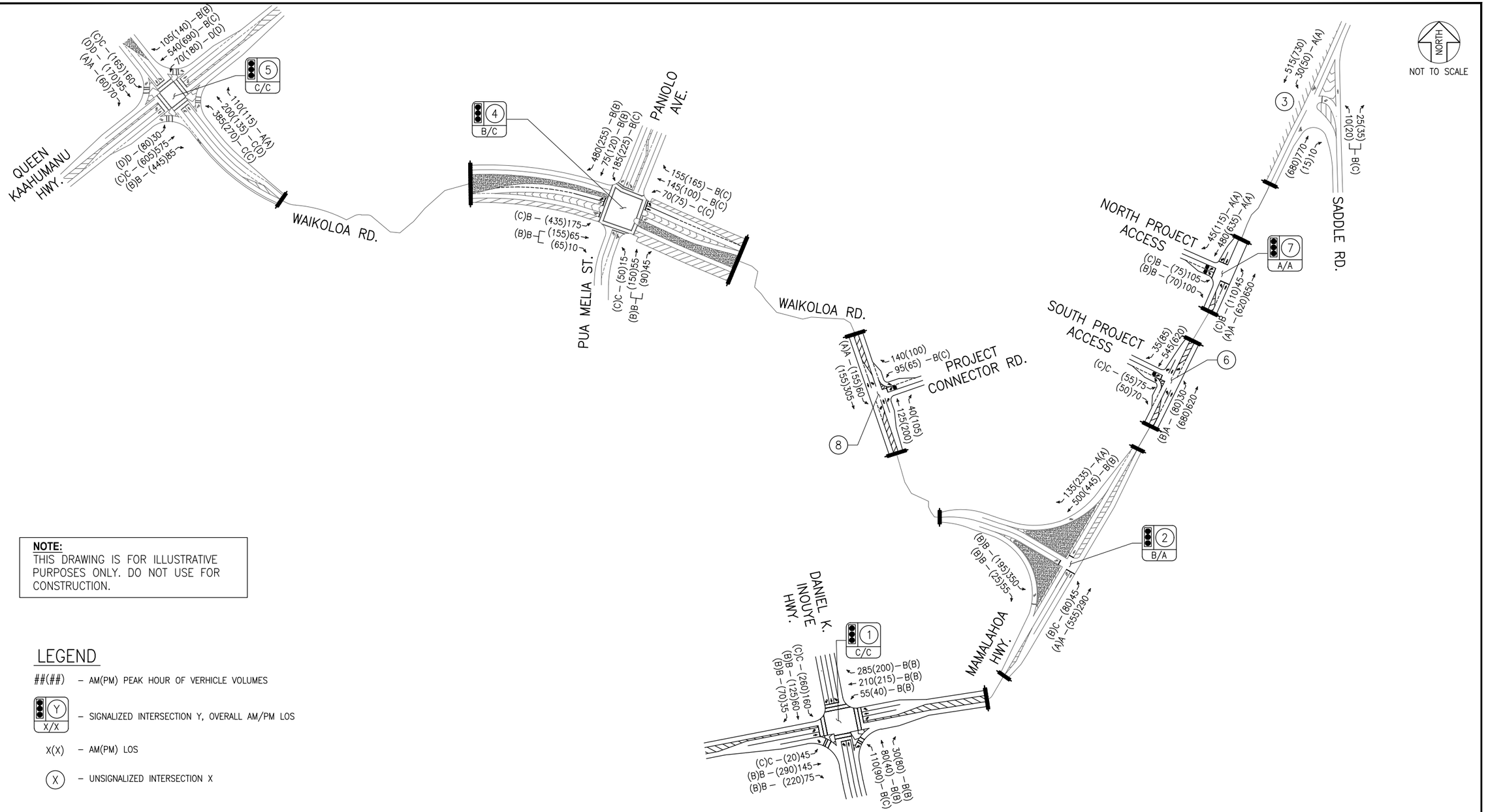
FUTURE YEAR 2038 PROJECT ONLY CUMULATIVE TRAFFIC

FIGURE 5.7



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LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) – AM(PM) LOS

(X) – UNSIGNALIZED INTERSECTION X

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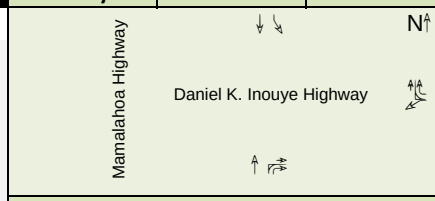
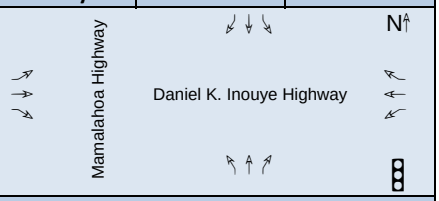
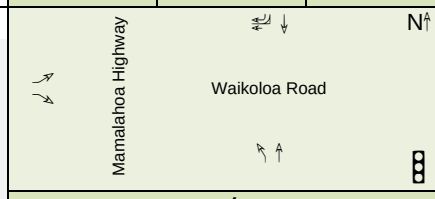
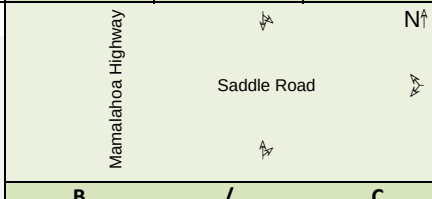
FUTURE YEAR 2038 LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

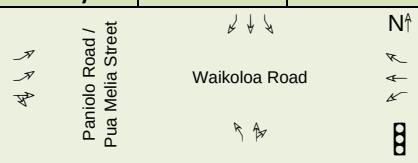
FIGURE 5.8

Table 5.5: Future Year 2028 with Project with Mitigation and Future Year 2038 with Project Level of Service Summary

	Intersection Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Future Year 2028 with Project with Mitigation (AM / PM)			Future Year 2038 with Project (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1	**Mamalahoa Highway & Daniel K. Inouye Highway** *Discussion: This intersection is expected to operate satisfactorily with the Daniel K. Inouye Highway extension and signalization of the intersection.*						
		C 0.24 15.1	**/ / /**	**C 0.28 19.7**	**C 0.51 20.9**	**/ / /**	**C 0.46 29.0**
	NB LT				21 / 29	0.51 / 0.46	C / C
	NB TH				16 / 18	0.54 / 0.7	B / B
	NB RT				13 / 14	0.08 / 0.14	B / B
	EB LT				20 / 23	0.75 / 0.8	C / C
	EB TH				15 / 17	0.26 / 0.37	B / B
	EB RT				14 / 15	0 / 0.05	B / B
	WB LT				16 / 21	0.5 / 0.51	B / C
	WB TH				15 / 19	0.34 / 0.22	B / B
	WB LT/RT	15 / 20	0.24 / 0.28	C / C			
	WB RT				14 / 18	0.01 / 0.01	B / B
	SB LT	8 / 8	0.09 / 0.14	A / A	15 / 19	0.25 / 0.22	B / B
	SB TH				13 / 13	0.51 / 0.39	B / B
	SB RT				11 / 11	0.2 / 0.11	B / B
2	**Mamalahoa Highway & Waikoloa Road** *Discussion: This intersection is expected to operate similar to Future Year 2028 with Project with Mitigation. A decrease in volumes along Waikoloa Road is expected as a result of the Daniel K. Inouye Highway extension.*				See Future Year 2028 with Project with Mitigation		
		B - 13.1	**/ / /**	**B - 11.8**	**B - 13.7**	**/ / /**	**A - 8.9**
	NB LT	19 / 19	0.75 / 0.72	B / B	21 / 17	0.52 / 0.57	C / B
	NB TH	6 / 7	0.2 / 0.35	A / A	6 / 5	0.33 / 0.57	A / A
	EB LT	13 / 13	0.8 / 0.78	B / B	16 / 15	0.79 / 0.73	B / B
	EB RT	8 / 8	0.08 / 0.12	A / A	10 / 11	0.03 / 0.02	B / B
	SB TH	15 / 14	0.6 / 0.62	B / B	17 / 10	0.82 / 0.74	B / B
	SB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
3	**Mamalahoa Highway & Saddle Road** *Discussion: This intersection is expected to operate with longer delays for the minor movements as traffic increases along Mamalahoa Highway. However, the intersection is anticipated to continue operating satisfactorily.*				See Future Year 2028 with Project with Mitigation		
		B 0.07 11.8	**/ / /**	**C 0.18 17.9**	**B 0.08 13.6**	**/ / /**	**C 0.22 22.3**
	WB LT/RT	12 / 18	0.07 / 0.18	B / C	14 / 22	0.08 / 0.22	B / C
	SB LT/TH	9 / 9	0.04 / 0.05	A / A	10 / 10	0.04 / 0.06	A / A

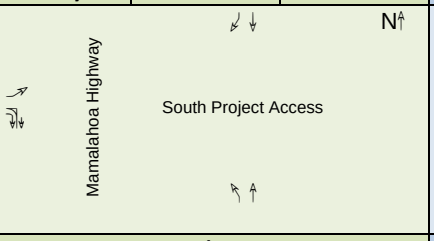
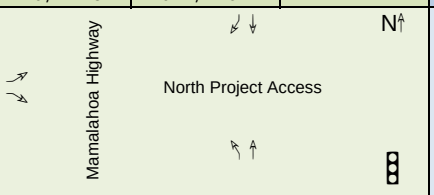
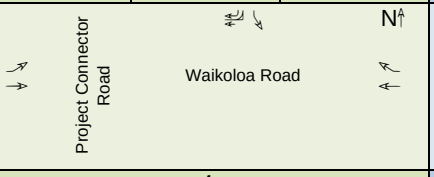
Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

Table 5.5: Future Year 2028 with Project with Mitigation and Future Year 2038 with Project Level of Service Summary Continued

Intersection	Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Future Year 2028 with Project with Mitigation (AM / PM)			Future Year 2038 with Project (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
4	**Waikoloa Road & Paniolo Avenue & Pua Melia Street** *Discussion: Operations at this intersection are expected to improve with the Daniel K. Inouye Highway extension providing an alternate route between Queen Kaahumanu Highway and Mamalahoa Highway.*				See Future Year 2028 with Project with Mitigation		
		C - 20.3	/ /	D - 37.3	B - 15.5	/ /	C - 20.7
	NB LT	36 / 54	0.46 / 0.72	D / D	26 / 29	0.44 / 0.58	C / C
	NB TH/RT	26 / 37	0.44 / 0.73	C / D	15 / 20	0.32 / 0.64	B / B
	EB LT	26 / 43	0.54 / 0.83	C / D	16 / 21	0.47 / 0.72	B / C
	EB TH/RT	13 / 34	0.35 / 0.89	B / C	13 / 18	0.21 / 0.54	B / B
	WB LT	33 / 52	0.69 / 0.77	C / D	21 / 30	0.58 / 0.68	C / C
	WB TH	18 / 27	0.79 / 0.59	B / C	16 / 24	0.53 / 0.55	B / C
	WB RT	12 / 23	0.14 / 0.12	B / C	13 / 21	0.09 / 0.08	B / C
	SB LT	27 / 52	0.8 / 0.89	C / D	19 / 24	0.74 / 0.78	B / C
	SB TH	16 / 21	0.17 / 0.21	B / C	10 / 12	0.16 / 0.21	B / B
	SB RT	17 / 20	0.31 / 0.11	B / C	12 / 12	0.39 / 0.17	B / B
5	**Queen Kaahumanu Highway & Waikoloa Road & Waikoloa Beach Drive** *Discussion: Traffic is anticipated to continue operating satisfactorily at this intersection with decreases in turning volumes as a result of the Daniel K. Inouye Highway extension.*				See Future Year 2028 with Project with Mitigation		
		C - 23.5	/ /	D - 49.7	C - 23.6	/ /	C - 30.3
	NB LT	39 / 72	0.54 / 0.79	D / E	42 / 53	0.55 / 0.76	D / D
	NB TH	25 / 48	0.79 / 0.88	C / D	23 / 29	0.85 / 0.87	C / C
	NB RT	18 / 38	0.1 / 0.58	B / D	14 / 19	0.06 / 0.27	B / B
	EB LT	23 / 42	0.41 / 0.44	C / D	26 / 31	0.43 / 0.44	C / C
	EB TH	32 / 79	0.63 / 0.89	C / E	35 / 46	0.62 / 0.8	D / D
	EB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	WB LT	20 / 53	0.78 / 0.89	B / D	22 / 30	0.73 / 0.72	C / C
	WB TH	21 / 43	0.5 / 0.41	C / D	26 / 35	0.55 / 0.44	C / D
	WB RT	0 / 0	0 / 0	A / A	0 / 0	0 / 0	A / A
	SB LT	37 / 80	0.78 / 0.94	D / E	45 / 47	0.77 / 0.83	D / D
	SB TH	22 / 25	0.78 / 0.56	C / C	19 / 24	0.75 / 0.84	B / C
	SB RT	15 / 19	0.07 / 0.08	B / B	13 / 14	0.07 / 0.09	B / B

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

Table 5.5: Future Year 2028 with Project with Mitigation and Future Year 2038 with Project Level of Service Summary Continued

	Intersection 🚦 Signalized: Overall LOS Unsignalized TWSC: Critical Movement LOS LOS [X / X] DELAY [X / X]	Future Year 2028 with Project with Mitigation (AM / PM)			Future Year 2038 with Project (AM / PM)		
		HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
6	**Mamalahoa Highway & South Project Access** *Discussion:* *The South Project Access is expected to experience an increase in delay as traffic continues to grow along Mamalahoa Highway. However, the intersection is expected to continue operating satisfactorily.*				See Future Year 2028 with Project with Mitigation		
		C 0.17 16	**/ / /**	**C 0.14 18.9**	**C 0.23 18.2**	**/ / /**	**C 0.23 23.2**
	NB LT	9 / 9	0.02 / 0.08	A / A	9 / 10	0.03 / 0.1	A / A
	EB LT	16 / 19	0.17 / 0.14	C / C	18 / 23	0.23 / 0.23	C / C
7	**Mamalahoa Highway & North Project Access** *Discussion:* *The North Project Access is expected to continue operating satisfactorily as in Future Year 2028 with Project with Mitigation.*				See Future Year 2028 with Project with Mitigation		
		A - 6.5	**/ / /**	**A - 7.1**	**A - 6.7**	**/ / /**	**A - 7.5**
	NB LT	16 / 19	0.48 / 0.64	B / B	17 / 21	0.49 / 0.7	B / C
	NB TH	4 / 3	0.57 / 0.47	A / A	4 / 3	0.61 / 0.51	A / A
	EB LT	14 / 18	0.57 / 0.55	B / B	15 / 20	0.59 / 0.59	B / C
	EB RT	11 / 14	0.05 / 0.02	B / B	12 / 16	0.05 / 0.02	B / B
	SB TH	8 / 8	0.63 / 0.71	A / A	8 / 9	0.66 / 0.74	A / A
	SB RT	5 / 5	0.04 / 0.08	A / A	5 / 5	0.04 / 0.08	A / A
8	**Waikoloa Road & Project Connector Road** *Discussion:* *Operations at this intersection are expected to improve with the Daniel K. Inouye Highway extension providing an alternate route between Queen Kaahumanu Highway and Mamalahoa Highway. The intersection is anticipated to operate satisfactorily by Future Year 2038 with the Project.*				See Future Year 2028 with Project with Mitigation		
		C 0.28 18.4	**/ / /**	**E 0.40 35.8**	**B 0.19 13.4**	**/ / /**	**C 0.17 15.5**
	EB LT	9 / 9	0.07 / 0.18	A / A	8 / 8	0.05 / 0.14	A / A
	SB LT	18 / 36	0.28 / 0.4	C / E	13 / 16	0.19 / 0.17	B / C

Note:
1. For unsignalized intersections, intersection delay, v/c and LOS are based on the "worse" movement.
2. " * " indicates overcapacity conditions, v/c ratio > 1.

6. CONCLUSIONS

The Project proposes to develop Neighborhood Commercial and Family Agricultural land uses on currently agricultural zoned land located on the northwest corner of the Mamalahoa Highway/Waikoloa Road intersection. The proposed Project components and their build-out years are described further below.

Build-out by 2023

- 449 agricultural lots with single-family (SF) farm dwellings located on the north parcels (TMKs (3) 6-8-002: 005, 028, 029, 030) of the Project site
- 300 multi-family (MF) dwelling units with retail component in the Neighborhood Commercial area
- Approximately three (3) acres light industrial in the Neighborhood Commercial area
- An approximately six-acre “community green” neighborhood park
- Access will be provided by:
    - An access point along Mamalahoa Highway (“North Project Access”)

Build-out by 2028

- 409 agricultural lots with SF farm dwellings located on the southern half of the Project area
- An approximately 29-acre regional park
- Access will be provided by:
    - Previously constructed North Project Access
    - An access point along Mamalahoa Highway (“South Project Access”)
    - New Project Connector Road (improvement of an existing dirt road through the neighboring parcel to the southwest) providing access to the Project from Waikoloa Road

Build-out by 2038

- 108 accessory dwelling units (ADUs)
    - Although ADUs will not be part of the initial Project development, future agricultural lot owners, at their own discretion and expense, may elect to build an ADU on their agricultural lot as may be permitted and limited under Chapter 205, HRS and Section 25-5-67(c), HCC. While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, for the purpose of this report 108 ADUs are assumed to be built out in 2038. For additional ADU construction beyond the anticipated 108 units an updated traffic study is recommended.
- Access will be provided by all three (3) previously constructed accesses.

At full buildout, the Project is projected to generate a total of 814 (1042) net external trips during the AM (PM) peak hour of traffic.

6.1 Existing Conditions

Queen Kaahumanu Highway and Mamalahoa Highway provide regional connectivity between Kohala to the north and Kailua-Kona to the south. Volumes were observed to be higher in the southbound direction towards Kailua-Kona during the AM peak hour of traffic and higher in the northbound direction towards Kohala in the PM peak hour. Daniel K. Inouye Highway provides regional connectivity between Hilo to the east and Kona to the west. The old Saddle Road alignment was observed to carry minimal traffic compared to the new Daniel K. Inouye Highway alignment. Traffic was observed to be higher from Hilo during the AM peak hour and higher towards Hilo during the PM peak hour. Traffic along the major thoroughfares in the vicinity of the Project was generally light with free flow conditions observed along all roadways. As a result of the downturn in tourism on Hawaii Island beginning in May 2018, traffic volumes in the study area were likely on the lower end, and adjustments were made to the studied roadways to reflect more typical conditions.

All study intersections operate adequately with minimal delay with the exception of the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection. The southbound left-turn operates at LOS F and overcapacity during the PM peak hour of traffic as a result of the intersection providing exclusive access to Waikoloa Village. Southbound queues of up to eight (8) vehicles were observed along Paniolo Avenue during the peak hours of traffic.

6.2 Base Year Scenarios

Traffic projections in the study area were based upon known developments in the region along with ambient growth applied to nearby roadways. Growth was applied to the years 2023, 2028 and 2038 to reflect the build-out of the Project by those years.

A roundabout at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection was a previously required condition imposed by the State Land Use Commission (LUC) on the Waikoloa Highlands Subdivision project for development on the subject parcel. However, based on a November 2018 LUC ruling, the rural land use classification of the parcel has been reverted back to agricultural, and the project may or may not move forward at this time. To provide conservative projections for traffic in the study area, it was assumed that the project would ultimately be built out in the studied time frame.

Based on existing and Base Year 2023 conditions, improvements will be required at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection. Although a roundabout was previously identified as the preferred mitigation at the intersection, based on capacity and space requirements, a traffic signal was assumed for Base Year 2023. In the event that the Waikoloa Highlands Subdivision does not move forward, mitigation at the intersection is expected to be constructed under Future Year 2023 conditions with the Project based on pro-rata traffic shares by regional developers at the intersection.

The proposed Daniel K. Inouye Highway extension was assumed to be completed by Base Year 2038. With the extension, regional traffic currently using Waikoloa Road is expected to reroute to Daniel K. Inouye Highway, which is anticipated to improve operations along Waikoloa Road and at its major intersections.

6.3 Future Year Scenarios

At full buildout, the Project is projected to generate a total of 814 (1042) net external trips during the AM (PM) peak hour of traffic. Traffic from the Project is expected to generate growth along major roadways in the study area.

With the Project, Mamalahoa Highway and Waikoloa Road are expected to experience the greatest increase in traffic. By Future Year 2023 with Project, a traffic signal is expected to be warranted and is recommended at the Mamalahoa Highway/Waikoloa Road intersection. If a traffic signal is not constructed at the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection with the Waikoloa Highlands Subdivision, construction is recommended under Future Year 2023 conditions. The intersection is expected to operate with all movements at LOS D or better by Future Year 2023.

By Future Year 2028 with Project, the Waikoloa Road/Paniolo Avenue/Pua Melia Street intersection is expected to operate with movements at overcapacity. An additional eastbound left-turn lane and an exclusive westbound right-turn lane are recommended to serve the high volumes turning into Waikoloa Village.

All Project accesses are expected to operate adequately by Future Year 2038. To accommodate the projected Project traffic, full acceleration, deceleration and turning lanes are proposed at the Mamalahoa Highway/South Project Access and at the Waikoloa Road/Project Connector Road intersections. Because the Mamalahoa Highway/North Project Access is proposed to be constructed first and will handle all Future Year 2023 traffic, a traffic signal is proposed and warranted at the intersection with exclusive deceleration/turning lanes.

With the assumed and recommended regional and Project-specific roadway improvements, traffic in the Project area is expected to operate adequately by 2038 with acceptable levels of service at all study intersections.

7. RECOMMENDATIONS

The following improvements are planned or recommended for with and without Project conditions as a result of future development in the study area. With the following assumed and recommended regional and Project-specific roadway improvements, traffic in the Project area is expected to operate adequately by 2038 with acceptable levels of service at all study intersections.

7.1 Planned Roadway Improvements

7.1.1 Year 2038

[1] Mamalahoa Highway/Daniel K. Inouye Highway

- Extend Daniel K. Inouye Highway from Mamalahoa Highway to Queen Kaahumanu Highway.
- Construct a traffic signal at the intersection with exclusive turning lanes along all approaches.

The Daniel K. Inouye Highway Extension is planned to reduce through traffic along Waikoloa Road by providing a new arterial connecting Mamalahoa Highway to Queen Kaahumanu Highway. The extension is identified in the District of Hawaii Long Range Development Plan as a potential long-range capacity solution. Currently, funding has been secured for final design and preliminary right-of-way (ROW) acquisition. Based on the identification of the extension as a long-range solution, the extension was assumed to occur by Year 2038.

7.2 Base Year Roadway Improvements

7.2.1 Base Year 2023 with Mitigation

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

- Construct a traffic signal when warranted.
- Intersection improvements previously required by the State Land Use Commission (LUC) for the Waikoloa Highlands Subdivision. If the project does not move forward, the signal is recommended under Future Year 2023 with Mitigation conditions.

Although a single-lane roundabout was previously required to satisfy LUC conditions for the Waikoloa Highlands Subdivision, a traffic signal is proposed as the preferred alternative due to the limited space available at the intersection for construction of a roundabout with necessary bypass lanes. Based on the MUTCD Four-Hour Vehicular Volume warrant, a traffic signal is expected to warrant at this intersection by Base Year 2023. As mentioned above, if improvements are no longer required by the Waikoloa Highlands Subdivision, regional developers in the area may be required to pay pro-rata share contributions to construct the traffic signal.

7.2.2 Base Year 2028 with Mitigation

[2] Mamalahoa Highway/Waikoloa Road

- Construct a traffic signal when warranted.

Based on the MUTCD 70% Four-Hour Vehicular Volume warrant, a traffic signal is expected to warrant at this intersection as early as Base Year 2023 and should be installed when warranted. Installation of a traffic signal is proposed by Base Year 2028 in order to mitigate projected issues with queuing and delay. Because this improvement is not currently funded, regional developers in the area may be required to pay pro-rata share contributions to construct the traffic signal.

7.3 Future Year Roadway Improvements

7.3.1 Future Year 2023

[7] Mamalahoa Highway/North Project Access

- Provide eastbound left-turn and right-turn lanes out of the North Project Access.
- Provide a northbound left-turn lane into the North Project Access.
- Provide a southbound right-turn deceleration lane into the North Project Access.
- Construct a traffic signal when warranted.

The North Project Access is proposed for construction during build-out of the north Project parcels (TMKs (3) 6-8-002: 005, 028, 029, 030) and will provide sole access to the Project for Future Year 2023. Exclusive left-turn and right-turn lanes out of the North Project Access are recommended to reduce delays for vehicles exiting the Project. In addition, turning lanes along Mamalahoa Highway into the Project are proposed to remove vehicles from the high-speed through movements along the highway. Based on the MUTCD 70% Four-Hour Vehicular Volume warrant and the high posted speeds along Mamalahoa Highway, a traffic signal is expected to warrant at this intersection by Future Year 2023.

7.3.2 Future Year 2023 with Mitigation

[2] Mamalahoa Highway/Waikoloa Road

- Construct a traffic signal when warranted.

Based on the MUTCD 70% Four-Hour Vehicular Volume warrant, a traffic signal is expected to warrant at this intersection as early as Base Year 2023 and should be installed when warranted. Installation of a traffic signal is proposed by Future Year 2023 with Project in order to mitigate projected issues with queuing and delay. Because this improvement is not currently funded, regional developers in the area may be required to pay pro-rata share contributions to construct the traffic signal.

7.3.3 Future Year 2028

[6] Mamalahoa Highway/South Project Access

- Provide eastbound left-turn and right-turn lanes out of the South Project Access.
- Provide a northbound left-turn lane into the South Project Access.
- Provide a southbound right-turn deceleration lane into the South Project Access.
- Provide eastbound left-turn and right-turn acceleration lanes along Mamalahoa Highway.

The South Project Access is proposed for construction during build-out of the south Project parcel (TMK (3) 6-8-002: 006). Exclusive left-turn and right-turn lanes out of the South Project Access are recommended to reduce delays for vehicles exiting the Project. In addition, turning lanes along Mamalahoa Highway into the Project are proposed to remove vehicles from the high-speed through movements along the highway. Acceleration lanes along Mamalahoa Highway for vehicles exiting the South Project Access are recommended at this intersection to reduce conflicts for exiting vehicles and provide adequate distance for vehicles to accelerate to posted speeds along Mamalahoa Highway. A traffic signal is not expected to warrant at this intersection with the recommended acceleration lanes.

[8] Waikoloa Road/Project Connector Road

- Provide southbound left-turn and right-turn lanes out of the Project Connector Road.
- Provide an eastbound left-turn lane into the Project Connector Road.
- Provide a westbound right-turn deceleration lane into the Project Connector Road.
- Provide southbound left-turn and right-turn acceleration lanes along Waikoloa Road.

The Project Connector Road is proposed for construction for build-out of the Project by 2028. Exclusive left-turn and right-turn lanes out of the Project Connector Road are recommended to reduce delays for vehicles exiting the Project. In addition, turning lanes along Waikoloa Road into the Project are proposed to remove vehicles from the high-speed through movements along the roadway. Acceleration lanes along Waikoloa Road for vehicles exiting the Project Connector Road are recommended at this intersection to reduce conflicts for exiting vehicles and provide adequate distance for vehicles to accelerate to posted speeds along Waikoloa Road. A traffic signal is not expected to warrant at this intersection with the recommended acceleration lanes.

7.3.4 Future Year 2028 with Mitigation

[4] Waikoloa Road/Paniolo Avenue/Pua Melia Street

- Construct an additional eastbound left-turn lane.
- Construct an exclusive westbound right-turn lane.

With the proposed traffic signal at this intersection, additional capacity improvements are anticipated by Future Year 2028. An additional exclusive eastbound left-turn lane and an exclusive westbound right-turn lane into Waikoloa Village are expected to provide adequate capacity at the intersection. As noted previously, regional developers in the area may be required to pay pro-rata share contributions to construct improvements at this intersection.

8. REFERENCES

1. American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2011.
2. Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2009.
3. Institute of Transportation Engineers, Trip Generation, 10th Edition, 2017.
4. Transportation Research Board, Highway Capacity Manual, 6th Edition, 2016.

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Appendix E

Preliminary Engineering Report

PRELIMINARY ENGINEERING REPORT AND DRAINAGE STUDY
NAKAHILI

WAIKOLOA, ISLAND OF HAWAI'I, HAWAI'I
TMK: (3) 6-8-002: 005, 006, 028, 029, 030

DRAFT

January 25, 2019

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PRELIMINARY ENGINEERING REPORT
AND DRAINAGE STUDY
NAKAHILI

Waikoloa, Island of Hawai'i, Hawai'i

TMK: (3) 6-8-002: 005, 006, 028, 029, 030

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January 25, 2019

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PRELIMINARY ENGINEERING REPORT
AND DRAINAGE STUDY
FOR
NAKAHILI

I. INTRODUCTION

The purpose of this report is to provide an overview of the preliminary civil engineering design and to analyze existing drainage conditions for the proposed Nakahili project. This report evaluates the existing site conditions and presents proposed drainage, water, wastewater, and other site improvements needed to meet County of Hawaii Standards.

II. PROPOSED PROJECT

A. LOCATION

The Nakahili site is located in Waikoloa, Hawaii on Hawaii Island and is identified by Tax Map Key (TMK) numbers: (3) 6-8-002: 005, 006, 028, 029, and 030. The site is situated on the western side of Mamalahoa Highway, also known as Hawaii Belt Road, and northwest of Waikoloa Road. The site is bordered by land zoned: 1) Agricultural to the north and south; and 2) Open to the west. Mamalahoa Highway borders the site on the east. The total site is approximately 1,558 acres. Refer to Exhibit 1 for the Location and Vicinity Map and Exhibit 2 for the Tax Map Key Plan.

B. PROJECT DESCRIPTION

Nahahili will be a workforce family agricultural community that will include: 1) farm dwellings on agricultural lots; 2) a small neighborhood commercial “village” area with multi-family rental apartments, limited retail and light industrial uses, and a small wastewater treatment facility to service the neighborhood commercial area and any single-family (SF) farm dwellings within 1,000 feet of any well sites; and 3) two parks: a) a community green for community activities

and events adjacent to the village area; and b) an approximately 29-acre regional park. Community infrastructure will be provided on-site, including water wells, water tanks, a small wastewater treatment facility to serve the village area and any farm dwellings located within a 1,000-foot radius of a well site, and several large detention basins. Refer to Exhibit 3 for the Conceptual Site Plan.

Within Nakahili, Work Force Developers LLC proposes to develop:

- Approximately 705 agricultural lots approximately 1 acre in size for single-family farm dwellings;
- Approximately 153 agricultural lots ranging from approximately 2 to 5 acres in size for single-family farm dwellings;
- Approximately 300 multi-family rental apartments in a neighborhood commercial village area;
- Limited retail and light industrial uses in the neighborhood commercial village area; and
- 2 parks: a community green adjacent to the village area; and an approximately 29-acre regional park in the lower (makai) central area.

For the purpose of this report and ensuring that the proposed infrastructure is adequately sized, it is assumed that:

- Future agricultural lot owners, at their own discretion and expense, may elect to build an accessory dwelling unit (ADU) on their agricultural lot as may be permitted and limited under Chapter 205, Hawaii Revised Statues and Section 25-5-67(c), Hawaii County Code. While it is unlikely that all homeowners would elect to build an ADU on their lot and it cannot be known as to when any homeowner may choose to build an ADU, to analyze the potential impact of ADUs build out of the ADUs are assumed to be on: 1) half of the agricultural lots by 2038; and 2) the other half by 2058.
- The project will be developed in eight phases:

Phase 1:

- Approximately 193 acres
- Includes 75 multi-family rental apartments, 105 single-family farm dwelling units (158 total including potential ADUs), 20,000 square feet of commercial space, 3 acres of self-storage

Phase 2:

- Approximately 152 acres
- Includes 75 multi-family rental apartments, 105 single-family farm dwellings (158 total including potential ADUs), 20,000 square feet of commercial space

Phase 3:

- Approximately 140 acres
- Includes 75 multi-family rental apartments, 115 single-family farm dwellings (172 total including potential ADUs)

Phase 4:

- Approximately 300 acres
- Includes 75 multi-family rental apartments, 124 single-family farm dwellings (186 total including potential ADUs), 6 acre community green, 29 acre regional park

Phase 5:

- Approximately 140 acres
- Includes 101 single-family farm dwellings (152 total including potential ADUs)

Phase 6:

- Approximately 140 acres

- Includes 90 single-family farm dwellings (135 total including potential ADUs)

Phase 7:

- Approximately 140 acres
- Includes 100 single-family farm dwellings (150 total including potential ADUs)

Phase 8:

- Approximately 140 acres
- Includes 118 single-family farm dwellings (177 total including potential ADUs)

In general, site work will include mass grading the roadways, multi-family, and commercial areas; construction of buildings, parks, and roadways; and installation of utility services including water, sewer, drainage, underground electrical, television, and cable.

III. EXISTING CONDITIONS

A. TOPOGRAPHY AND SOIL CONDITIONS

The project site generally slopes in a northwest direction with an average slope of approximately 8 to 12 percent. There is a slight undulation between the drainage path low points and mild ridge high points. Elevations range from approximately 1880 feet to 2640 feet mean sea level (msl) with the highest elevation located near the center of the east boundary of the project site.

The offsite land east of Mamalahoa Highway slopes toward the project site and also contributes runoff. This offsite area has topography similar to that of the onsite areas, with undulations and slopes ranging from ten to fifteen percent as it rises along the lower flanks of Mauna Kea. Mamalahoa Highway itself alternates between a cut condition at existing ridges, and a fill condition at existing gulches or depressions.

The Natural Resource Conservation Service (NRCS) soil types found in the proposed project area are Waikaloa-Puu Pa complex 2 to 10 percent slopes,

Waikaloa-Puu Pa complex 10 to 20 percent slopes, Waikaloa medial very fine sandy loam 2 to 10 percent slopes, Waikaloa medial very fine sandy loam 10 to 20 percent slopes, and Hapuna-Waikui-Lalamilo complex 0 to 20 percent slopes. Approximately 95 percent of the onsite soils are comprised of the Waikaloa-Puu Pa Complex. The Hapuna-Waikui-Lalamilo Complex is located within the northwest corner of the project site which makes up four percent of the onsite soils. The very small remaining portion of the site is comprised of Waikaloa medial very fine sandy loam which is located along the southern border of the project site. Refer to Exhibit 4 for the Soils Map.

The Waikaloa-Puu Pa Complex is made up of two sub-soils which 70 percent are Waikaloa and 28 percent are Puu Pa. According to the NRCS Soil Survey, a representative soil profile of Waikoloa consists of a 25 inch thick layer of median very fine sandy loam, flowed by a 25 inch thick layer of silty clay loam, underlain by approximately 15 inches of sandy loam. Bedrock is typically found at a depth of 60 inches. Permeability in Waikaloa soils is moderate. The Hydrologic Soil Group (HSG) for runoff is Group B, indicating a very well-drained soil. According to the NRCS, a representative soil profile of Puu Pa consists of 40 inches of cobbly median sandy loam underlain with 10 inches of cobbles, and hard bedrock starting at a depth of 50 inches. Permeability in Puu Pa soils varies from very high at the surface to low to moderately low at the underlying rock. The HSG for runoff is group A, indicating a very well-drained soil.

Hapuna-Waikui-Lalamilo Complex is located within the northwest corner of the project site and makes up about 4 percent of the site. The complex is comprised of 35 percent Hapuna, 35 percent Waikui, and 20 percent Lalamilo. According to the NRCS Soil Survey, a representative soil profile for Hapuna soils consists of 12 inches of cobbly medial silt loam, underlain with five inches of cemented material, followed by 40 inches of cobbly medial sand, with a 20 inch thick layer of bedrock. Permeability in Hapuna soils is rapid in the soil and very slow in the petrocalcic horizon with hydrophobic conditions in the surface that can reduce infiltration. The HSG is Group D, indicating a well-drained soil. Waikui soils have a representative soil profile of a 47 inch thick layer of cobbly medial silt loam, with bedrock encountered starting at 40 inches deep spanning to a depth of more than 60 inches. Wakui soils have rapid permeability in the soil however;

hydrophobic conditions in the surface can reduce infiltration. The HSG is Group A, indicating a well-drained soil. Lalamilo soils have a representative soil profile of a 37 inch thick layer of sandy loam underlain with 26 inches of medial silt loam, with a two inch layer of strongly cemented material at the bottom of the soil profile. These soils have moderately rapid permeability in the soil and very slow permeability in the petrocalcic/duripan horizon. Hydrophobic conditions in the surface of this soil type can also reduce infiltration. Lalamilo soils are well-drained and are part of HSG Group A.

Waikoloa medial very fine sandy loam is located on the southern border of the project site and makes up about 1 percent of the site. According to the NRCS Soil Survey, a representative soil profile consists of 25 inches of medial sandy loam, followed by a 25 inch thick layer of medial silty clay loam, underlain with a 15 inch thick layer of medial sandy loam. Permeability in Waikoloa medial very fine sandy loam soils is moderately high to high. The HSG is Group B, indicating a very well-drained soil. See Exhibit 4 for the Soil Map.

The site vegetation consists of moderate to sparse grasses, weeds, and low brush. Many rocks and boulders are spread throughout the ground surface. Areas of bare ground can also be found on the site. The project area also contains some existing dirt roads throughout the site.

B. CLIMATE AND RAINFALL

The climate in the vicinity of Waikoloa is relatively sunny and warm, with average temperatures varying from a low of 66 degrees Fahrenheit in the winter to a high of 82 degrees in the summer. Waikoloa is exposed to prevailing trade winds that come from the northeast direction while the Kona winds come from the southwest.

With an annual rainfall of approximately 19.2 inches, the site is considered to be arid/semi-arid. The rainfall amounts increase in the mauka direction, as the offsite areas mauka of Mamalahoa Highway have approximately 24.7 inches of annual rainfall and are considered to be semi-arid. In terms of rainfall seasonality, the project area is considered to have mild seasonal variation

with fairly low season fluctuation compared to other locations in Hawaii. Overall the area appears to be quite dry based on vegetation and ground cover.

C. INFRASTRUCTURE

1. Roadways and Access

The site has four unimproved dirt access points off of Mamalahoa Highway and one access through the neighboring parcel to the southwest, off of Waikoloa Road. All the access ways are currently gated, have a rough surface condition, and experience infrequent use. There is currently no onsite parking.

Mamalahoa Highway runs along the east end of the site and is a two-lane State arterial highway with one lane in each direction and an un-curbed shoulder. The highway has a posted speed limit of 50 miles per hour (mph) and provides access between Waimea and Kailua-Kona.

Waikoloa Road is a two-lane collector roadway which extends makai from Mamalahoa Highway, providing a connection to Queen Kaahumanu Highway. The roadway has one lane in each direction, no curbs, and a posted speed limit of 55 mph. It serves as a primary access-way for the Waikoloa Village development where it turns into a four-lane collector roadway with a posted speed limit of 35 mph.

2. Drainage

The entire site is currently undeveloped and has no onsite drainage infrastructure. The runoff generally sheet flows overland from the east portion of the site to the west portion of the site and concentrates into several minor dry gulches. See Exhibit 5 for the Existing Conditions Drainage Area Map and Exhibit 6 for the Offsite Drainage Area Map.

Based on the receiving gulch and the downstream roadway culvert that the runoff flows into, the site is divided into four watersheds. All gulches are tributaries, draining into Auwaiakeakua Gulch. Existing Culvert “1” is located at Paniolo Avenue in Waikoloa Village, approximately 0.3 miles north of the Waikoloa Road intersection. This

culvert consists of two 10' x 8' concrete box culverts that receive runoff from Gulch "1". Existing Culvert "2" is located at Waikoloa Road, approximately 0.9 miles east of the Paniolo Avenue intersection. This culvert consists of two 8' x 5.5' arched corrugated metal culverts that receive runoff from Gulch "2". Existing Culvert "3" consists of two 42-inch diameter corrugated metal pipes and is located along Waikoloa Road, approximately 1.9 miles away from the Waikoloa Road and Mamalahoa Highway intersection. This culvert receives runoff from Gulch "3". Existing Culvert "4" receives runoff from the south and southeast portions of the site through Gulch "4" and is located approximately 1.75 miles away from the Waikoloa Road and Mamalahoa Highway intersection. This culvert is a 90-inch arch and made of corrugated metal.

The entire Auwaiakeakua Gulch watershed is 68.93 square miles in size and has an overall 100-year flow of 10,500 cubic feet per second (cfs). The majority of the stormwater stays in the tributaries and gulches until it reaches the area just makai of Queen Kaahumanu Highway. Once the stormwater reaches Queen Kaahumanu Highway, the gulches become undefined and disperse runoff over a wide area located makai of Queen Kaahumanu highway. According to the FEMA Flood Insurance Study number 155166V001B, as these gulches become undefined toward the makai regions, shallow flooding conditions can occur.

The mauka offsite drainage areas that flow onto the site consist of over 4,455 acres and generates approximately 3,447 cfs of runoff. The runoff flows into the same four tributaries of Auwaiakeakua Gulch as the onsite drainage areas, ultimately flowing into the same four existing culverts that are mentioned above. Each of the onsite watersheds receive varying amounts of storm water runoff, with drainage areas E-1 and E-3 receiving significant amounts of offsite runoff.

The County of Hawaii stormwater rules state that drainage areas less than 100 acres are to be designed and analyzed for the 50-year storm. Drainage areas exceeding 100 acres are designed to the 100-year

storm. A summary of the hydraulic analysis for both the onsite and offsite existing conditions are summarized in Table 1 below. The detailed drainage calculations can be found in Appendix A.

Table 1: Existing Conditions, 50 and 100-Year Runoff

Drainage Area	Area (ac)	Existing Q 50 (cfs)	Existing Q 100 (cfs)	Flows To
Drainage Area E-1	183.06	218.81	300.67	2- 10'x8' Conc. Box Culverts
Drainage Area E-2	994.84	1,097.74	1,509.08	2- 8'x5.5' CMP Arch Culverts
Drainage Area E-3	266.68	251.11	345.38	2- 42" Dia. CMP Culverts
Drainage Area E-4	118.79	205.64	281.39	90" CMP Arch Culverts
Onsite Total	**1,563.37**	**1,828.74**	**2,512.50**	
Drainage Area O-1a	323.31	225.63	315.46	Not Verified
Drainage Area O-1b	2,131.75	999.26	1,407.70	Not Verified
Drainage Area O-2a	210.34	160.73	226.95	10'x6' Conc. Box Culvert
Drainage Area O-2b	78.74	62.52	69.29	36" Dia. Conc. Culvert
Drainage Area O-2c	83.53	67.83	75.18	24" Dia. Conc. Culvert
Drainage Area O-2d	7.82	8.40	9.34	24" Dia. Conc. Culvert
Drainage Area O-3a	577.58	356.63	503.06	8'x5.5' Conc. Box Culvert
Drainage Area O-3b	45.55	40.63	45.10	30" Dia. Conc. Culvert
Drainage Area O-4a	2.34	2.75	3.05	36" Dia. CMP Culvert
Drainage Area O-4b	49.59	45.72	50.78	36" Dia. CMP Culvert
Drainage Area O-4c	944.78	525.82	741.35	7.7'x6.6' Conc. Box Culvert
Offsite Total to Existing Culverts	**4,455.34**	**2,495.93**	**3,447.25**	

3. Water

The site is currently undeveloped and there is no water service to the site. Hawaii Water Service provides water service within the vicinity of the site, including servicing Waikoloa Village.

4. Wastewater

The proposed project site is not served by a wastewater collection system and a new collection system will be required as part of the development. The nearest treatment plants are both located at Waikoloa Village, with the nearest one being almost six miles away from the project site. Due to the distance between the project site and the nearest treatment plant, as well as the required upgrades to expand capacity at the existing plant, it is not feasible to connect to the Waikoloa Village Plant.

D. FLOOD ZONE

The site is within the FEMA Zone X floodway area which is an area determined to be outside the 0.2% annual chance floodplain. Zone X is not subject to inundation by the 100-year (one percent annual chance) floods. Most of the developed parts of the site will be within the unshaded Flood Zone X, which are areas determined to be outside the 500-year (0.2 percent annual chance) floodplain.

Flood zone classifications are based on the State of Hawaii, Department of Land and Natural Resources, Flood Hazard Assessment Tool as the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) is currently unpublished. Refer to Exhibit 7 for the Flood Zone Map.

IV. PROPOSED IMPROVEMENTS

A. ROADWAYS AND ACCESS

There are three proposed access points, two from Mamalahoa Highway and one from Waikoloa Road. The two access points from Mamalahoa Highway would provide direct access to the site. The proposed access point from

Waikoloa Road would require improving an existing dirt road through the neighboring parcel to the southwest and obtaining an easement over the property which Work Force Developers intends to pursue. Refer to Exhibit 3 for the Conceptual Site Plan.

Two spine collector roads are proposed to run mauka to makai through this portion of the development. The collector roadway is planned to be a privately owned, two-lane undivided street with a 50-foot width Right-of-Way (ROW). The road will have wide gravel shoulders and drainage swales on both sides.

Within the neighborhood commercial "village area," the roadway will also be privately owned, consisting of a two-lane undivided street with a 50-foot width ROW. The road will also incorporate the use of wide gravel shoulders as a multi-use path and grassed swales on both sides. Within the neighborhood commercial "village area" area, it is also recommended to incorporate an additional 16 feet or ROW width to provide parking for residents and retail customers.

All other roadways within the development will be privately owned. These roadways will consist of two-lane undivided street with a total ROW width of 40-feet. The road will have widened gravel shoulders and grassed swales along both sides. For Roadway Typical Sections, refer to Exhibit 8.

Offsite roadway improvements will be required as a result of this project and should be constructed as each access to the site is constructed. The first access to be provided is for the north portion of the site from Mamalahoa Highway. The North Project Access Road intersection will be installed at the start of the project during Phase 1 and will require the addition of a dedicated southbound right-turn lane and a northbound dedicated left-turn lane. As a result, Mamalahoa Highway will need to be widened by 28 feet for approximately 2,500 LF of roadway within the vicinity of that intersection. The second access to the site will also be provided along Mamalahoa Highway at the South Project Access Road. This access is anticipated to be constructed during Phase 5 of the project. At that time, another 2,500 LF of Mamalahoa Highway will need to be widened by

approximately 28 feet at the South Project Access, providing improvements similar to those constructed at the North Project Access.

In the future, a Project Connector Road may be constructed which would connect the site to Waikoloa Road (improvement of an existing dirt road through the neighboring parcel to the southwest). Similarly to the other two intersections, this would require Waikoloa Road to be widened by approximately 28 feet for 2,100 LF within the vicinity of the Project Connector Road/Waikoloa Road intersection. The widening would provide a dedicated westbound right-turn deceleration lane and a dedicated east-bound left-turn pocket. During the course of the project, it is anticipated that a traffic signal will be warranted at the Mamalahoa Highway/North Project Access Road intersection. According to the Traffic Impact Analysis Study, this signal is expected be warranted by the end of Phase 4.

B. GRADING

The proposed grading improvements discussed herein are based on a preliminary civil engineering evaluation. A more detailed engineering design and analysis will be necessary during the design phase of the project.

The project will require both excavation and embankment for the construction of new roadways, building pad areas, and drainage structures. Overall, the site will be graded to maintain existing drainage patterns on the site and avoid any grading within the gulches. Grading will be minimized wherever possible due to the shallow depth to rock, however the site must be graded to provide consistent slopes for the roadways and level pads for the future building locations. Pads will be graded for the buildings that are located within the neighborhood commercial “village area” area; however, pads for the single family farm dwellings will not be graded with the site work.

The grading of the site will be phased with the site development phases. See Exhibit 3 and below for the phasing and a description of the grading by phase.

- <u>Phase 1:</u>

3 acres of multi-family rental apartments, 3 acres of self-storage, 20,000 square feet of commercial, upper water tank site, temporary wastewater treatment plant site, stormwater detention basins

- Phase 2:

  3 acres of multi-family rental apartments, 20,000 square feet of commercial

- Phase 3:

  3 acres of multi-family rental apartments, middle water tank site

- Phase 4:

  3 acres of multi-family rental apartments, 5.9 acres of community green, 28 acres of Regional Park

Phases 5 through 8 consist solely of single-family farm dwellings, which will not be graded with the site work.

C. DRAINAGE

The site will continue to be divided into four watersheds similar to the existing conditions. The project site in the existing condition generates approximately 2,513 cfs of runoff and the project site proposed condition generates approximately 3,316 cfs of runoff based on a 100-year design storm. In general, the proposed drainage concept addresses the runoff flowing into Gulches 1, 3, and 4 to prevent the quantity of runoff generated by the proposed conditions from exceeding that of the existing conditions. The runoff from the central portion of the site, Drainage Area P-2 (DA P-2), will be managed by retention systems to prevent a runoff increase in Gulch 2.

The amount of runoff generated by offsite drainage areas that flow through the site is fairly significant. To address this, it is recommended that the natural drainage ways be respected and utilized in this manner throughout the site. Table 2 below shows proposed runoff generated by the project site.

Table 2: Proposed, 50 and 100-Year Runoff

Drainage Area	Area (ac)	Proposed Q_{50} (cfs)	Proposed Q_{100} (cfs)	Flows to
Drainage Area P-1	132.99	202.04	280.58	2- 10'x8' Conc. Box Culverts
Drainage Area P-2	1,096.24	1,789.80	3,554.78	2- 8'x5.5' CMP Arch Culverts
Drainage Area P-3	237.48	418.93	306.40	2- 42" Dia. CMP Culverts
Drainage Area P-4	96.74	140.52	162.74	90" CMP Arch Culverts
Onsite Total	**1,563.46**	**2,551.29**	**3,316.19**	
Drainage Area O-1a	323.31	225.63	315.46	Not Verified
Drainage Area O-1b	2,131.75	999.26	1,407.70	Not Verified
Drainage Area O-2a	210.34	160.73	226.95	10'x6' Conc. Box Culvert
Drainage Area O-2b	78.74	62.52	69.29	36" Dia. Conc. Culvert
Drainage Area O-2c	83.53	67.83	75.18	24" Dia. Conc. Culvert
Drainage Area O-2d	7.82	8.40	9.34	24" Dia. Conc. Culvert
Drainage Area O-3a	577.58	356.63	503.06	8'x5.5' Conc. Box Culvert
Drainage Area O-3b	45.55	40.63	45.10	30" Dia. Conc. Culvert
Drainage Area O-4a	2.34	2.75	3.05	36" Dia. CMP Culvert
Drainage Area O-4b	49.59	45.72	50.78	36" Dia. CMP Culvert
Drainage Area O-4c	944.78	525.82	741.35	7.7'x6.6' Conc. Box Culvert
Offsite Total to Existing Culverts	**4,455.34**	**2,495.93**	**3,447.25**	

Based on the conceptual plan, the total storage volume required for the site is approximately 120 ac-ft. The 120 ac-ft storage volume is to ensure the runoff flow rates as a result of the project do not exceed that of the existing condition. This total volume may be subject to change and will require closer analysis during design. The proposed drainage concept uses seven smaller retention basins throughout the site to capture and retain stormwater onsite, while minimizing the amount of developable land used for stormwater

management. Exhibit 9 shows the proposed drainage concept and the proposed locations of the retention basins.

Gulch "1", which is located along the north boundary of the site, and Gulch "2", which is located along the south boundary of the site, are depicted as intermittent streams on the USGS topographic maps. Any disturbance within the flow line of these mapped gulches will likely require a 404 permit from the US Army Corps of Engineers and a 401 Water Quality Certification from the State of Hawaii Department of Health Clean Water Branch. For these reasons, it is recommended that these two gulches be left undisturbed and in their natural state.

Runoff water quality treatment and provisions are not required by Hawaii County. The overall proposed drainage concept intends to incorporate water quality best management practices (BMPs) where feasible. Examples of potential water quality BMPs that could be included are vegetated buffers/filter strips, extended detention or retention basins, grass swales, and infiltration basins.

D. EROSION CONTROL

Temporary erosion control measures will be incorporated during construction to minimize soil loss and erosion hazards. Best Management Practices will include temporary sediment basins, temporary diversion berms and swales to intercept runoff, silt fences, filter socks, dust fences, slope protection, stabilized construction entrances and truck wash-down areas. Periodic water spraying of loose soils will be employed to minimize air-borne dirt particles. To limit the amount of exposed soils at any period of time, phased grading will be incorporated into the project plans. Work Force Developers LLC will also need to apply for and meet the requirements of a National Pollution Discharge Elimination System (NPDES) permit.

E. WATER SYSTEM

With no existing tank available to provide a water source for Nakahili, a new source of water for the project is being pursued, and a separate study for the source water is being prepared.

For the purposes of this PER, it is assumed that source water will be available for the project. The following sections discuss proposed improvements for the storage and transmission of the water for the project.

1. Water Demand

The projected average day water demands were estimated based on a combination of DWS's Water System Standards (WSS) and an adjusted version of the estimated current Waikoloa Village usage rates, as follows:

- Multi-Family Rental Apartments 400 gpd/unit
- Farm Dwellings
  - o 1 Acre Lot 800 gpd/unit
    - ▪ 1 Acre Lot ADU 400 gpd/unit
  - o 2 to 4 Acre Lot 2,100 gpd/unit
    - ▪ 2 to 4 Acre Lot ADU 400 gpd/unit
  - o 5+ Acre Lot 3,3450 gpd/unit
    - ▪ 5+ Acre Lot ADU 400 gpd/unit
- Regional Park and Village Green 4,000 gpd/acre
- Commercial/Residential Mix 4,000 gpd/acre
- Light Industrial 4,000 gpd/acre

The maximum day demand and peak hour demands were calculated by multiplying the average day demand by 1.5 and 5.0, respectively, per the WSS. Appendix B shows a breakdown of the projected water demands.

2. Water Service Levels

Due to the significant elevation range of the project, there will be five pressure zones throughout the site. The determination of each pressure zone boundary was based on the assumed location of the well site being at the highest point of the north portion of the site. The lowest

elevation of each pressure zone was determined in accordance with the WSS requirement of a maximum static pressure of 125 psi. The highest elevation of each pressure zone was based on providing a minimum static pressure between 50 psi and 60 psi. Providing a static pressure of 50 psi to 60 psi should be adequate to meet the WSS requirement of providing a minimum residual pressure of 40 psi in the system during peak hour conditions.

- Zone 1 – Pressurized Upper System Service Area

  The Pressurized Upper System water service area of Nakahili ranges in elevation from 2,600 feet msl to 2,530 feet msl. Zone 1 will be serviced by the upper tank, which is located at an elevation of 2,650 feet msl.

  The Upper Tank has an approximate bottom elevation of 2,650 feet msl, which would not provide enough pressure to service Zone 1 via gravity. As a result, a booster pump system will be required to boost the pressure to provide water service within this first pressure zone.

  The first tank would be constructed to serve all the areas within Phase 1 of the development, as well as portions of the other remaining phases.

- Zone 2 – Upper Level Gravity System Service Area

  Zone 2 ranges from 2,530 feet msl to 2,380 feet msl and will be served by the Upper Tank through a gravity system. The majority of Phase 1 of the development falls within this service area. This entire zone will be served through a gravity line from the Upper Tank.

- Zone 3 – Mid-Level Gravity System Service Area

  Zone 3 ranges 2,380 feet msl to 2,230 feet msl. Lots located within Zone 3 located in the North portion of the site will be served by the Upper Tank temporarily until the Mid-Level tank is installed. Due to the large elevation difference between the Upper

Tank and Zone 3, a temporary by-pass pressure reducing valve (PRV) would be required to decrease the pressure, ensuring the maximum static pressure does not exceed 125 psi. The PRV would be located at an elevation of 2,380 feet msl to temporarily provide water service to the North portion of Zone 3.

A Mid-Level Tank will be constructed during Phase 5 of the project with a bottom elevation of 2,520 feet msl. Once this Mid-Level Tank is constructed, the majority of the Mid-Level Gravity System Service area, including the North portion of the site, will receive water service from this tank. Any portion of the site located within this zone that was previously connected to the Upper Tank will be connected to the Mid-Level Tank at that point. Due to the proposed road layout and an attempt to minimize gulch crossings, there is a portion of this service zone located south of Gulch 3 that will be served by the Upper Tank through a PRV installed at an elevation of 2,500 feet msl. All portions of Zone 3 located north of Gulch 3 are to be served by the Mid-Level Tank.

- Zone 4 – Low Level Service Area

  Service Zone 4 of Nakahili ranges in elevation from 2,230 feet msl to 2,060 feet msl. Zone 4 will ultimately be served by gravity from the Mid-Level Tank. However, due to the large elevation difference between the Mid-Level Tank and the lowest elevation of Zone 4, a PRV is required to decrease the pressure such that the maximum static pressure does not exceed 125 psi. Two PRV's should be installed at an approximate elevation of 2,230 feet msl to provide water service to all of Zone 4.

- Zone 5 – Low-Low Level Service Area

  Service Area Zone 5 of Nakahili ranges in elevation from 2,060 feet msl to 1,880 feet msl. Zone 5 will ultimately be served by the Mid-Level Tank. Similar to Zone 4, this zone will require the installation of a PRV to decrease the pressure such that it does not exceed 125 psi. The PRV should be installed at an

approximate elevation of 2,060 feet msl. See Exhibit 10 Proposed Water System for the delineation of each pressure zone discussed above.

3. Water Storage

New storage for this development will be required. County of Hawaii's Department of Water Supply WSS includes three criteria for sizing reservoirs, as follows:

1. Meet maximum day consumption. Reservoir full at the beginning of the 24-hour period with no source input to the reservoir.
2. Meet maximum day rate plus fire flow for a duration of fire. Reservoir 3/4 full at start of fire, with credit for incoming flow from pumps, one maximum size pump out of service.
3. Minimum size reservoir shall be 0.1 MG (million gallons). Reservoir size shall be as specified in Section 105.10 – RESERVOIR, Subsection A – size.

Where there are two or more reservoirs serving the same system, the design shall be made on the basis of combined protection provided by all facilities available.

The standard sizes allowed by DWS are 0.10 MG, 0.20 MG, 0.25 MG, 0.30 MG, 0.50 MG, and 1.0 MG. After 1.0 MG, sizes should be in multiples of 0.50 MG.

The required fire flow is based on the WSS Table 100-19 and varies throughout the site. See Table 3 for a breakdown of the fire flow requirements based on land use used for sizing purposes.

Table 3: Fire Flow Requirements

Land Use	Flow (GPM)	Duration (HRS)
PUD Townhouse and Low Rise Apartments	1,500 gpm	1
Neighborhood Businesses, Small Shopping Centers, Commercial/Industrial Areas	2,000 gpm	2
10,000 SF or Larger Lots	500 gpm	0.5

The storage requirements for the entire project site based on each pressure zone are discussed below. For water tank and sizes, as well as a schematic of the system, see Exhibits 10 to 12.

- Zone 1 (Upper Pressurized System)

  At the start of the project, the construction of a 1.0 MG tank will be required. This tank will be installed at a ground elevation of 2,650 feet msl and will ultimately serve all of Zones 1 and 2, as well as a portion of Zone 3 located south of Gulch 3.

  Due to minimum water pressure requirements for pressurized service areas, a booster pump system will be installed during the first phase of development to provide water service to all areas that fall within Zone 1. This booster pump system installation must be constructed at the start of Phase 1 since a portion of the Multi-Family rental apartments, the Self-Storage Facility, and some of the farm dwellings to be constructed with Phase 1 are located within this upper pressurized zone.

  The total projected maximum daily water demand for Zone 1 is 434,000 gpd. Zone 1 includes portions of the site to be constructed with Phases 1 through 4, and 6. For the tank serving the upper pressurized zone, the maximum daily consumption requirements took precedence over fire flow requirements so at a minimum, a 0.5 MG tank is required to serve Zone 1. Although a 0.5 MG tank would provide sufficient capacity for this this area alone, a significant portion of Phase 1 of the project is located within Zone 2. As such, it is recommended that the Upper tank has 1.0 MG of storage to serve both the pressurized and gravity portions of the site located within Phase 1.

- Zone 2 (Upper Gravity System)

  Zone 2 can be served entirely by the Upper Tank via gravity due to the elevation of the Zone 2 Service Area. The total maximum daily water demand for Zone 2 is 324,000 gpd. The

combined demand required for Zones 1 and 2 is approximately 758,000 gpd, suggesting that the installation of a 1.0 MG Upper Tank will provide sufficient capacity to serve this area.

- Zone 3 (Mid-Level Gravity System)

  Zone 3 has a total maximum daily water demand of 491,300 gpd. Before Phase 5 of the project site is built, a second 1.0 MG Mid-Level tank should be installed at an approximate elevation of 2,500 feet msl. This tank is ultimately intended to serve Zones 3 through 5 via gravity and 4 PRV's, and will utilize the excess capacity in the Upper Tank to provide enough storage for these zones.

  There are portions of the site to be developed during Phase 1 that are located within Zone 3. In an effort to defer the installation of a second 1.0 MG tank at the start of Phase 1, it is recommended that a temporary bypass PRV be installed near the future Mid-Level tank site. The installation of this temporary bypass PRV will allow portions of the site built during Phases 1 through 4 to temporarily receive water service from the Upper Tank through a combination of gravity and PRV's. Once the Mid-Level tank is installed, the water main serving Zones 3, 4, and 5 will be connected to the Mid-Level tank.

  There are a number of natural gulches running throughout the site and to avoid costly permitting and construction, all construction through the gulches should be avoided where possible. There is a portion of Zone 3 located south of Gulch 3. In order to serve this part of the site, it is recommended that it is served from the Upper Tank and that a PRV is installed at an approximate elevation of 2,380 feet msl.

- Zone 4 (Low-Level Gravity System)

  Zone 4 has a maximum daily demand of 348,200 gpd. As mentioned previously, this zone will ultimately be served by the

Mid-Level tank. To provide water service for this zone through the Mid-Level Tank, the installation of one PRV will be required during Phase 2 and another one will be required during Phase 3. Both PRVs will be installed at an approximate elevation of 2,230 feet msl.

The portions of Zone 4 constructed prior to the construction of the Mid-Level tank will receive service from the Upper Tank until the Mid-Level tank is constructed. Once the Mid-Level tank is constructed, the connection of the water main from the temporary bypass PRV to the Mid-Level tank will allow Zone 4 to receive water service from the Mid-Level tank.

- Zone 5 (Low-Low Level Gravity System)

  Zone 5 is the located at the lowest part of the site and the entire portion of the site located within Zone 5 will ultimately be served by the Mid-Level water tank. Zone 5 has a maximum daily demand of 483,900 gpd. A PRV should be installed at an approximate elevation of 2,060 feet msl due to the elevation difference from the Mid-Level tank.

  Similar to Zones 3, 4, and 5, any portions of Zone 5 constructed during Phases 1 through 4 will temporarily receive its water from the Upper Tank through the temporary bypass PRV until the Mid-Level tank is constructed. Once the Mid-Level tank is constructed, all of Zone 5 regardless of phase will receive its water from the Mid-Level Tank.

  See Exhibit 10 through 12 for the tank and PRV locations and elevations.

4. Water Transmission/Distribution System

Requirements for pipeline sizing are included in the WSS, and are as follows:

Pipelines shall be sized to meet the following requirements:

1. Maximum daily flow plus fire flow with a residual pressure of 20 psi at critical fire hydrant.

2. Peak Hour flow with a minimum residual pressure of 40 psi.

3. In determining the carrying capacity of the mains, the "C" values applied would be 110 for 8" and 12" pipes, and 120 for 16" and 20" pipes.

4. Maximum velocity in distribution main (without fire flow) is 6 feet per second.

5. Maximum velocity in distribution mains with fire flow shall be 10 feet per second.

6. Unless specified otherwise, maximum static or pumping pressure, whichever is greater, shall not exceed 125 psi.

The distribution waterlines would be located within the project roadways, and would be of ductile iron pipe, fire hydrants would be installed at a maximum of 300 foot intervals for non-single family areas, and at 600 foot intervals within agricultural lot farm dwelling areas. All sizes discussed below are based on conceptual sizes and will need to be reevaluated during the design phase should the conceptual plan change.

- Zone 1

At this time, the location of the source water for Nakahili is unknown and the size of the transmission main connecting the well to the onsite distribution system will be dependent upon the well location. The size of the transmission main will need to be determined once the well location is set.

New pressurized 12-inch distribution mains would be required for Phase 1. The new pressurized waterlines would be connected to the booster pump system and would serve the entire portion of the site located within Zone 1.

- Zone 2

Zone 2 will be served by gravity from the Upper Tanks, and will consist of 12-inch water distribution mains to the WWTP and the Mid-Level Water Tank Site due to the fire flow requirement of 2,000 gpm for those areas. The remaining portions of Zone 2 may be served by 8-inch distribution lines.

- Zone 3, 4, and 5

  A 12-inch transmission main would convey water from the Upper Tank to the Mid-Level Tank. All of the agricultural farm dwelling lots located within Zones 3, 4, and 5 can be served by 8-inch water lines.

F. WASTEWATER

A connection to the existing WWTP located at Waikoloa Village was considered. However, due to the distance from the site and the upgrades required to expand the available capacity at the Waikoloa Village WWTP, it was determined to be costly and an infeasible option. It is recommended that an onsite WWTP be constructed to provide sewer service to the neighborhood commercial "village" area. Wastewater needs for the farm dwellings on agricultural lots will be addressed with individual wastewater systems (IWS) with the exception of any farm dwellings located within 1,000 feet of the proposed well site per Department of Health (DOH) regulations. HAR 11-62, Table II in Appendix D states that individual wastewater systems consisting of a soil absorption system must have a minimum horizontal distance of 1,000 ft from any potable water sources serving public water systems.

1. Wastewater Design Flow

a. Wastewater Treatment Plant Flow

The build-out populations and projected wastewater flows for this multi-phase project is estimated based upon the number of units proposed and the *City and County of Honolulu Wastewater System Design Standards, July 2017.* The proposed neighborhood commercial village area consisting of the multi-family apartments, commercial spaces, and self-storage facility as well as any farm dwellings located within the

1,000-foot radius of the well site will be the only portions of the served by the proposed WWTP. The remaining portions of the site are to be served by IWS. Below is a discussion on the flow projections as related to the wastewater treatment plant. All portions of the site that will be served by an IWS are not considered in the calculations below.

During the first phase of the project, portions of the site to be served by the WWTP consists of 3 acres for multi-family rental apartments, 5 acres of farm dwellings, 0.46 acres for commercial use, and 3 acres for a self-storage facility. Per the wastewater flow standards, an estimated 70 gallons per capita per day (gpcd) for the multi-family homes, farm dwellings, and 15 gpcd for commercial spaces and the self-storage facility were used to determine the wastewater flow rates. The projected build-outs and flows for Phase 1 of the project are summarized in the following table.

Table 4: Phase 1 Flow Projections

Description	Area (ac)	Wastewater Contribution	Average Day Flow (gpd)	Design Average Flow (gpd)	Design Max Flow (gpd)	Design Peak Flow (gpd)
Multi-Family	**3**	**70 gpcd**	**14,700**	**22,050**	**44,100**	**53,100**
Farm Dwellings	**5**	**70 gpcd**	**4,200**	**6,300**	**12,600**	**27,600**
Commercial	**0.46**	**15 gpcd**	**975**	**3,250**	**5,688**	**7,068**
Self-Storage Facility	**3**	**15 gpcd**	**4,500**	**15,000**	**26,250**	**32,250**

For the second phase of the project, the portion of the site to be served by the WWTP includes 3 acres of multi-family rental apartments and 0.46 acres for commercial use. The projected build-outs and flows for Phase 2 of the project are summarized in the following table.

Table 5: Phase 2 Flow Projections

Description	Area (ac)	Wastewater Contribution	Average Day Flow (gpd)	Design Average Flow (gpd)	Design Max Flow (gpd)	Design Peak Flow (gpd)
Multi-Family	3	70 gpcd	14,700	22,050	44,100	53,100
Commercial	0.46	15 gpcd	975	3,250	5,688	7,068

During the third phase, 3 acres of multi-family housing will need to be served by the WWTP. The projected build-outs and flows for Phase 3 of the project are summarized in the following table.

Table 6: Phase 3 Flow Projections

Description	Area (ac)	Wastewater Contribution	Average Day Flow (gpd)	Design Average Flow (gpd)	Design Max Flow (gpd)	Design Peak Flow (gpd)
Multi-Family	3	70 gpcd	14,700	22,050	44,100	53,100

During the fourth phase, 3 acres for multi-family housing, 25 acres for farm dwellings, 5.9 acres of village green, and 28 acres for a regional park will need to be served by the WWTP. The projected build-outs and flows for Phase 4 of the project are summarized in the following table.

Table 7: Phase 4 Flow Projections

Description	Area (ac)	Wastewater Contribution	Average Day Flow (gpd)	Design Average Flow (gpd)	Design Max Flow (gpd)	Design Peak Flow (gpd)
Multi-Family	3	70 gpcd	14,700	22,050	44,100	53,100
Farm Dwellings	25	70 gpcd	35,000	52,500	105,000	180,000
Village Green	5.9	15 gpcd	1,328	N/A	N/A	N/A
Regional Park	28	15 gpcd	6,300	N/A	N/A	N/A

The sixth phase of the project will have 25 acres of farm dwellings that will be served by the WWTP. The projected build-outs and flows for Phase 6 of the project are summarized in the following table.

Table 8: Phase 6 Flow Projections

Description	Area (ac)	Wastewater Contribution	Average Day Flow (gpd)	Design Average Flow (gpd)	Design Max Flow (gpd)	Design Peak Flow (gpd)
Farm Dwellings	25	70 gpcd	63,000	94,500	189,000	264,000

The sizing of the permanent WWTP will be based on the ultimate wastewater flow generated by the portions of the site to be served by the WWTP. This includes all the flows per each phase that were outlined in Tables 4 through 8. For a summary of the ultimate wastewater flow anticipated, see Table 9 below.

Table 9: Ultimate Flow Summary

Flow	Gallons per Day (gpd)	Gallons per Minute (gpm)
Design Average Flow	116,840	81
Design Max Flow	228,310	159
Design Peak Flow	441,070	306

Portions of the site to be developed Phases 5 and 7 through 8 are not anticipated to generate any wastewater to be treated by the wastewater treatment plant so they were not included in the analysis of the WWTP. All parts of the site constructed during those phases will be served by an IWS.

b. Individual Wastewater Systems

Wastewater needs for the farm dwellings on agricultural lots will be addressed with IWS. The IWS will be in compliance with all State of Hawai‘i Department of Health (DOH) requirements, as provided under Hawai‘i Administrative Rules (HAR) Title 11, Chapter 62, Wastewater Systems (Wastewater System Rules). DOH and the Wastewater System Rules provide clear oversite and requirements for the installation and operation of IWS to ensure each system is installed and operated so that wastewater from wastewater systems do not contaminate or pollute water sources. As mentioned previously, to comply with these requirements, all farm dwellings located within 1,000 feet of the well site will be served by the WWTP.

The Wastewater System Rules also specifies that the “total wastewater flow into one individual wastewater system shall not exceed one thousand gallons, and one individual wastewater system shall not serve more than five bedrooms, whether they are in one

dwelling unit or two…" (see Section 11-32.61.1, HAR). For overall wastewater generation calculations, each non-ADU agricultural lot was assumed to have a total of 4 bedrooms per lot and each lot with an ADU was assumed to have a total of 5 bedrooms per lot.

Combined, the farm dwellings on the agricultural lots to be served through an IWS are expected to generate an average daily flow of 264,670 gpd of wastewater with a design peak flow of 4,271,010 gpd. Each lot is expected to generate an average daily flow of approximately 230 gpd per lot, assuming an ADU on half of all agricultural lots.

2. Wastewater System Synopsis

Wastewater generated by the first phase of Nakahili will be collected and transferred to a temporary WWTP, where the wastewater will be treated to State of Hawaii R-2 water standards. The treated and disinfected R-2 water will flow from the temporary treatment facility to one of two soil aquifer treatment (SAT) ponds for disposal or an underground leach field.

As the development proceeds, a new permanent wastewater Treatment Plant will be constructed in phases to accommodate the additional flows from future developments.

The permanent Wastewater Treatment Plant (WWTP) will produce effluent treated to State of Hawaii R-1 recycled water standards. The R-1 water will be pumped to a storage tank for the development's irrigation use for certain common areas and the regional park. Initially when flows are minimal, groundwater will be added to the storage tank when the R-1 recycled water supply is insufficient to meet the irrigation demands of the users. During wet weather periods there may be excess recycled water that will require disposal. The excess R-1 water passes will flow to a soil aquifer treatment (SAT) system

3. Treatment Plant Ownership and Operation

The wastewater system will be owned and operated by a private utility company regulated by the State of Hawaii Public Utilities Commission and the State of Hawaii Department of Health (DOH).

4. Wastewater Treatment Plant

a. Temporary Wastewater Treatment Plant

A temporary wastewater treatment plant will be sized for a design average daily flow of 66,860 gpd with a peak design flow of 173,106 gpd for Phase 1 and 2. A package Treatment Plant was selected as a cost savings alternative. The system would be operated and maintained by a certified WWTP operator and company. The WWTP facility should include a primary and a backup soil aquifer treatment basin for disposal of the effluent.

Although there is no planned use of the effluent from the temporary facility, it is recommended that the package WWTP be an aerobic biological unit that is capable of treating the wastewater to an R-2 effluent level. Aerobic treatment systems are widely used and are considered an industry standard for the production of reliable R-2 water. The system will consist of several processes that function together to produce a high quality effluent, including debris removal, aeration, clarification and biosolids recirculation. In addition, aerobic systems have a smaller footprint of the various biological treatment systems available and are able to produce a very consistent water quality as compared to wastewater treatment ponds and lagoons.

b. Permanent Wastewater Treatment Plant

The permanent WWTP is intended to be expandable to accommodate the projected build out of the development for portions of the site to be served by the treatment plant. The permanent WWTP will treat the wastewater to R-1 standards, allowing the effluent to be used for unlimited irrigation purposes.

The permanent WWTP will be sized for an average daily flow of 116,840 gallons per day with a peak design flow of 441,070 gallons per day. As Phase 3 begins, a packaged MBR system will be installed to accommodate the additional flows. If the flows from the existing WWTP are to be diverted to the permanent facility, the temporary WWTP will be decommissioned. It is anticipated that two packaged MBR systems will be required to treat the average daily flow as well as the peak flow from the existing portions of the project, should the flows be redirected to the permanent treatment plant.

Approximately 3-4 acres will be required to accommodate the equipment for the WWTP, irrigation reservoir, and secondary disposal using a soil aquifer treatment basin.

G. ELECTRICAL SYSTEM

The development is situated along Mamalahoa Highway in the vicinity of Hawaii Electric Light Company's (HELCO) existing Keamuku Switching Station and a HELCO 69 kV transmission line which runs north-to-south along the development's eastern boundary within the Mamalahoa Highway right-of-way.

At full build-out, the proposed development would add approximately 6 Mega Volt-Amperes (MVA) of load to HELCO's system. This projected load is a diversified demand load estimation which takes into consideration the fact that not all residences will be occupied during any given point in the day and, in addition, those units that are occupied will not be using the same amount of power at the same level at the same time. As currently planned, HELCO would likely need to a substation site, approximately 20,000 square feet in size, within the development parcels preferably along Mamalahoa Highway to avoid extension of the 69 kV line to far into the property.

To the extent practicable, an underground HELCO duct system consisting of 4-inch and 5-inch, concrete encased PVC conduits may be placed within the road right-of-way with handholes or manholes placed at intervals to allow for parcel utility laterals and for intersection utility extensions. Construction of the duct system will conform to Hawaii Administrative Rules (HAR) Chapter 6-73. As

an option, overhead utilities may be utilized where undergrounding is infeasible and/or cost prohibitive.

HELCO will require three or more switchgear easements for placement of their PME-9 switchgear which function as sectionalizing and protective devices for HELCO's distribution system. HELCO's main, unfused lines will terminate on these switchgear and smaller sized cables, also known as fused feeders will emanate from primary fuse terminations within the switchgear and provide service to the lots via two sets of distribution cables, along the subdivision roadways.

For maximum flexibility, HELCO's typical underground distribution cabling will be configured as a three-phase dual radial system. This allows HELCO to connect single-phase transformers or three-phase transformers to the same sets of cables while retaining redundancy in their system. In the event of a short circuit in one of the sets of cables, each transformer can be quickly reconnected to the remaining set of cables while HELCO works to repair the shorted set of cables.

At the commencement of the engineering design, HELCO will determine if single-phase transformers will be placed or if the individual lots will each have a transformer based on the lot's projected load. If HELCO determines that single phase transformers are to be placed and serves multiple lots, HELCO will require easements for these transformers. For electric service to the on-site water well, water pumping stations and wastewater facility, three-phase distribution lines will be required along the infrastructure roadways servicing as access roadways to these facilities.

H. TELECOMMUNICATION SYSTEM

Both Hawaiian Telcom (HTCO) and Charter Communications (Charter) are likely to require their service connection points from the existing utility pole line within the Mamalahoa Highway right-of-way along the eastern boundary of the parcel.

Although their respective overhead facilities within Mamalahoa Highway may not have sufficient capacity to provide service to the Development, both

Charter and HTCO will extend additional aerial facilities to provide service when the Development is constructed. Per HTCO's PUC approved tariff and Charter's DCA franchise, the off-site infrastructure costs are typically borne by the respective utility company based on the anticipated revenue from the Development.

Both Hawaiian Telcom (HTCO) and Charter Communications (Charter) have the capability to provide bundled telecommunications services i.e. telephone lines, cable television and broadband, via a fiber optic cable installation. Both companies will likely provide the underground infrastructure with fiber optic cables. Unless directed differently by the Developer due to infeasibility, provisions for both telecommunication utilities will be included in the underground infrastructure.

During the development of the engineering plans, both HTCO and Charter may request easements within the subdivision for fiber distribution hubs (HTCO) and power supplies (Charter).

Underground HTCO and Charter duct systems consisting of 4-inch, concrete encased PVC conduits will be placed within the road right-of-way with handholes or manholes placed at intervals to allow for parcel utility laterals and for intersection utility extensions. Construction of the duct system will conform to HAR Chapter 6-73. As an option, these utilities may be run overhead depending on feasibility.

I. STREET AND HIGHWAY LIGHTING

For new roadway access points at Mamalahoa Highway, HDOT will typically require a highway lighting system on either side of the proposed intersection. The highway lighting system typically extends 1,000 – 1,500 feet on either side of the intersection. Per a maintenance agreement between HDOT and the County of Hawaii, the highway light poles and luminaires will utilize COH standard materials. It should be noted that although the COH will maintain the highway light poles and luminaires, the highway lighting system must have its own electrical meter and electrical system. A final determination of the extent of the required highway lighting system will be made by HDOT when reviewing the plans for the new roadway access to the Development.

The street lighting system along the Development roadways will utilize COH standard poles and luminaires. The street lighting system will require one or more sets of electrical meters and service equipment. The street lighting system conductors will run parallel with the electric and telecommunications infrastructure. It is important to note that the street and highway lighting systems must conform to the COH Outdoor Lighting Ordinance, Chapter 14, Article 9, which stipulates that light emitting diode light sources be utilized.

Both the street and highway lighting systems will be designed in accordance with the Illuminating Engineering Society RP-8 criteria and AASHTO Lighting Design Guidelines, respectively.

J. ELETRICAL AND COMMUNICATION IMPACTS AND MIGITATION

1. Impacts

There will be short-term impacts to traffic and view planes due to construction and dust prevention measures. HELCO's 69 kV line along Mamalahoa Highway is existing and the only additional cabling that might be required is a telecommunication cable on a lower position on the existing pole line. Any 69 kV overhead line extension from Mamalahoa Highway down to the preferred substation location will be perpendicular to the Highway minimizing the view plane impact.

The County of Hawaii ordinances do not require electric and telecommunications utility service within proposed subdivisions to be placed underground. With the exception of the HELCO 69 kV line extension, the electric and telecommunication utility lines for the proposed development are anticipated to be placed underground minimizing view plane impacts, unless determined to be infeasible and/or cost prohibitive.

The increase in demand load to HELCO system has been described in "Electrical" section above.

2. Mitigation

HELCO and HTCO are regulated by the State Public Utilities Commission who approve their respective tariffs. Similarly, Charter is a franchisee of the Department of Commerce and Consumer Affairs, who review and approve

Charter's franchise. Under these respective documents, HELCO, HTCO and Charter are required to provide electric and telecommunication services and to plan for and construct any improvements required to ensure that their respective systems have sufficient capacity to provide such services.

V. CONCLUSION

The proposed improvements for this project will be designed in accordance with the applicable rules and regulations for the County of Hawaii and the State of Hawaii.

The Department of Public Works (DPW) Storm Drainage Rules require mitigation of the increase in stormwater runoff between the pre and post-development conditions. Nakahili will reduce and manage stormwater runoff to meet the DPW requirements. Erosion control and water quality measures will be provided to minimize pollution during and after construction.

A new source of water will be required for Nakahili – a discussion of which is included in a separate study. Nakahili will require a total of 2,081,400 gpd to meet the maximum daily demand requirements including water demands for agricultural lots with ADUs. Storage at the start of Phase 1 will require a 0.5 MG Upper Tank to serve this portion of the development. As the development expands, Phase 3 will require the installation of an additional 0.5 MG tank installed at the Mid-Level Tank site to meet demand requirements. A new 18-inch transmission main will most likely be required to provide water service to the site and the installation of a distribution system consisting of 8-inch and 12-inch water lines will be required to serve the site. The size of the transmission main will need to be confirmed once a well site is determined.

In addition to a new water system, this development will also require an onsite WWTP to treat and dispose of sewage from the mixed use village and commercial areas, as well as the lots located within 1,000-feet of the well site. The onsite wastewater treatment system will consist of a temporary package plant to serve the portions of the site developed in Phases 1 and 2. As the development expands, a permanent treatment plant will be constructed in the northwest corner of the site. This plant will produce R-1 quality effluent that could potentially be reused for irrigation purposes in the future as the

development expands and begins to generate enough wastewater. The onsite wastewater collection system will essentially follow the proposed roadway systems of the project. The network of 8-inch and 12-inch gravity sewer lines will collect wastewater from the residential lots throughout the project site.

All calculations and proposed water, sewer, and drainage concepts are based on the conceptual plan dated January 24, 2019. Should this conceptual plan change, it will be necessary to perform additional analyses to determine if the infrastructure concepts are still adequate to serve the project site. Based on this current concept and the information presented in this report, the Nakahili development will have no adverse effects on any existing facilities or on the surrounding environment.

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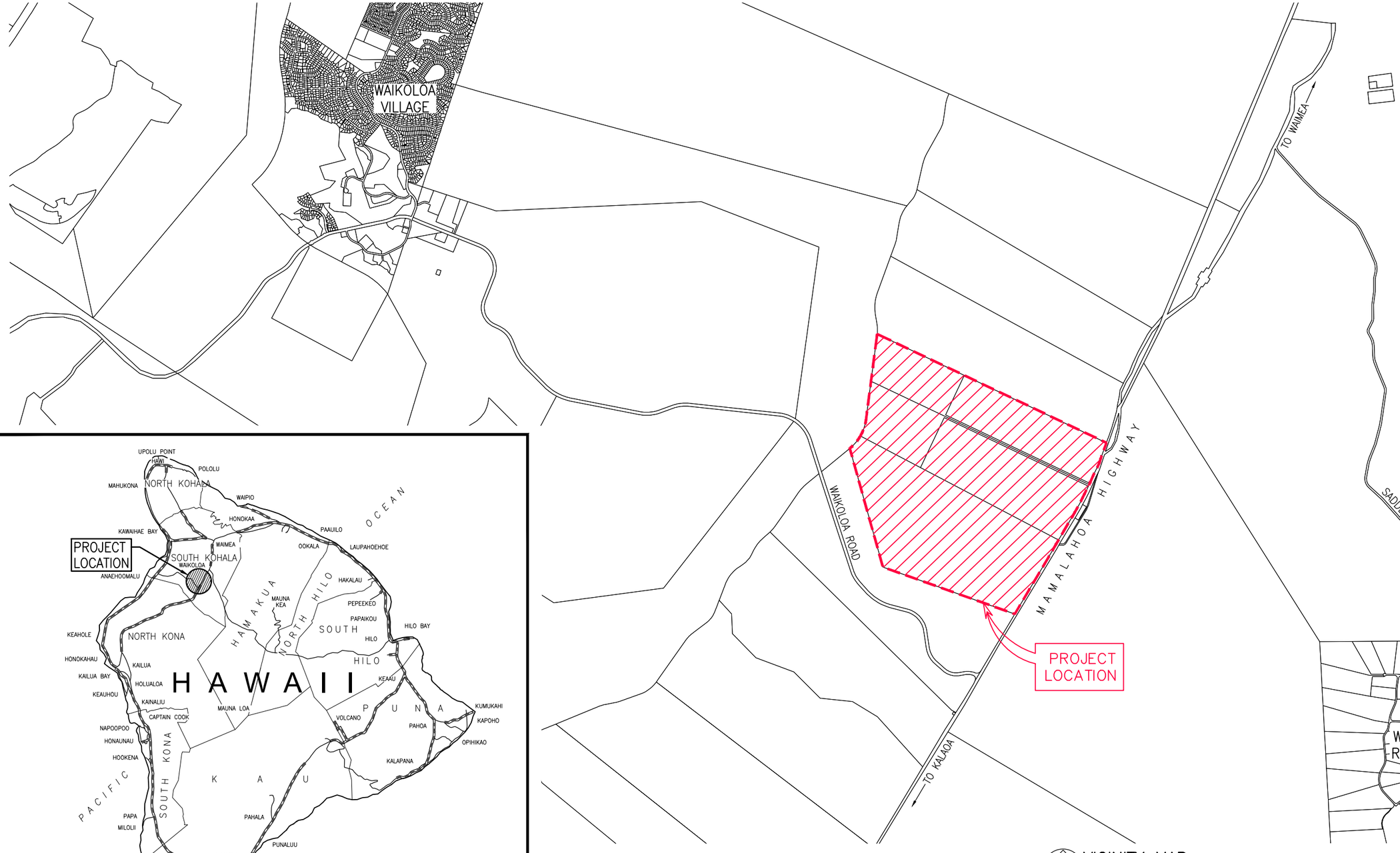
EXHIBITS



VICINITY MAP
SCALE: 1"=4,000'

ISLAND OF HAWAII

LOCATION MAP
NOT TO SCALE

0 1
LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS ● HONOLULU, WAILUKU, HILO, HAWAII

VICINITY AND LOCATION MAP

EXHIBIT 1

JOB NO. 18-062

JANUARY 2019



PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS ● HONOLULU, WAILUKU, HILO, HAWAII

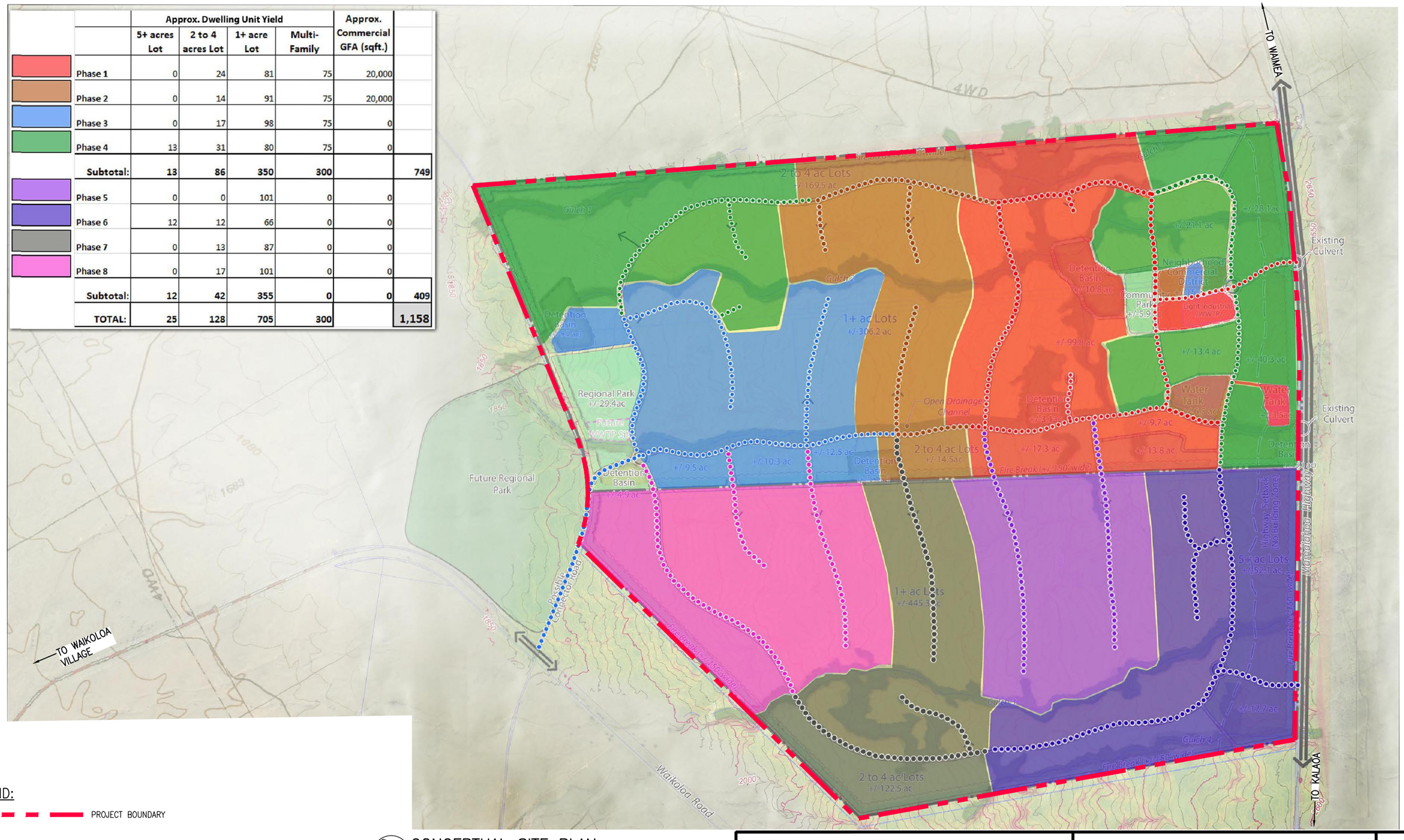
TMK MAP

EXHIBIT 2

JOB NO. 18-062

JANUARY 2019

	Approx. Dwelling Unit Yield				Approx. Commercial GFA (sqft.)	
	5+ acres Lot	2 to 4 acres Lot	1+ acre Lot	Multi-Family		
Phase 1	0	24	81	75	20,000	
Phase 2	0	14	91	75	20,000	
Phase 3	0	17	98	75	0	
Phase 4	13	31	80	75	0	
Subtotal:	**13**	**86**	**350**	**300**		**749**
Phase 5	0	0	101	0	0	
Phase 6	12	12	66	0	0	
Phase 7	0	13	87	0	0	
Phase 8	0	17	101	0	0	
Subtotal:	**12**	**42**	**355**	**0**	**0**	**409**
TOTAL:	**25**	**128**	**705**	**300**		**1,158**



LEGEND:

PROJECT BOUNDARY

NORTH

CONCEPTUAL SITE PLAN

SCALE: 1"=1,200'

0 1

LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

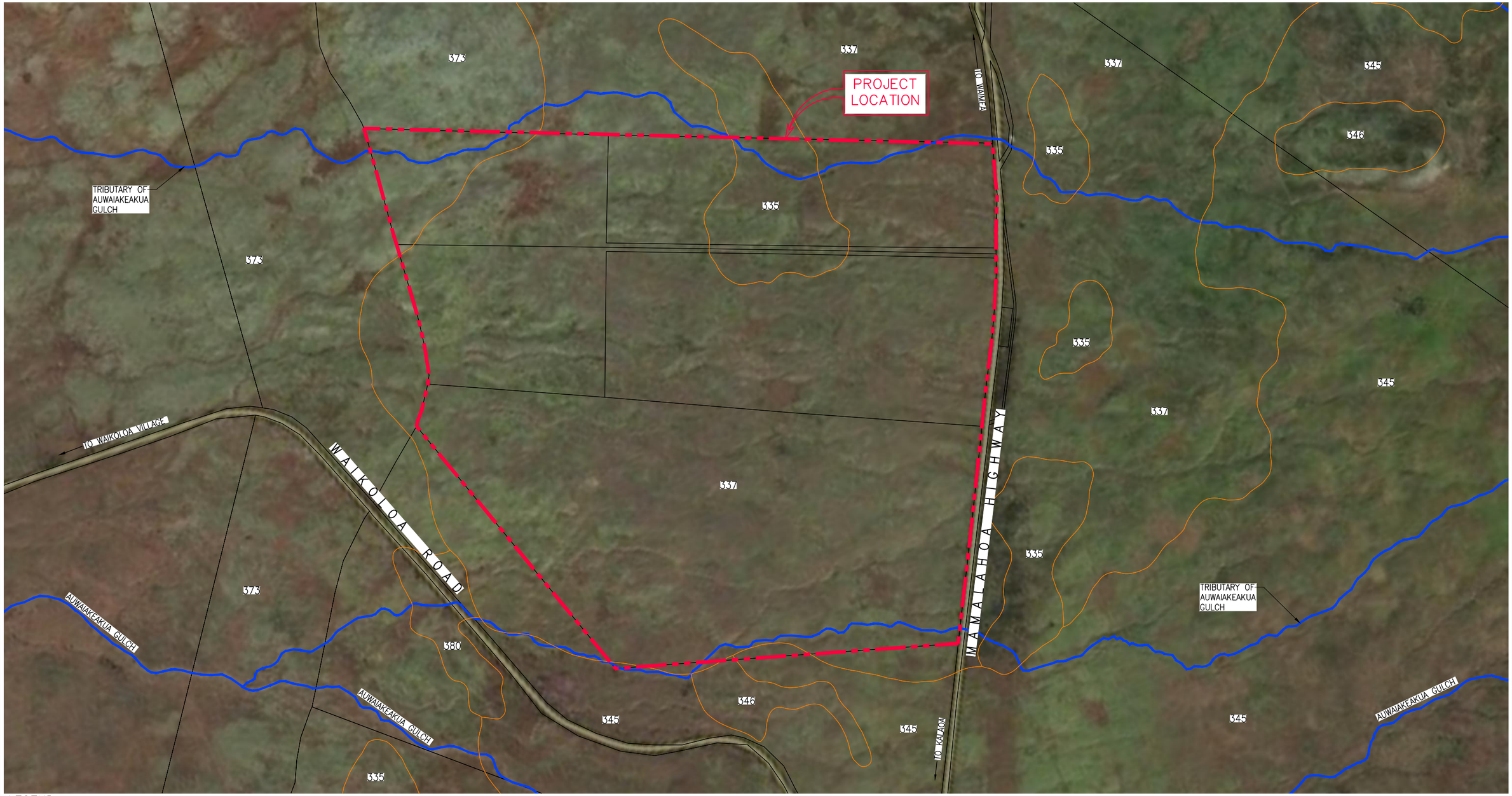
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS ● HONOLULU, WAILUKU, HILO, HAWAII

CONCEPTUAL SITE PLAN

EXHIBIT 3

JOB NO. 18-062

JANUARY 2019



LEGEND:

335 : WAIKALOA–PUU PA COMPLEX, 10 TO 20% SLOPE, HSG B

337 : WAIKALOA–PUU PA COMPLEX, 2 TO 10% SLOPE, HSG B

345 : WAIKALOA MEDIAL VERY FINE SANDY LOAM, 2 TO 10% SLOPE, HSG B

346 : WAIKALOA MEDIAL VERY FINE SANDY LOAM, 10 TO 20% SLOPE, HSG B

373 : HAPUNA–WAIKUI–LALAMILO COMPLEX, 0 TO 20% SLOPE, HSG A

380 : KAMAKOA VERY FINE SANDY LOAM, 2 TO 10% SLOPE, HSG A

NORTH

SOIL MAP

SCALE: 1"=1,500'

0 1

LINE IS 1 INCH AT FULL SIZE
(If NOT 1–inch : Scale Accordingly)

NOTE:
SOIL MAP AND DATA OBTAINED FROM USGS WEB SOIL SURVEY OPERATED BY THE USDA NATIONAL RESOURCES CONSERVATION SERVICE (NRCS);
HTTPS://WEBSOILSURVEY.SC.EGOV.USDA.GOV/APP/WEBSOILSURVEY.ASPX

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS ● HONOLULU, WAILUKU, HILO, HAWAII

SOIL MAP

EXHIBIT 4

JOB NO. 18–062

JANUARY 2019

DRAINAGE AREA E-1
DRAINS TO EXIST. GULCH "1"
A=183.06 AC.
Q_{50}=218.81 CFS.
Q_{100}=300.67 CFS.

DRAINAGE AREA E-2
DRAINS TO EXIST. GULCH "2"
A=994.84 AC.
Q_{50}=1,097.74 CFS.
Q_{100}=1,509.08 CFS.

GULCH "1", TRIBUTARY OF AWAIAKEAKUA GULCH. DRAINS TO EXISTING CULVERT 1 (2x(10'x8') CONC. BOX CULVERTS) AT PANIOLO AVENUE, 0.3 MILES NORTH OF WAIKOLOA ROAD INTERSECTION. Q_{100} CONTRIBUTION FROM DA E-1, O-1a, AND O-1b.

GULCH "2", TRIBUTARY OF AWAIAKEAKUA GULCH. DRAINS TO EXISTING CULVERT 2 (2x(8'x5.5') CMP ARCH CULVERTS) AT WAIKOLOA ROAD, 0.9 MILES EAST OF PANIOLO AVENUE INTERSECTION. Q_{100} CONTRIBUTION FROM DA E-2, O-2a, O-2b, O-2c, and O-2d.

TO WAIMEA

O-1a
O-1b
O-2a
O-2b
O-2c
O-2d
O-3a
O-3b
O-4a
O-4b
O-4c

SEE NOTE (1)

1800
1900
2000
2100
2200
2300
2400
2500
2600

TO WAIKOLOA VILLAGE

WAIKOLOA ROAD

EXISTING CULVERT 3
(2x42" DIA. CMP).
Q100 CONTRIBUTION FROM DA E-3, O-3a, and O-3b. DRAINS TO TRIBUTARY OF AWAIAKEAKUA GULCH.

EXISTING CULVERT 4
(90" CMP ARCH CULVERT).
Q100 CONTRIBUTION FROM DA E-4, O-4a, O-4b, and O-4c. DRAINS TO TRIBUTARY OF AWAIAKEAKUA GULCH.

DRAINAGE AREA E-3
DRAINS TO EXIST. GULCH "3"
A=266.68 AC.
Q_{50}=306.55 CFS.
Q_{100}=421.36 CFS.

DRAINAGE AREA E-4
DRAINS TO EXIST. GULCH "4"
A=118.79 AC.
Q_{50}=205.64 CFS.
Q_{100}=281.39 CFS.

TO KALAOA

MAMALAHOA HIGHWAY

TYPICAL EXISTING CULVERT AT MAMALAHOA HIGHWAY

NOTE:

(1) REFER TO OFFSITE DRAINAGE AREA MAP FOR OFFSITE AREAS AND FLOWS.

LEGEND:

PROJECT BOUNDARY

NORTH

DRAINAGE AREA MAP – EXISTING CONDITIONS

SCALE: 1"=1,500'

0 1

LINE IS 1 INCH AT FULL SIZE
(if NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

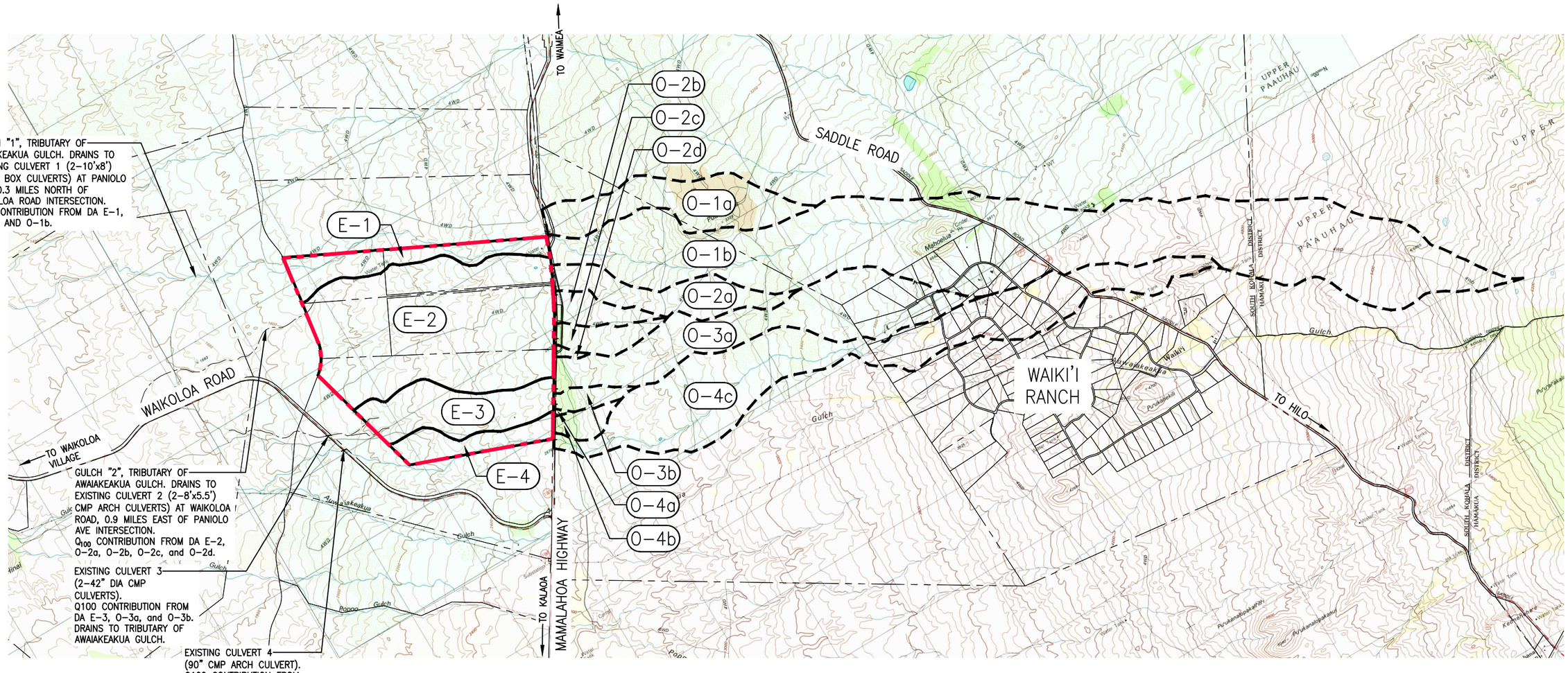
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS ● HONOLULU, WAILUKU, HILO, HAWAII

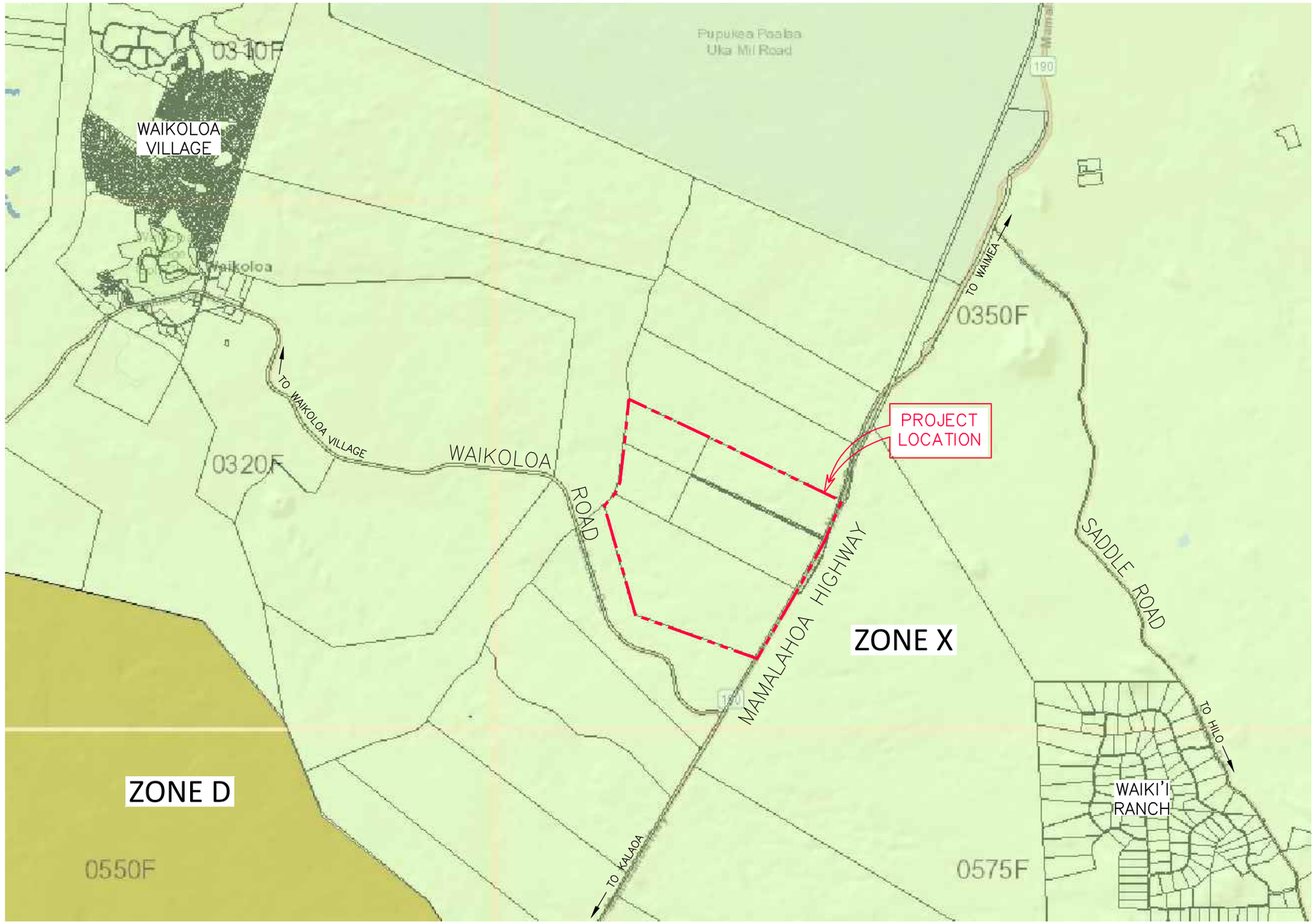
DRAINAGE AREA MAP – EXISTING CONDITIONS

EXHIBIT 5

JOB NO. 18-062

JANUARY 2019


GULCH "1", TRIBUTARY OF AWAIAKEAKUA GULCH. DRAINS TO EXISTING CULVERT 1 (2–10'x8') CONC. BOX CULVERTS) AT PANIOLO AVE, 0.3 MILES NORTH OF WAIKOLOA ROAD INTERSECTION. Q_{100} CONTRIBUTION FROM DA E–1, O–1a, AND O–1b.
GULCH "2", TRIBUTARY OF AWAIAKEAKUA GULCH. DRAINS TO EXISTING CULVERT 2 (2–8'x5.5') CMP ARCH CULVERTS) AT WAIKOLOA ROAD, 0.9 MILES EAST OF PANIOLO AVE INTERSECTION. Q_{100} CONTRIBUTION FROM DA E–2, O–2a, O–2b, O–2c, and O–2d.
EXISTING CULVERT 3 (2–42" DIA CMP CULVERTS). Q100 CONTRIBUTION FROM DA E–3, O–3a, and O–3b. DRAINS TO TRIBUTARY OF AWAIAKEAKUA GULCH.
EXISTING CULVERT 4 (90" CMP ARCH CULVERT). Q100 CONTRIBUTION FROM DA E–4, O–4a, O–4b, and O–4c. DRAINS TO TRIBUTARY OF AWAIAKEAKUA GULCH.
E–1
E–2
E–3
E–4
O–1a
O–1b
O–2a
O–2b
O–2c
O–2d
O–3a
O–3b
O–4a
O–4b
O–4c
WAIKOLOA ROAD
TO WAIKOLOA VILLAGE
TO WAIMEA
TO KALAOA
MAMALAHOA HIGHWAY
SADDLE ROAD
TO HILO
WAIKI'I RANCH
UPPER PA'AUHAU
SOUTH KOHALA DISTRICT
HAMAKUA DISTRICT
Awaiakeakua Gulch
Pohoo Gulch
Puukahaili
Mahoohua Cinder Pit
Keamuku Lake
Waiki Tank
Waiki Spring
Puukahaili Tank
Puukahaili Spring
Puukahaili Lake
Puukahaili Cinder Cone
Substation
Puu Lilinoe
Puu Kalepa
Puu Kaumaka
Puu Kaumakaiwa
Puu Kaumakaiwa Cinder Cone
Puu Kaumakaiwa Lake
Puu Kaumakaiwa Spring
Puu Kaumakaiwa Tank
Puu Kaumakaiwa Trail



NORTH

FLOOD ZONE MAP

SCALE: 1"=5,000'

Flood Hazard Assessment Report

www.hawaiinfip.org

Property Information

COUNTY:	HAWAII
TMK NO:	(3) 6-8-002:030
WATERSHED:	POHAKULOA
PARCEL ADDRESS:	UNKNOWN ADDRESS WAIKOLOA, HI 96738

Notes:

Flood Hazard Information

FIRM INDEX DATE:	SEPTEMBER 29, 2017
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL:	1551660350F
PANEL EFFECTIVE DATE:	SEPTEMBER 29, 2017

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

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

LEGEND:

	ZONE X:	AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
	ZONE D:	UNSTUDIED AREAS WHERE FLOOD HAZARDS ARE UNDETERMINED, BUT FLOODING IS POSSIBLE. NO MANDATORY FLOOD INSURANCE PURCHASE APPLY, BUT COVERAGE IS AVAILABLE IN PARTICIPATING COMMUNITIES.

0 1

LINE IS 1 INCH AT FULL SIZE
(if NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

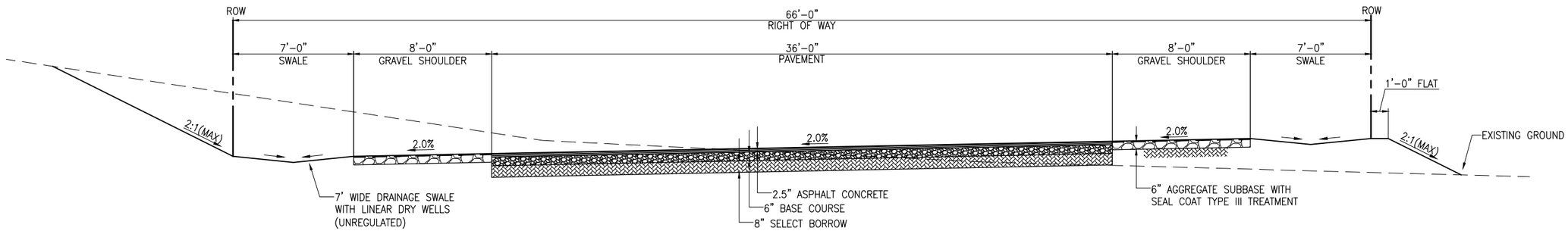
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS ● HONOLULU, WAILUKU, HILO, HAWAII

FLOOD ZONE MAP

EXHIBIT 7

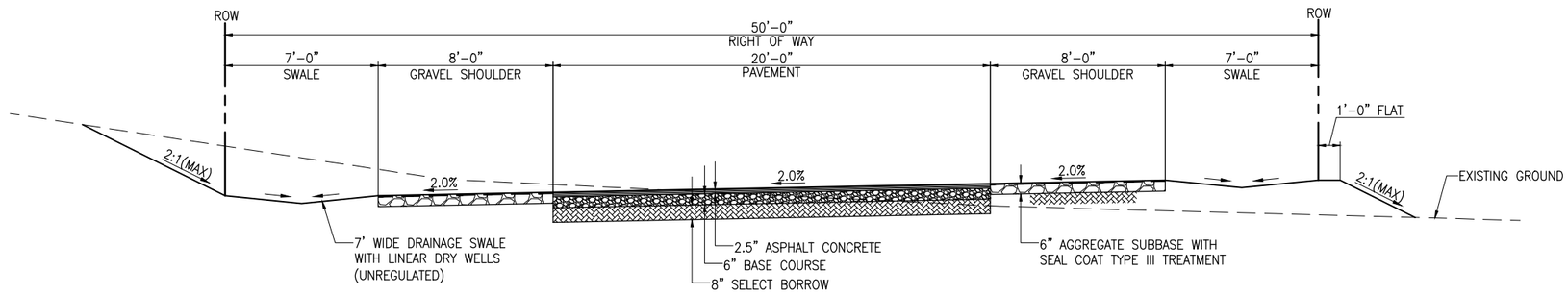
JOB NO. 18-062

JANUARY 2019



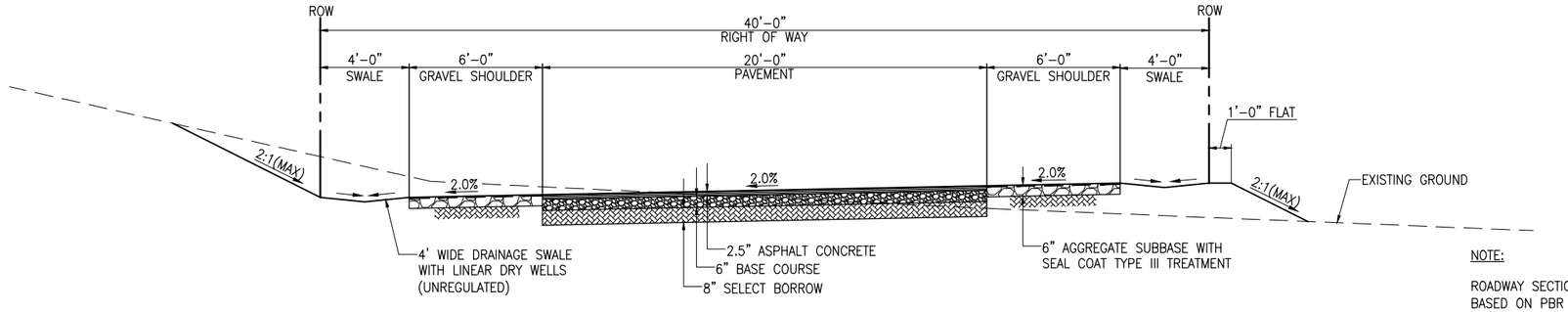
TYPICAL SECTION 1 – MIXED-USE AND COMMERCIAL AREA (66' ROW)

SCALE: 1"=60'



TYPICAL SECTION 2 – MAJOR COLLECTOR ROAD (50' ROW)

SCALE: 1"=60'



TYPICAL SECTION 3 – MINOR STREETS AND CUL-DE-SACS (40' ROW)

SCALE: 1"=60'

NOTE:

ROADWAY SECTIONS AND PAVEMENT CROSS SECTION ARE BASED ON PBR DRAFT 8/14/18 AND CONCEPTUAL DESIGN. PAVEMENT AND SHOULDER THICKNESSES SHOULD BE RE-EVALUATED UPON COMPLETION OF A GEOTECHNICAL INVESTIGATION.

0 1

LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

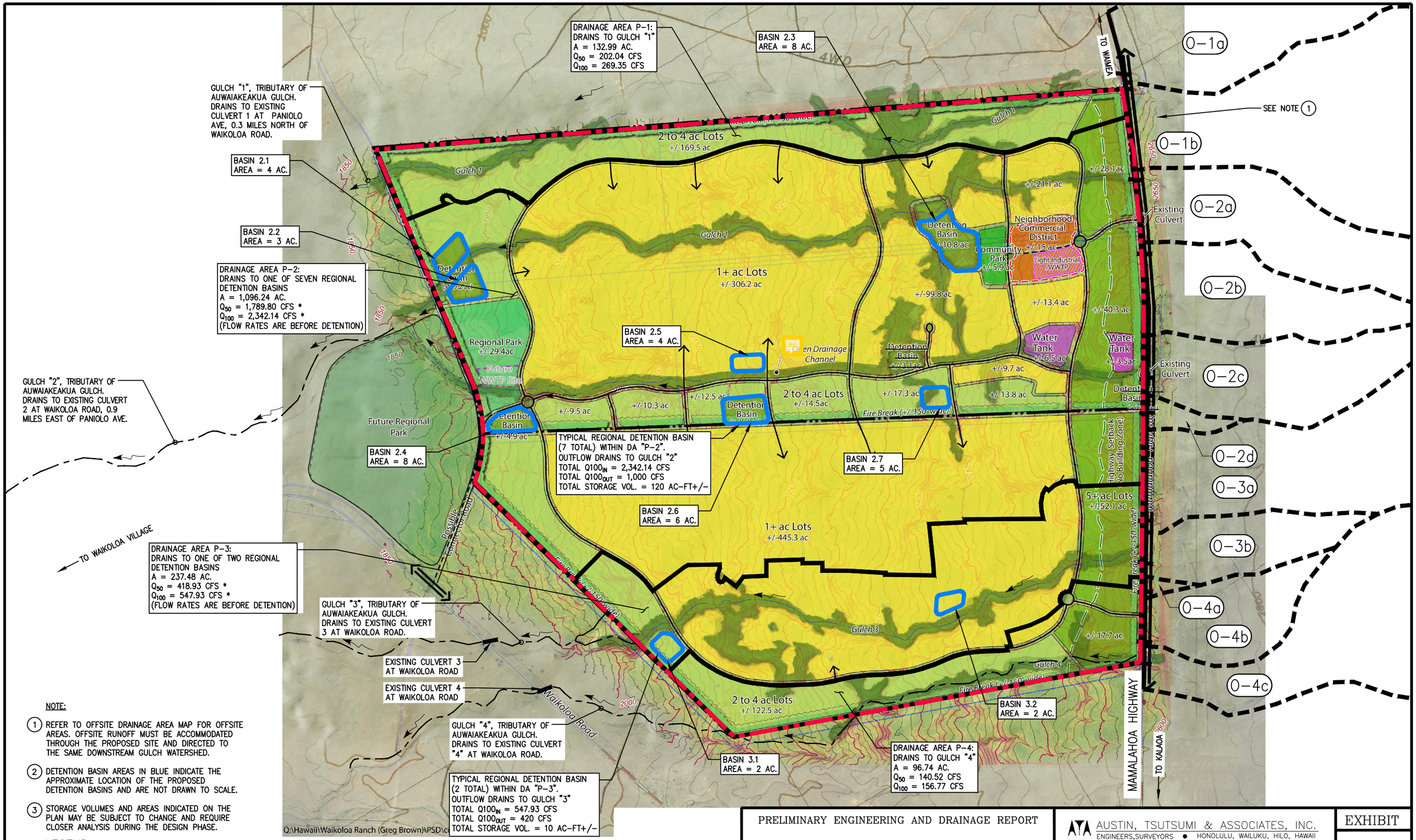
NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS ● HONOLULU, WAILUKU, HILO, HAWAII

TYPICAL ROADWAY SECTIONS

EXHIBIT 8



NOTE:

(1) REFER TO OFFSITE DRAINAGE AREA MAP FOR OFFSITE AREAS. OFFSITE RUNOFF MUST BE ACCOMMODATED THROUGH THE PROPOSED SITE AND DIRECTED TO THE SAME DOWNSTREAM GULCH WATERSHED.

(2) DETENTION BASIN AREAS IN BLUE INDICATE THE APPROXIMATE LOCATION OF THE PROPOSED DETENTION BASINS AND ARE NOT DRAWN TO SCALE.

(3) STORAGE VOLUMES AND AREAS INDICATED ON THE PLAN MAY BE SUBJECT TO CHANGE AND REQUIRE CLOSER ANALYSIS DURING THE DESIGN PHASE.

LEGEND:

PROJECT BOUNDARY

Q:\Hawaii\Waikoloa Ranch (Greg Brown)\PSD\c

NORTH

DRAINAGE AREA MAP – PROPOSED CONDITIONS

SCALE: 1"=1,200'

0 1

LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

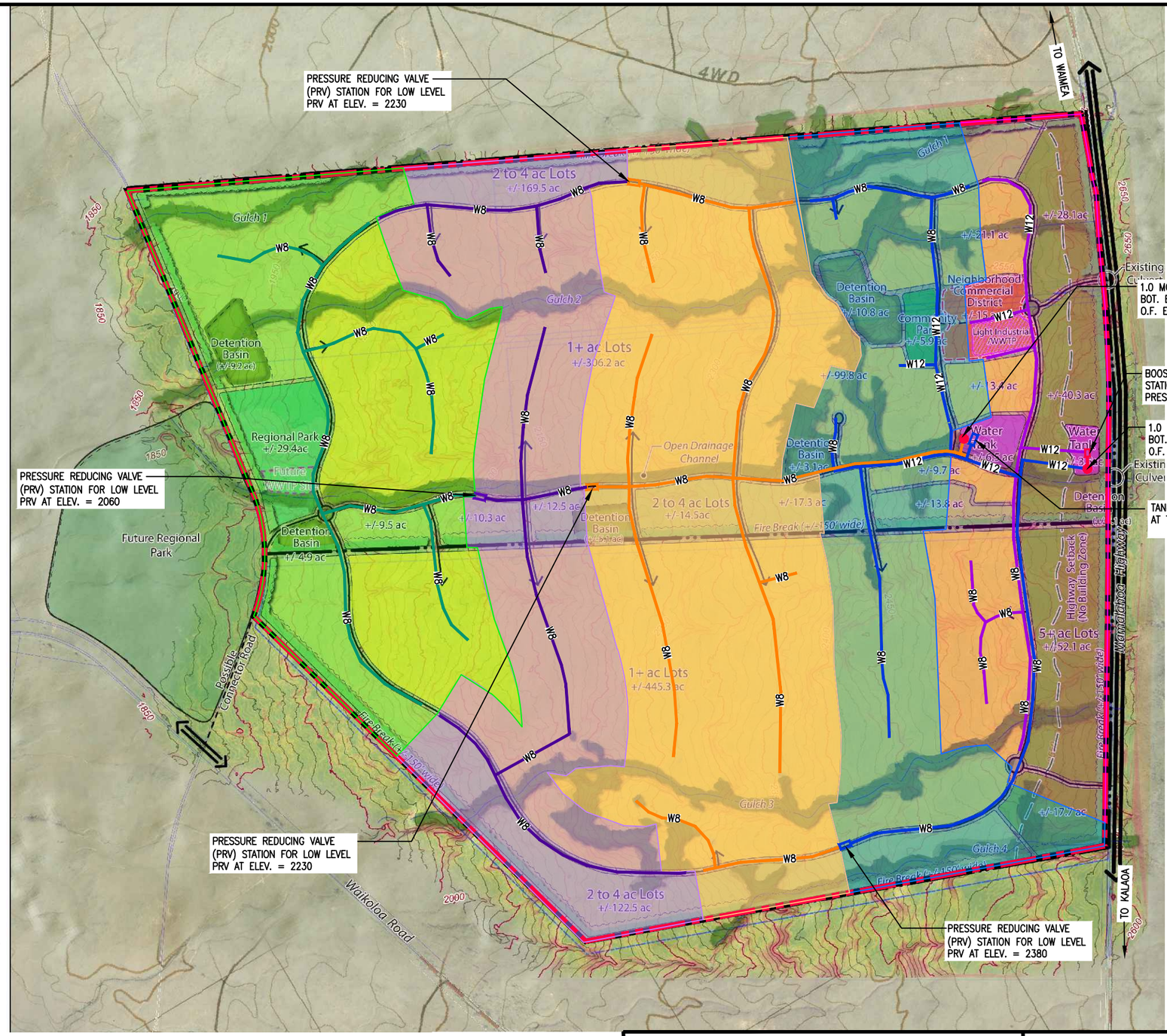
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, WAILUKU, HILO, HAWAII

DRAINAGE AREA MAP – PROPOSED CONDITIONS

EXHIBIT 9

JOB NO. 18-062

JANUARY 2019



PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

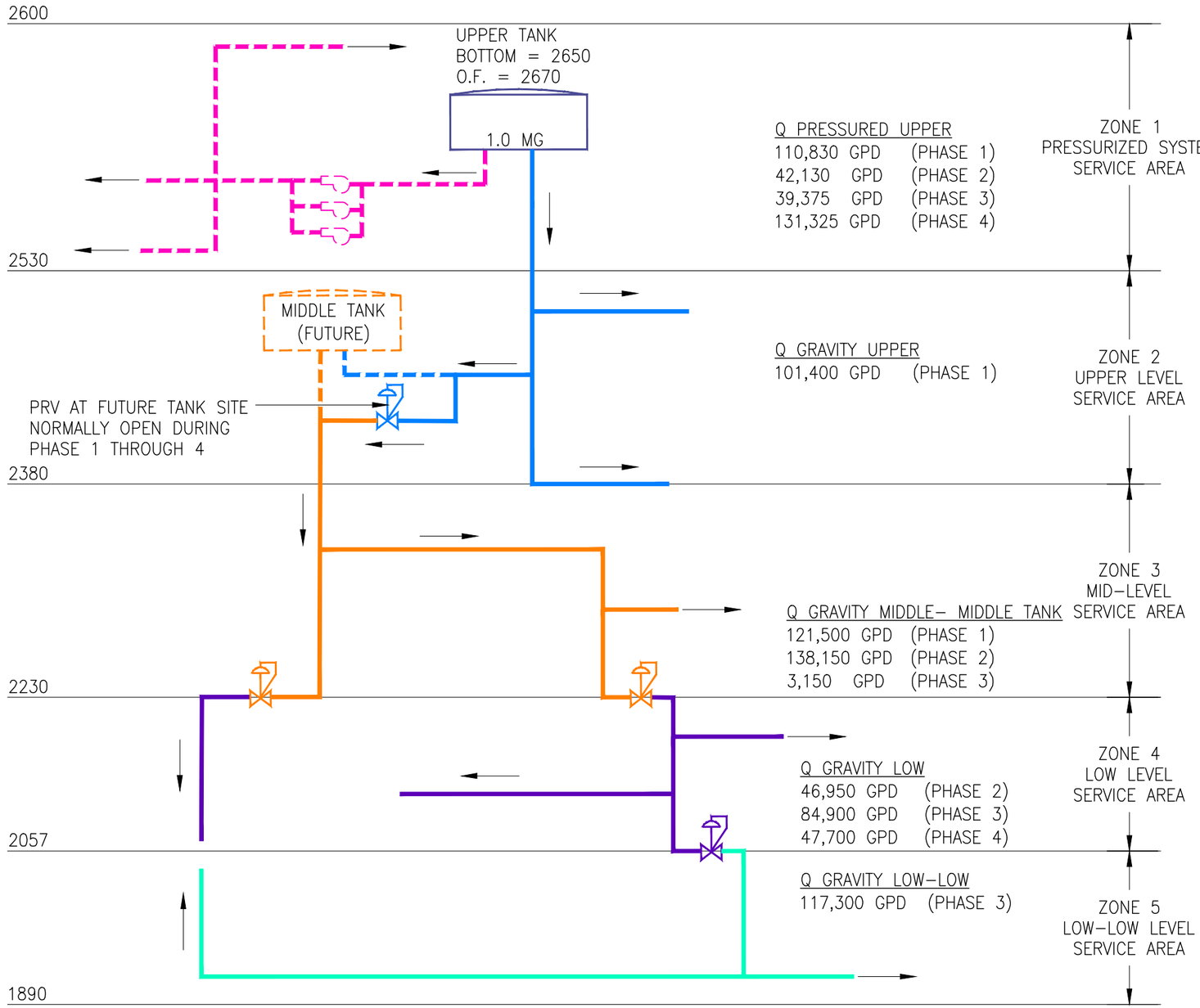
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HILO, HAWAII

PROPOSED WATER SYSTEM

EXHIBIT 10

JOB NO. 18-062

JANUARY 2019



STORAGE REQUIREMENTS
UPPER TANKS
SERVICE AREA – ALL ZONES; PHASES 1 THROUGH 3, PHASE 4 PRESSURIZED AND GRAVITY LOW ZONES ONLY.
SEE EXHIBIT 12 FOR FINAL CONDITION ONCE MID-LEVEL TANK IS INSTALLED.
REQUIRED VOLUME = 984,700 GALLONS
TANK VOLUME = 1.0 MG

LEGEND:

BOOSTER PUMP

PRESSURE REDUCING VALVE (PRV)

0 1
LINE IS 1 INCH AT FULL SIZE
(if NOT 1-inch : Scale Accordingly)

NOT TO SCALE

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

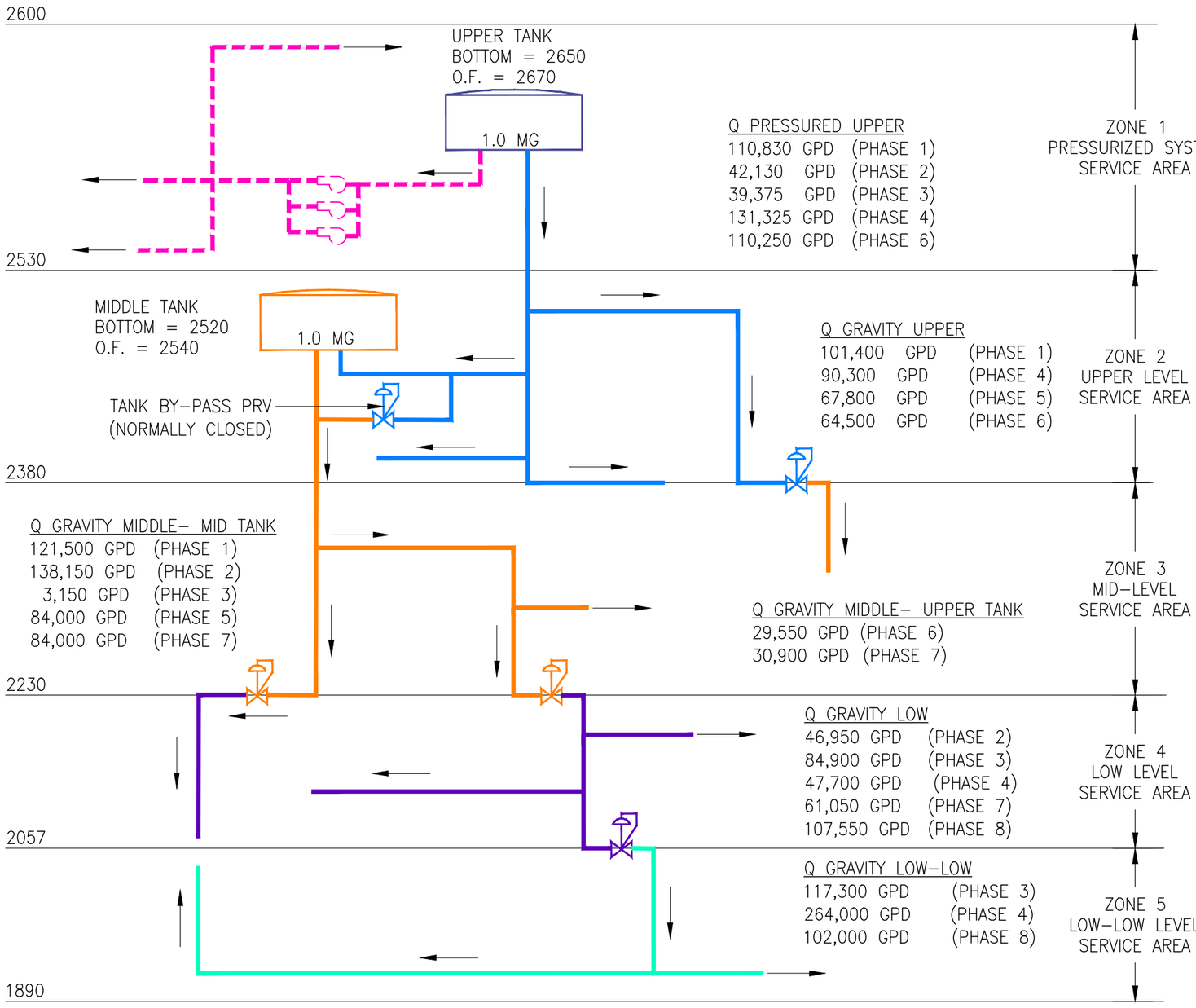
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS ● HONOLULU. WAILUKU. HILO. HAWAII

WATER SYSTEM SCHEMATIC-
PHASES 1 TO 4

EXHIBIT
11

JOB NO. 18-062

JANUARY 2019



STORAGE REQUIREMENTS
UPPER TANKS
SERVICE AREA – ZONES 1 AND 2
REQUIRED VOLUME = 818,500 GALLONS
TANK VOLUME = 1.0 MG

STORAGE REQUIREMENTS
MIDDLE TANK
SERVICE AREA – ZONES 3 TO 5
REQUIRED VOLUME = 1,262,900 GALLONS
TANK VOLUME = 1.0 MG

LEGEND:

BOOSTER PUMP

PRESSURE REDUCING VALVE (PRV)

NOT TO SCALE

0 1
LINE IS 1 INCH AT FULL SIZE
(If NOT 1-inch : Scale Accordingly)

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

NAKAHILI

WAIKOLOA, ISLAND OF HAWAII, HAWAII

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS,SURVEYORS • HONOLULU, WAILUKU, HILO, HAWAII

WATER SYSTEM SCHEMATIC-
FINAL CONDITION

EXHIBIT
12

JOB NO. 18-062

JANUARY 2019

APPENDIX A

Preliminary Drainage Calculations

APPENDIX A

RUNOFF CALCULATIONS
EXISTING CONDITIONS

Drainage Area Label	Flows To	Area (acres)	C Runoff Coeff.	Tc (min)	50-Yr Runoff		100-Yr Runoff	
					I_{50} (in/hr)	Q_{50} (cfs)	I_{100} (in/hr)	Q_{100} (cfs)
Onsite - Existing Conditions								
E-1	Exist. Downstream Culvert 1 at Paniolo Ave.	183.058	-	29.5	-	218.81	-	**300.67**
E-2	Exist. Downstream Culvert 2 at Waikoloa Rd.	994.841	-	33.9	-	1,097.74	-	**1,509.08**
E-3	Exist. Downstream Culvert 3 at Waikoloa Rd.	266.683	-	31.5	-	306.55	-	**421.36**
E-4	Exist. Downstream Culvert 4 at Waikoloa Rd.	118.786	-	14.0	-	205.64	-	**281.39**
ONSITE TOTAL		**1,563.369**				**1,828.74**		**2,512.50**
Offsite - Existing Conditions								
O-1a	Exist. Culvert 1a at Mamalahoa Highway	323.314	-	-	-	225.63	-	**315.46**
O-1b	Exist. Culvert 1b at Mamalahoa Highway	2,131.747	-	-	-	999.26	-	**1,407.70**
O-2a	Exist. Culvert 2a at Mamalahoa Highway	210.336	-	-	-	160.73	-	**226.95**
O-2b	Exist. Culvert 2b at Mamalahoa Highway	78.738	0.20	21.6	3.97	**62.52**	4.40	69.29
O-2c	Exist. Culvert 2c at Mamalahoa Highway	83.531	0.20	20.6	4.06	**67.83**	4.50	75.18
O-2d	Exist. Culvert 2d at Mamalahoa Highway	7.823	0.20	10.4	5.37	**8.40**	5.97	9.34
O-3a	Exist. Culvert 3a at Mamalahoa Highway	577.584	-	-	-	356.63	-	**503.06**
O-3b	Exist. Culvert 3b at Mamalahoa Highway	45.554	0.20	16.1	4.46	**40.63**	4.95	45.10
O-4a	Exist. Culvert 4a at Mamalahoa Highway	2.344	0.20	8.9	5.86	**2.75**	6.51	3.05
O-4b	Exist. Culvert 4b at Mamalahoa Highway	49.590	0.20	14.7	4.61	**45.72**	5.12	50.78
O-4c	Exist. Culvert 4c at Mamalahoa Highway	944.775	-	-	-	525.82	-	**741.35**
OFFSITE TOTAL		**4,455.336**				**2,495.93**		**3,447.25**

APPENDIX A

RUNOFF CALCULATIONS
PROPOSED CONDITIONS

Drainage Area Label	Flows To	Area (acres)	C Runoff Coeff.	Tc (min)	50-Yr Runoff		100-Yr Runoff	
					I_{50} (in/hr)	Q_{50} (cfs)	I_{100} (in/hr)	Q_{100} (cfs)
Onsite - Proposed Conditions								
P-1	Exist. Downstream Culvert 1 at Paniolo Ave.	132.991	-	26.4	-	202.04	-	**269.35**
P-2	Exist. Downstream Culvert 2 at Waikoloa Rd.	1,096.243	-	28.6	-	1,789.80 *	-	**2,342.14 ***
P-3	Exist. Downstream Culvert 3 at Waikoloa Rd.	237.483	-	24.8	-	418.93 *	-	**547.93 ***
P-4	Exist. Downstream Culvert 4 at Waikoloa Rd.	96.743	0.35	16.2	4.15	**140.52**	4.63	156.77
ONSITE TOTAL		**1,563.460**				**2,551.29 ***		**3,316.19 ***
Offsite - Proposed Conditions								
O-1a	Exist. Culvert 1a at Mamalahoa Highway	(No Change - See Existing Conditions)				225.63	-	**315.46**
O-1b	Exist. Culvert 1b at Mamalahoa Highway	(No Change - See Existing Conditions)				999.26	-	**1,407.70**
O-2a	Exist. Culvert 2a at Mamalahoa Highway	(No Change - See Existing Conditions)				160.73	-	**226.95**
O-2b	Exist. Culvert 2b at Mamalahoa Highway	(No Change - See Existing Conditions)				**62.52**	-	69.29
O-2c	Exist. Culvert 2c at Mamalahoa Highway	(No Change - See Existing Conditions)				**67.83**	-	75.18
O-2d	Exist. Culvert 2d at Mamalahoa Highway	(No Change - See Existing Conditions)				**8.40**	-	9.34
O-3a	Exist. Culvert 3a at Mamalahoa Highway	(No Change - See Existing Conditions)				356.63	-	**503.06**
O-3b	Exist. Culvert 3b at Mamalahoa Highway	(No Change - See Existing Conditions)				**40.63**	-	45.10
O-4a	Exist. Culvert 4a at Mamalahoa Highway	(No Change - See Existing Conditions)				**2.75**	-	3.05
O-4b	Exist. Culvert 4b at Mamalahoa Highway	(No Change - See Existing Conditions)				**45.72**	-	50.78
O-4c	Exist. Culvert 4c at Mamalahoa Highway	(No Change - See Existing Conditions)				525.82	-	**741.35**
TOTAL		**4,455.336**				**2,495.93**		**3,447.25**

Notes:
1. The Rational Method (Q=CIA) is used to determine runoff from *all* areas < 100 acres.
   The NRCS TR-20 Method is used to determine runoff from *onsite* areas > 100 acres.
   Regresion equations from USGS are used to determine runoff from *offsite* areas > 100 acres.
2. Runoff Coefficient determined using typical values and by engineering discretion.
3. Time of Concentration determined using Plate 3, Table 2, and Manning's Equation.
4. Rainfall Intensity obtained from the NOAA Precipitation Frequency Data Server, available online at: https://hdsc.nws.noaa.gov/hdsc/pfds
5. 50-year design recurrence interval is used for design of systems with contributing areas < 100 acres.
   100-year design recurrence interval is used for design of systems with contributing areas > 100 acres.
6. Runoff rates marked with an asterix "*" are flow rates prior to detention. Detention Basins will be used to reduce the 100-year peak outflow from these areas to less than the existing conditions flow rate.

APPENDIX B

Preliminary Water System Calculations

Based on Conceptual Site Plan, Dated January 24, 2019

Projected Water Demands By Service Levels						
Land Use Designation	**No. of Units**	**Area (acres)**	**Resident. Density**	**Domestic Average Day Unit Demand (gpd)**	**Total Domestic Avg. Daily Demand (gpd)**	**Total Domestic Max. Daily Demand (gpd)**
Projected Water Demands By Service Levels						
Upper Pressurized System Service Area						
Multi-Family (Apartment)	300	12.00	25.00	350	105,000	157,500
1 Acre Agricultural Lots (Farm Dwelling)	53			800	42,400	63,600
1 Acre Agricultural Lots (ADU)	27			400	10,800	16,200
2 to 4 Acre Agricultural Lots (Farm Dwelling)	5			2,100	10,500	15,750
2 to 4 Acre Agricultural Lots (ADU)	2			400	800	1,200
5+ Acre Agricultural Lots (Farm Dwelling)	22			3,350	73,700	110,550
5+ Acre Agricultural Lots (ADU)	11			400	4,400	6,600
Neighborhood Commercial (Retail)	N/A	0.92	N/A	4,000	3,673	5,510
Light Industrial (Self-Storage Facility)	N/A	3.00	N/A	4,000	12,000	18,000
Upper Water Tank Site	N/A	6.50		4,000	26,000	39,000
Sub-Total Upper Pressurized (Rounded)					**289,300**	**434,000**
Upper Gravity System Service Area						
1 Acre Agricultural Lots (Farm Dwelling)	117			800	93,600	140,400
1 Acre Agricultural Lots (ADU)	59			400	23,600	35,400
2 to 4 Acre Agricultural Lots (Farm Dwelling)	21			2,100	44,100	66,150
2 to 4 Acre Agricultural Lots (ADU)	10			400	4,000	6,000
5+ Acre Agricultural Lots (Farm Dwelling)	2			3,350	6,700	10,050
5+ Acre Agricultural Lots (ADU)	1			400	400	600
Community Park (Village Green)	N/A	5.90	N/A	4,000	23,600	35,400
Mid-Level Water Tank Site	N/A	2.50	N/A	4,000	10,000	15,000
Wastewater Treatment Plant	N/A	N/A	N/A	4,000	10,000	15,000
Sub-Total Upper Gravity (Rounded)					**216,000**	**324,000**
Mid-Level (PRV) Service Area from Upper Tank Service Area						
1 Acre Agricultural Lots (Farm Dwelling)	24			800	19,200	28,800
1 Acre Agricultural Lots (ADU)	12			400	4,800	7,200

2 to 4 Acre Agricultural Lots (Farm Dwelling)	7			2,100	14,700	22,050
2 to 4 Acre Agricultural Lots (ADU)	4			400	1,600	2,400
Sub-Total Mid-Level PRV Upper Tank (Rounded)					**40,300**	**60,500**
Mid-Level Gravity Service Area from Mid-Level Tank Service Area						
1 Acre Agricultural Lots (Farm Dwelling)	241			800	192,800	289,200
1 Acre Agricultural Lots (ADU)	121			400	48,400	72,600
2 to 4 Acre Agricultural Lots (Farm Dwelling)	20			2,100	42,000	63,000
2 to 4 Acre Agricultural Lots (ADU)	10			400	4,000	6,000
Sub-Total Mid-Level Gravity Mid Tank (Rounded)					**287,200**	**430,800**
Low Level System (PRV) Sevice Area						
1 Acre Agricultural Lots (Farm Dwelling)	156			800	124,800	187,200
1 Acre Agricultural Lots (ADU)	78			400	31,200	46,800
2 to 4 Acre Agricultural Lots (Farm Dwelling)	33			2,100	69,300	103,950
2 to 4 Acre Agricultural Lots (ADU)	17			400	6,800	10,200
Sub-Total Low Level PRV (Rounded)					**232,100**	**348,200**
Low-Low Level System (PRV) Service Area						
1 Acre Agricultural Lots (Farm Dwelling)	114			800	91,200	136,800
1 Acre Agricultural Lots (ADU)	57			400	22,800	34,200
2 to 4 Acre Agricultural Lots (Farm Dwelling)	42			2,100	88,200	132,300
2 to 4 Acre Agricultural Lots (ADU)	21			400	8,400	12,600
Regional Park	N/A	28.00	N/A	4,000	112,000	168,000
Sub-Total Low-Low Level PRV (Rounded)					**322,600**	**483,900**

TANK SIZING

SIZE NEW UPPER TANK(Upper Pressurized, Upper Gravity System, Mid-Level PRV) FOR LOTS

Criteria 1.

Meet maximum day consumption. Reservoir full at the beginning of the 24-hour period with no source input to the reservoir.

Maximum Day Demand (Pressurized)	434,000	gpd	
Maximum Day Demand (Gravity)	324,000	gpd	
Maximum Day Demand (PRV)	60,500	gpd	
Required Tank Size	**818,500**	**gallons**	**Use This Size**

Criteria 2.

Meet max. day demand plus fire flow for duration of fire. Reservoir 3/4 full at start of fire, with credit for incoming flow from pumps, one maximum size pump.

Maximum Day Demand (VMX) =	157,500	gpd
Maximum Day Demand (VMX) =	109.38	gpm
Fire Flow =	1,500	gpm
Max. Day Demand plus Fire (VMX) =	1,609	gpm
Duration of fire, 1 hour =	60	minutes
Required volume for fire protection =	*96,563*	*gallons*
Maximum Day Demand (Retail, Self-Storage, WWTP etc.) =	92,510	gpd
Maximum Day Demand (Retail, etc.) =	64	gpm
Fire Flow =	2,000	gpm
Max. Day Demand plus Fire (Retail, etc.) =	2,064	gpm
Duration of fire, 2 hours =	120	minutes
Required volume for fire protection =	*247,709*	*gallons*
Maximum Day Demand (Ag Lots) =	568,400	gpd
Maximum Day Demand (Ag Lots) =	395	gpm
Fire Flow =	500	gpm
Max. Day Demand plus Fire (Ag Lots) =	895	gpm
Duration of fire, 2 hours =	120	minutes
Required volume for fire protection =	*107,367*	*gallons*
Required Tank Size =	**451,638**	**gallons**

NEED TO CONSTRUCT 1.0 MG TANK

Max tank size should be <3 MG

1.0 MG Tank:

Water Depth at Overflow Elevation =	20	feet
Required Volume =	1,000,000	cf
Required Diameter =	**252.3**	**ft**

SIZE Mid-Level Tank - Mid and Low Level Gravity Systems

Criteria 1.

Meet maximum day consumption. Reservoir full at the beginning of the 24-hour period with no source

Maximum Day Demand (Mid-Level Gravity)	430,800	gpd
Maximum Day Demand (Low Level PRV)	348,200	gpd
Maximum Day Demand (Low-Low Level PRV	483,900	gpd
Required Tank Size	**1,262,900**	**gallons**

Criteria 2.

Meet max. day demand plus fire flow for duration of fire. Reservoir 3/4 full at start of fire, with credit for

Maximum Day Demand =	1,262,900	gpd	
Maximum Day Demand =	877	gpm	
Fire Flow =	500	gpm	
Max. Day Demand plus Fire =	1,377	gpm	
Duration of fire, 2 hours =	120	minutes	
Required volume for fire protection =	165,242	gallons	
Required Tank Size =	**220,300**	**gallons**	**Use This Size**

NEED TO CONSTRUCT 1.0 MG TANK

Max tank size should be <3 MG

1.0 mg TANK IS OKAY, CAN USE EXCESS CAPACITY FROM UPPER TANK

1.0 MG Tank

Water Depth at Overflow Elevation =	20	feet
Required Volume =	1,000,000	cf
Required Diameter =	**252.3**	**ft**

APPENDIX C

Preliminary Wastewater Calculations

Per Conceptual Master Plan, January 24, 2019

Dry Weather Infiltration= 35 gpd/person
Wet Weather Infiltration= 3000 gpd/ac

PROJECTED WASTEWATER DEMANDS BY PHASE														
Land Use	Area (ac)	No. of Units	Number of People Per Unit	Total Number of People	Wastewater Contribution	Average Day Flow (gpd)	Flow Factor[1]	Max. Flow (gpd)	Dry Weather Infiltration (gpd)	Design Avg. Flow (gpd)	Design Max Flow (gpd)	Wet Weather Infiltration (gpd)	Design Peak Flow (gpd)	Design Peak Flow (gpm)
PHASE 1 (YEAR 1)														
Multi-Family (Mixed Use Village)	3	25 units/ac	2.8 capita/unit	210	70 gpcd	14,700	2.5	36,750	7,350	22,050	44,100	9,000	53,100	
Farm Dwellings	5	3 units	4 capita/unit	12	70 gpcd	840	2.5	2,100	420	1,260	2,520	15,000	17,520	
Commercial	0.46	N/A	140 capita/acre[3]	65	15 gpcd	975	3.5	3,413	2,275	3,250	5,688	1,380	7,068	
Self Storage Facility	3	N/A	100 capita/acre[3]	300	15 gpcd	4,500	3.5	15,750	10,500	15,000	26,250	9,000	35,250	
Subtotal (Year 1)	11.46	N/A				**21,015**		58,013	20,545	**41,560**	78,558	34,380	**112,938**	79
PHASE 2 (YEAR 2)														
Multi-Family (Mixed Use Village)	3	25 units/ac	2.8 capita/unit	210	70 gpcd	14,700	2.5	36,750	7,350	22,050	44,100	9,000	53,100	
Commercial	0.46	N/A	140 capita/acre[3]	65	15 gpcd	975	3.5	3,413	2,275	3,250	5,688	1,380	7,068	
Subtotal (Year 2)	3.46	N/A				**15,675**		40,163	9,625	**25,300**	49,788	10,380	**60,168**	42
PHASE 3 (YEAR 3)														
Multi-Family (Mixed Use Village)	3	25 units/ac	2.8 capita/unit	210	70 gpcd	14,700	2.5	36,750	7,350	22,050	44,100	9,000	53,100	
Subtotal (Year 3)	3.00	N/A				**14,700**		36,750	7,350	**22,050**	44,100	9,000	**53,100**	37
PHASE 4 (YEAR 4)														
Multi-Family (Mixed Use Village)	3	25 units/ac	2.8 capita/unit	210	70 gpcd	14,700	2.5	36,750	7,350	22,050	44,100	9,000	53,100	
Farm Dwellings	25	5 units	4 capita/unit	20	70 gpcd	1,400	2.5	3,500	700	2,100	4,200	75,000	79,200	
Village Green	5.9	N/A	15 capita/acre[3]	89	15 gpcd	1,328	N/A							
Regional Park	28	N/A	15 capita/acre[3]	420	15 gpcd	6,300	N/A							
Subtotal (Year 4)	61.90	N/A				**23,728**		40,250	8,050	**24,150**	48,300	84,000	**132,300**	92
PHASE 6 (YEAR 6)														
Farm Dwellings	25	9 units	4 capita/unit	36	70 gpcd	2,520	2.5	6,300	1,260	3,780	7,560	75,000	82,560	
Subtotal (Year 6)	25.00	N/A				**2,520**		6,300	1,260	**3,780**	7,560	75,000	**82,560**	58
TOTALS														
TOTAL (ROUNDED)	**105**	N/A				**77,640**		181,480	46,830	**116,840**	228,310	212,760	**441,070**	310

[1]Peak Factor Obtained from City and County of Honolulu, Wastewater Design Standards Vol. 1, Section 2.2.2.E

[2]Commercial Areas assumed to be Land Use B-2, City and County of Honolulu, Wastewater Design Standards Vol. 1, Section 2.2.2.C

[3]Self-Storage Facility is assumed to be Industrial Mixed Use District (IMX-1), City and County of Honolulu, Wastewater Design Standards Vol. 1 Section 2.2.2.C

[4]Farm Dwellings indicate the Farm Dwelling lots within 1,000 ft of the estimated well site that cannot have an IWS per DOH regulations.

[5]Years 5, 7, and 8 do not have any build-out that will result in the increase to the wastewater flows.

[6]The cummulative flows from years 1 and 2 are intended to be served by the Temporary WWTP

[7]The cummulative flows from years 1 through 4 are intended to be served by the Permanent WWTP

Per Conceptual Master Plan, January 24, 2019

Dry Weather Infiltration= 35 gpd/person
Wet Weather Infiltration= 3000 gpd/ac

PROJECTED WASTEWATER DEMANDS														
Land Use	Area (ac)	No. of Units	Number of People Per Unit	Total Number of People	Wastewater Contribution	Average Day Flow (gpd)	Flow Factor[1]	Max. Flow (gpd)	Dry Weather Infiltration (gpd)	Design Avg. Flow (gpd)	Design Max Flow (gpd)	Wet Weather Infiltration (gpd)	Design Peak Flow (gpd)	Design Peak Flow (gpm)
PHASE 1 (YEAR 1)														
Farm Dwellings (1 ac lots)	698	1 units/ac	4 capita/unit	2,792	70 gpcd	195,440	2.5	488,600	97,720	293,160	586,320	2,094,000	2,680,320	
Farm Dwellings (1 ac lot ADU)		353 units	1 capita/unit	353	70 gpcd	24,710	2.5	61,775	12,355	37,065	74,130	-	74,130	
Farm Dwellings (2 to 4 ac lots)	381	0.33 units/ac	4 capita/unit	508	70 gpcd	35,560	2.5	88,900	17,780	53,340	106,680	1,143,000	1,249,680	
Farm Dwellings (2 to 4 ac lot ADU)		64 units	1 capita/unit	64	70 gpcd	4,480	2.5	11,200	2,240	6,720	13,440	-	13,440	
Farm Dwellings (5+ ac lots)	80	0.20 units/ac	4 capita/unit	64	70 gpcd	4,480	2.5	11,200	2,240	6,720	13,440	240,000	253,440	
Farm Dwellings (5+ ac lot ADU)		13.00 units	1 capita/unit	13	70 gpcd	910	2.5	2,275	455	1,365	2,730	-	2,730	
Total Farm Dwellings	1,159.00	N/A				**264,670**		661,675	132,335	**397,005**	794,010	3,477,000	**4,271,010**	2,966

[1]Peak Factor Obtained from City and County of Honolulu, Wastewater Design Standards Vol. 1, Section 2.2.2.E

[2]Farm Dwellings indicate the Farm Dwelling lots within 1,000 ft of the estimated well site that cannot have an IWS per DOH regulations.

[3]Individual Wastewater Systems may only serve up to 5 bedrooms, for flow projection purposes it was assumed that the initial house includes 4 capita/unit while the ADU will include only 1 capita/unit

[4]ADU build-out is assumed to be half of the agricultural lots throughout the project site

Appendix F

Pre-Assessment Consultation Comments & Responses

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

January 23, 2019

Environmental Programs Branch
Programs and Project Management Division

Mr. Tom Schnell
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Schnell:

Thank you for your letter, dated December 11, 2018, requesting input for an Environmental Assessment on the proposed Nakahili development located in South Kohala on Hawaii Island. The area described in your letter (Tax Map Keys 3-6-8-002:005, 006, 028, 029, and 030) is within the former Waikoloa Maneuver Area (WMA) Formerly Used Defense Site (FUDS) (FUDS Project Number H09HI035912). The former WMA is located on the northwest side of Hawaii Island, and is comprised of approximately 100,000 acres that was used as a military training camp, maneuver area, and artillery range during WWII (see attached map).

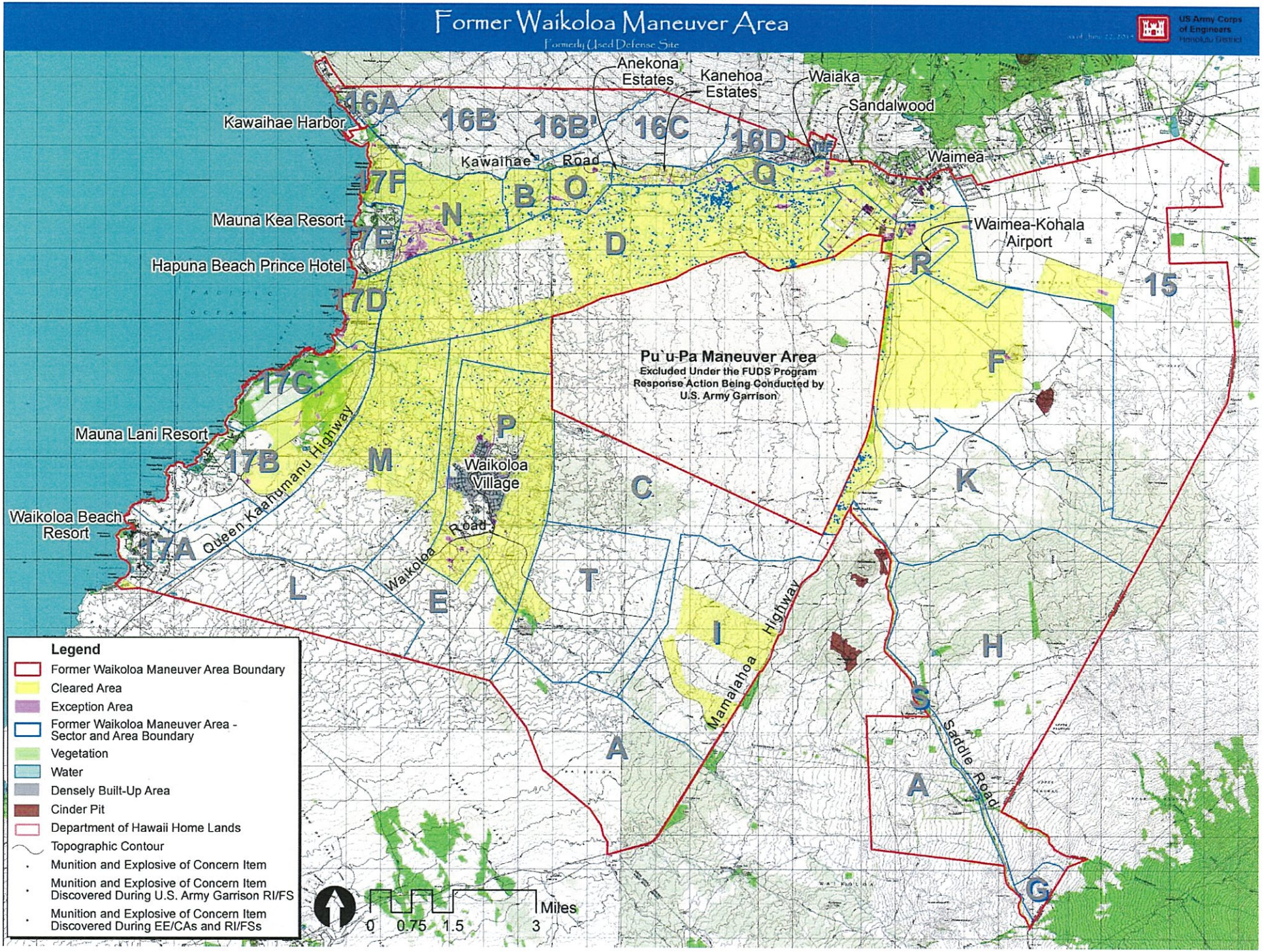
The U.S. Army Corps of Engineers (USACE) has completed the cleanup (munitions removal) at TMKs 3-6-8-002:005, 028, 029, and 030. USACE has not conducted its cleanup at TMK 3-6-8-002:006. There is the possibility of encountering unexploded ordnance (UXO) within WMA, even in areas that were previously cleared. If you discover an item that you think might be an UXO, remember the 3R's of Explosives Safety; Recognize when you may have come across a munition and that munitions are dangerous; Retreat by carefully leaving the area-DO NOT touch, move, or disturb the item; and Report what you saw and where you saw it to the County of Hawaii Police Department at 911 or 935-3311. They will contact the appropriate agency to identify and dispose of the item if necessary. USACE would be happy to provide a 3R's safety briefing to anyone associated with your project (landowners, stakeholders, construction personnel, etc.).

Should you have further questions about this matter, please contact Mr. Loren Zulick, Waikoloa Program/Project Manager at (808) 835-4305, or e-mail: loren.a.zulick@usace.army.mil.

Sincerely,

MICHAEL F. WONG, P.E.
Chief, Environmental Programs Branch

Enclosure


Former Waikoloa Maneuver Area
Formerly Used Defense Site
US Army Corps of Engineers
Honolulu District
Anekona Estates
Kanehoa Estates
Waiaka
Sandalwood
Waimea
Kawaihae Harbor
16A
16B
16B'
16C
16D
Kawaihae Road
7F
7E
7D
Mauna Kea Resort
Hapuna Beach Prince Hotel
N
B
O
Q
D
R
15
Waimea-Kohala Airport
Pu`u-Pa Maneuver Area
Excluded Under the FUDS Program
Response Action Being Conducted by
U.S. Army Garrison
F
17C
Mauna Lani Resort
17B
M
P
Waikoloa Village
C
K
Queen Kaahumanu Highway
Waikoloa Beach Resort
17A
Waikoloa Road
L
E
T
I
H
A
S
A
G
Mamalahoa Highway
Saddle Road
Legend
Former Waikoloa Maneuver Area Boundary
Cleared Area
Exception Area
Former Waikoloa Maneuver Area - Sector and Area Boundary
Vegetation
Water
Densely Built-Up Area
Cinder Pit
Department of Hawaii Home Lands
Topographic Contour
Munition and Explosive of Concern Item
Munition and Explosive of Concern Item Discovered During U.S. Army Garrison RI/FS
Munition and Explosive of Concern Item Discovered During EE/CAs and RI/FSs
0 0.75 1.5 3 Miles

From: Williams, Albert P CIV USARMY CEPOH (USA) <Albert.P.Williams@usace.army.mil>
Sent: Tuesday, January 22, 2019 10:35 AM
To: sysadmin <sysadmin@pbrhawaii.com>
Subject: POH-2019-00029 (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Aloha Mr. Snell,

This email is in reference to your request for pre-application consultation for the Nakahili Family Agricultural Community near Waikoloa Village, Island of Hawaii, Hawaii. This project has been assigned Department of the Army project number POH-2018-00029 which should be used in all future communications. I will be the project manager and my contact information is below.

Could you please provide the applicant's name and contact information (address, phone, and email)? This information is required for the administrative record and you will still be the primary point of contact.

Respectfully,
Albert Williams
Regulatory Specialist, Regulatory Branch U.S. Army Corps of Engineers Honolulu District
808-835-4056

CLASSIFICATION: UNCLASSIFIED

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

February 7, 2019

SUBJECT: Request for Comments for Nakahili Family Agricultural Community Development Project, Waikoloa Village, Island of Hawaii, Hawaii, DA File No. POH-2019-00029

Work Force Developers, LLC
Attention: Greg Brown
Post Office Box 1060
Lahaina, Hawaii 96767

Dear Mr. Brown:

The U.S. Army Corps of Engineers (Corps), Honolulu District has received your letter dated December 11, 2018 requesting comments for the Nakahili Family Agricultural Community Development Project located in Waikoloa Village on the Island of Hawaii, Hawaii. We have assigned Department of the Army (DA) File No. POH-2019-00029 to this action. Please reference this number in all future correspondence concerning this project.

Based on the description in your letter, it appears that there may be waters of the United States (U.S.) on the project site that are subject to our federal permitting authority pursuant to Section 404 of the Clean Water Act (CWA) of 1972 (33 USC 1344). Section 404 of the CWA prohibits the placement of dredged or fill material into waters of the U.S., including wetlands, unless the work has been authorized by a DA permit. Prior to finalizing your development plans and initiating work, we recommend you conduct a delineation of all aquatic resources that occur on the project site, including, but not limited to: rivers, streams, wetlands, ponds, lakes, and other similar drainage features. The aquatic delineation report and a request for a jurisdictional determination should be submitted to our office for review to determine if the project site contains waters of the U.S. Additional information about jurisdictional delineations and determinations, including a JD Request Form, can be found on our website.

Please be advised that if the project site contains waters of the U.S. and your proposed action cannot avoid impacting waters of the U.S., you will need to contact our office to determine if your activities are regulated and therefore, require prior DA authorization. Before authorizing work under our statutory authorities, the Corps must ensure a project complies with applicable Federal laws and regulations, such as the Endangered Species Act (ESA), Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Section 401 of the Clean Water Act, Coastal Zone Management Act, and the National Historic Preservation Act. In most instances, the Corps will coordinate directly with the appropriate agencies, but we may require additional information from the applicant to complete the coordination and consultation. To learn more about our Regulatory Program

and application process, you may visit our website at https://www.poh.usace.army.mil/Missions/Regulatory or request a pre-application consultation meeting by emailing me or our main office at CEPOH-RO@usace.army.mil.

Thank you for your cooperation with the Honolulu District Regulatory Program. Should you have any questions related to this letter, please contact me at (808) 835-4056 or via e-mail at albert.p.williams@usace.army.mil. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Branch by accessing our web-based customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Sincerely,



Albert P. Williams
Regulatory Specialist, Regulatory Branch

cc:
Mr. Tom Schnell, PBR Hawaii and Associates, Inc.

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

Mr. Albert Williams, Regulatory Specialist
U.S. Army Corps of Engineers
Honolulu District
ATTN: CEPOD-PDC
573 Bonney Loop
Fort Shafter, HI 96858-5440

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAIʻI (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

ATTN: Michael F. Wong, P.E.

Dear Mr. Williams,

On behalf of Work Force Developers, LLC, thank you for the U.S. Army Corps of Engineers' (USACE) responses as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (email from Albert Williams dated January 22, 2019, letter from Michael F Wong dated January 23, 2019, and your letter dated February 7, 2019, Reference code POH-2018-00029). In response to your comments, we offer the following responses:

1. We acknowledge that the USACE has completed munitions removal at the Property's north parcels (TMKs 3-6-8-002:005, 028, 029, and 030) and has yet to conduct cleanup at the Property's south parcel (TMK 3-6-8-002:006). We understand the possibility of encountering Unexploded Ordnances (UXO) on parcels that have been previously cleared and will take the precautionary measures recommended by USACE as well as recommendations from the State of Hawai'i Department of Health before further action is taken to clear the Property.

2. We acknowledge the regulations set forth under Section 404 of the Clean Water Act (CWA) of 1972 (33 USC 1344) and do not anticipate that Nakahili will impact surface water drainageways through the Property, including the two intermittent riverine systems classified in the National Wetlands Inventory. The Draft EA will discuss hydrological and aquatic features of the Property and the mitigation measures to avoid any impacts to waters of the U.S. Should impacts to waters of the U.S. be unavoidable, we will contact your office to determine regulated activities and further compliance with applicable environmental laws.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawai'i Office of Housing and Community Development

O:\Job33\3331.06 Nakahili\EA\Pre consultation\Responses\Federal USACE.docx

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DACHENG DONG, LEED® AP
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Associate

NATHALIE RAZO
Associate

GRACE ZHENG, ASLA, LEED® GA, SITES® AP
Associate

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GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 10, 2019

PBR Hawaii & Associates, Inc.
Attention: Mr. Tom Schnell, Principal
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

via email: tschnell@pbrhawaii.com

Dear Mr. Schnell:

SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "**Nakahili**" located at South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, & 030 on behalf of Work Force Developers LLC

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) Commission on Water Resource Management, and (b) Land Division – Hawaii District on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at (808) 587-0417. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2019 JAN -4 PM 3:44

DEPT OF LAND & NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
COMMISSION ON WATER
RESOURCE MANAGEMENT
2018 DEC 20 PM 3:03

December 21, 2018

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division
_X_Div. of Forestry & Wildlife
___Div. of State Parks
_X_Commission on Water Resource Management
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District
_X_Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "**Nakahili**"
LOCATION: South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, and 030
APPLICANT: PBR Hawaii & Associates, Inc. on behalf of Work Force Developers LLC

Transmitted for your review and comment is information on the above-referenced subject matter. We would appreciate your comments by **January 9, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ Dean D. Uyeno

Print Name: Acting Deputy Director

Date: January 3, 2019

Attachments
cc: Central Files

FILE ID: RFD.5008.8
DOC ID: 20749

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

BRUCE S. ANDERSON, PH.D.
WILLIAM D. BALFOUR, JR.
KAMANA BEAMER, PH.D.
MICHAEL G. BUCK
NEIL J. HANNAHS
PAUL J. MEYER

DEAN D. UYENO
ACTING DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

January 3, 2019

REF: RFD.5008.8

TO: Mr. Russell Tsuji, Administrator
Land Division

FROM: Dean D. Uyeno, Acting Deputy Director
Commission on Water Resource Management

SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "Nakahili"

FILE NO.: RFD.5008.8
TMK NO.: (3) 6-8-002:005, 006, 028, 029 and 030

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

- [ ] 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.
- [ ] 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.
- [ ] 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.
- [X] 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.
- [X] 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/
- [X] 6. We recommend the use of alternative water sources, wherever practicable.
- [X] 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.
- [X] 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at

http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

☐ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

☐ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☒ 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.

☒ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☐ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.

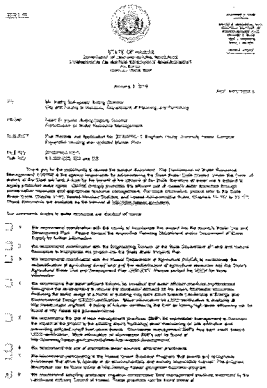
☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☒ OTHER: The Draft Environmental Assessment should discuss the projected water demands for the project, both potable and non-potable, and provide the calculations used to estimate demands. The Draft Environmental Assessment should identify the proposed water source(s) to support the project, and include a discussion of the potential impacts on water resources and other public trust uses of water, and describe any proposed mitigation measures. Water conservation and efficiency measures to be implemented should also be discussed.

If you have any questions, please contact W. Roy Hardy of the Regulation Branch at 587-0225 or Lenore Ohye of the Planning Branch at 587-0216.



Doc Review (3) RFD.5006.8 BYU; RFD.5007.8 Kolekole Gulch Park; RFD.5008.8 Nakahili

Adobe Sign Document History 01/04/2019

Created:	01/04/2019
By:	Kathy Yoda (kathy.s.yoda@hawaii.gov)
Status:	Signed
Transaction ID:	CBJCHBCAABAAjS7s2A75aRTbcVOMCABWD7qtZiWVJSy-

"Doc Review (3) RFD.5006.8 BYU; RFD.5007.8 Kolekole Gulch Park; RFD.5008.8 Nakahili" History

Document created by Kathy Yoda (kathy.s.yoda@hawaii.gov)
01/04/2019 - 8:18:57 AM HST- IP address: 132.160.239.30

Document emailed to Dean Uyeno (dean.d.uyeno@hawaii.gov) for signature
01/04/2019 - 8:21:01 AM HST

Document viewed by Dean Uyeno (dean.d.uyeno@hawaii.gov)
01/04/2019 - 8:57:10 AM HST- IP address: 132.160.239.30

Document e-signed by Dean Uyeno (dean.d.uyeno@hawaii.gov)
Signature Date: 01/04/2019 - 9:06:30 AM HST - Time Source: server- IP address: 132.160.239.30

Signed document emailed to all eligible parties.
01/04/2019 - 9:06:30 AM HST

ETS
STATE OF HAWAI'I

DAVID Y. IGE
GOVERNOR OF HAWAII

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LAND DIVISION
2019 JAN -7 AM 10:56
DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

2018 DEC 24 P 1:13
RECEIVED
LAND DIVISION
HILO, HAWAII

December 21, 2018

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division
_X_Div. of Forestry & Wildlife
___Div. of State Parks
_X_Commission on Water Resource Management
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District
_X_Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "**Nakahili**"
LOCATION: South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, and 030
APPLICANT: PBR Hawaii & Associates, Inc. on behalf of Work Force Developers LLC

Transmitted for your review and comment is information on the above-referenced subject matter. We would appreciate your comments by **January 9, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: _____

Print Name: GORDON C. HEIT

Date: 1-3-19

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 14, 2019

PBR Hawaii & Associates, Inc.
Attention: Mr. Tom Schnell, Principal
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

via email: tschnell@pbrhawaii.com

Dear Mr. Schnell:

SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "**Nakahili**" located at South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, & 030 on behalf of Work Force Developers LLC

Thank you for the opportunity to review and comment on the subject matter. In addition to our previous comments dated January 10, 2019, enclosed are comments from the Engineering Division on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at (808) 587-0417. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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LAND DIVISION
2019 JAN 11 AM 11:34
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII
2019 JAN 11 AM 11:54 ENGINEERING

December 21, 2018

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division
_X_Div. of Forestry & Wildlife
___Div. of State Parks
_X_Commission on Water Resource Management
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District
_X_Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "**Nakahili**"
LOCATION: South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, and 030
APPLICANT: PBR Hawaii & Associates, Inc. on behalf of Work Force Developers LLC

Transmitted for your review and comment is information on the above-referenced subject matter. We would appreciate your comments by **January 9, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____

Print Name: Carty S. Chang, Chief Engineer

Date: 1/9/19

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji

Ref: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "Nakahili", South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, and 030

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 1/9/19

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 18, 2019

PBR Hawaii & Associates, Inc.
Attention: Mr. Tom Schnell, Principal
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

via email: tschnell@pbrhawaii.com

Dear Mr. Schnell:

SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "**Nakahili**" located at South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, & 030 on behalf of Work Force Developers LLC

Thank you for the opportunity to review and comment on the subject matter. In addition to our previous comments dated January 10 and 14, 2019, enclosed are comments from the Division of Forestry & Wildlife on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at (808) 587-0417. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure
cc: Central Files

19385

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 21, 2018

MEMORANDUM

RECEIVED
LAND DIVISION
2019 JAN 15 AM 10:54
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

TO: FR.

DLNR Agencies:
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division
_X_Div. of Forestry & Wildlife
___Div. of State Parks
_X_Commission on Water Resource Management
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District
_X_Historic Preservation

FROM: T. Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "**Nakahili**"
LOCATION: South Kohala, Waikoloa, Island of Hawaii; TMK: (3) 6-8-002:005, 006, 028, 029, and 030
APPLICANT: PBR Hawaii & Associates, Inc. on behalf of Work Force Developers LLC

Transmitted for your review and comment is information on the above-referenced subject matter. We would appreciate your comments by **January 9, 2019.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed: _____

Print Name: **DAVID G. SMITH, Administrator**

Date: 1/11/19

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

JEFFREY T. PEARSON, P.E.
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

December 27, 2018

MEMORANDUM

TO: Tom Schnell, AICP, PBR HAWAII & Associates, Inc.

FROM: David G. Smith, Forestry and Wildlife DGS

SUBJECT: Comment- Pre-Assessment Consultation for an Environmental Assessment (EA) for the Proposed Workforce Family Agricultural Community called "Nakahili"

The Division of Forestry and Wildlife has no objections on the pre-consultation for the draft Environmental Assessment referenced above; however, we would offer recommendations to encourage Work Force Developers LLC to consider agroforestry in their land use decisions, increase the project lot sizes to at least five acres to allow participation in the Forest Stewardship Program, and encourage utilization of native plants in their landscaping.

Agroforestry is the process of growing trees together with more traditional agricultural crops. Planting of agroforestry trees can provide a number of benefits including increased tree canopy, watershed and improved soil health, and carbon sequestration, among others, while supporting a diversified agricultural system with possibilities for shorter and long-term products.

The Division's Forest Stewardship Program provides technical and financial assistance for private land managers interested in land stewardship, conservation, reforestation, and forest production. This program in particular could support the development of agroforestry systems; however, the minimum acreage requirement to participate in the program is five acres. By increasing the lot sizes to at least five acres, they would be eligible for the program and receive assistance for the implementation of their land management projects.

Although your project is considering lots sizes of one acre, neighboring properties can work together through an organization such as a homestead association to achieve the five-acre lot size requirement and qualify for the program. Additionally, there are complementary federal program that can support agroforestry that are available for smaller lot sizes. The Division also supports using the areas around the development as a buffer and the 150-ft wide firebreak. We recommend using native species in the buffer area and in landscaping, whenever possible.

Should you have any questions, please contact Malia Nanbara at (808) 587-4176 or by email at Malia.Y.Nanbara@hawaii.gov.

Mahalo.

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

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

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Mr. Tsuji,

On behalf of Work Force Developers, LLC (Applicant) thank you for the Department of Land and Natural Resources' (DLNR) comments from various DLNR divisions as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA). In response DLNR's comments, we offer the following responses:

Commission on Water Resource Management (CWRM)

1. We acknowledge CWRM's recommendation to use water efficient fixtures and practices as well as LEED-certified practices in the development of Nakahili. The Applicant will explore options for water efficient design where appropriate as the project progresses into the design phase.
2. The Applicant will utilize stormwater BMPs where practicable to reduce any impacts to existing hydrology as well as stormwater infiltration and runoff from the Property.
3. We acknowledge your recommendation to use alternative water sources where practicable.
4. We acknowledge your recommendation to participate in the Hawai‘i Green Business Program and the resources provided by CWRM.
5. Landscape irrigation conservation BMPs will be considered and incorporated into future project design where practicable. Irrigation will also be incorporated as necessary for the planned agricultural uses within the Property as the project moves into the design phase.
6. The Applicant will submit applications Well Construction Permit(s) prior to the construction of any well(s) on the Property.
7. The Applicant will submit the necessary Pump Installation Permit(s) before any ground water is developed as a source of water supply for Nakahili.
8. The Draft EA will discuss potable and non-potable water demand projections for the Property and include the calculations for such from a certified engineer. The Draft EA will also discuss the water source, public trust uses of water source, and potential impacts and mitigation measures including water efficiency and conservation measures to be considered or implemented for Nakahili.

THOMAS S. WITTEN, FASLA
Chairman / Principal

R. STAN DUNCAN, ASLA
President / Principal

RUSSELL Y. J. CHUNG, FASLA, LEED® AP BD+C
Executive Vice-President / Principal

VINCENT SHIGEKUNI
Senior Vice-President / Principal

GRANT T. MURAKAMI, AICP, LEED® AP BD+C
Vice-President / Principal

TOM SCHNELL, AICP
Principal

KIMI MIKAMI YUEN, LEED® AP BD+C
Principal

W. FRANK BRANDT, FASLA
Chairman Emeritus

ANN MIKIKO BOUSLOG, PhD
Project Director

RAMSAY R. M. TAUM
Cultural Sustainability Planner

RAYMOND T. HIGA, ASLA
Senior Associate

CATIE CULLISON, AICP
Senior Associate

MARC SHIMATSU, ASLA
Senior Associate

DACHENG DONG, LEED® AP
Senior Associate

MICAH McMILLEN, ASLA, LEED® AP
Associate

NATHALIE RAZO
Associate

GRACE ZHENG, ASLA, LEED® GA, SITES® AP
Associate

BRIAN WOLF, ASLA, LEED® AP
Associate

HONOLULU OFFICE
1001 Bishop Street, Suite 650
Honolulu, Hawai‘i 96813-3484
Tel: (808) 521-5631
Fax: (808) 523-1402
E-mail: sysadmin@pbrhawaii.com

printed on recycled paper

Land Division
We acknowledge that the Land Division has no comments on the subject project at this time.

Engineering Division
We acknowledge the information provided regarding the National Flood Insurance Program and Flood Hazard Zones from the Federal Emergency Management Agency (FEMA). The Property is located in Zone X (an area of minimal flood hazard), which will be discussed along with a FEMA Flood Insurance Rate Map (FIRM) in the Draft EA.

Division of Forestry and Wildlife (DOFAW)

1. We acknowledge that the DOFAW has no objections to the subject project.
2. We acknowledge DOFAW's recommendation to incorporate agroforestry on the Property and the benefits it can provide such as diversified agriculture and increased agricultural productivity. As planning and design for Nakahili progresses, agroforestry will be considered for agricultural lots where practicable and where best suited for the climatic and regional conditions. While no decision has been made at this time, the Draft EA will discuss agricultural feasibility for the Property and potential crops well suited for the region and current design for the Property.
3. We acknowledge the information provided regarding the DOFAW's Forest Stewardship Program and related benefits. While Nakahili will include smaller (1-acre) agricultural lots, Nakahili will also include larger 2- to 5-acre agricultural lots.
4. We acknowledge your support of using areas around the development as a buffer and the 150-ft wide firebreak. We also acknowledge your recommendation to use native species in the buffer area and in landscaping, which will be considered and implemented where practicable.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawaiʻi Office of Housing and Community Development

DAVID Y. IGE
GOVERNOR

DR. CHRISTINA M. KISHIMOTO
SUPERINTENDENT

STATE OF HAWAI`I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI`I 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

December 28, 2018

Tom Schnell, AICP
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Re: Pre-Assessment Consultation for Nakahili, Waikoloa, Hawaii

Dear Mr. Schnell:

The Hawaii State Department of Education (HIDOE) would like to comment on your letter of December 11, 2018, seeking comments on the Nakahili project (Project) being proposed for Waikoloa.

The Project is not located in a school impact fee district where we are currently collecting school impact fees. It is located within the boundaries of the West Hawaii School Impact Fee District which was designated by the Board of Education in 2010. A fee analysis will be required before any further action can be taken to begin collecting school impact fees in West Hawaii.

The Project will have an impact on the HIDOE schools serving the Waikoloa area. The HIDOE students from kindergarten through the 8th grade living in the Project would attend Waikoloa Elementary and Middle School (WEMS). The official 2018-2019 school year enrollment count for the school is 833 pupils. Our most recent assessment of the school's classroom capacity is space for 702 students, so the school is crowded and would have difficulty accommodating a large number of additional students.

Current enrollment is considered a peak number and projected enrollment is estimated to decline gradually over the next five years. In the 2023-2024 school year, enrollment is projected to decline to approximately 786 students. The enrollment projection would not include any students projected to live in the early phases of the Project.

High school students in the Project would attend Kealakehe High School. Enrollment at Kealakehe had declined for many years, but has now grown over the past three school years. The 2018-2019 official enrollment for the high school is 1,374 students, which is very close to the school's classroom capacity of 1,334 students. Enrollment is expected to continue to grow to 1,549 students over the next five years.

The HIDOE is planning a new eight classroom building at WEMS. A construction contract was awarded in 2018. If there was a larger jump in enrollment at WEMS in the short term, it might be possible to utilize the excess capacity at the two middle schools closest WEMS: Waimea Middle Conversion Charter and Kealakehe Intermediate School. In the longer term, the HIDOE can secure the future middle school site adjacent to WEMS and design a facility to accommodate enrollment growth.

The HIDOE looks forward to reviewing the environmental assessment for the Project. If you have any questions, please contact Heidi Meeker, Land Use Planner of the Facilities Development Branch, Planning Section, at (808) 784-5095.

Respectfully,

Kenneth G. Masden II
Public Works Manager
Planning Section

KGM:hm

c: Arthur Souza, Complex Area Superintendent for Honokaa/Kealakehe/Kohala/Konawaena Complex

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

Mr. Kenneth G. Masden II, Public Works Manager
State of Hawai'i
Department of Education
P.O. Box 2360
Honolulu, HI 96804

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI'I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Mr. Masden,

On behalf of Work Force Developers, LLC, we thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (dated December 28, 2018). In response to your comments, we offer the following responses:

1. We acknowledge Nakahili is: 1) not located in a school impact fee district where the Department of Education (DOE) is currently collecting school impact fees; 2) in the West Hawai'i School Impact Fee District, which will require a fee analysis prior to collecting the required school impact fees. The Applicant will continue to consult the State Department of Education (HIDOE) regarding the construction timeline and appropriate school impact fees generated by Nakahili.

2. We acknowledge the data provided on existing student capacity within HIDOE facilities and projected enrollment for the facilities that will serve residents of Nakahili, including the Waikoloa Elementary and Middle School and Kealakehe High School. Existing and projected student enrollment will be included and discussed within the Draft EA.

3. We acknowledge Nakahili will have an impact on DOE facilities serving the Waikoloa area and appreciate your allocations regarding which area schools Nakahili school-age residents would go to.

4. The Applicant will continue to consult the HIDOE on the construction timeline for Nakahili, particularly regarding impacts on the estimated student enrollment at Waikoloa Elementary and Middle School as well as Kealakehe High School.

Work Force Developers will comply with all laws regarding school impact fees, including Sections 302A-1601 to Section 320A-1612, HRS, which establish a structure for assessing school impact fees for residential development.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawai'i Office of Housing and Community Development

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Project Director

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 1399
HWY-PS 2.9278

January 28, 2019

Mr. Tom Schnell
Principal
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Schnell:

Subject: Requests for Comments
Pre-Consultation for Draft Environmental Assessment
Nakahili Agricultural Community
TMK: No: 6-8-002: 005, 006, 028, 029 and 030-Waikaloa, South Kohala, Hawaii

Thank you for the opportunity to review the above-referenced project for the preparation of an upcoming Draft Environmental Assessment (DEA) required by Chapter 343, Hawaii Revised Statutes for the purpose of a 201H-38 workforce housing application.

The proposed masterplan development will be a family agricultural community and will consist of 449 farm dwellings on agricultural lots ranging from two to five acres that will allow for farm uses. A proposed village area with 300 multifamily units and limited retail uses, as well as 3-acres of land for light industrial uses and offices will be developed. A 29-acres regional park for community events is also being proposed.

The 1,550 acre site appears to have multiple access driveways directly onto the State Route No.190, Mamalahoa Highway.

1. A Traffic Impact Analysis Report (TIAR) to be included in the DEA and should be prepared by a Professional Engineer with State license and traffic expertise.

   a. The study should include the following intersections:

      i. Mamalahoa Highway and Saddle Road

      ii. Mamalahoa Highway and Waikaloa Road

      iii. Queen Kaahumanu Highway and Waikaloa Road

b. The TIAR should include a phasing plan and the transportation improvements of each phase.

c. An evaluation should be included for regional traffic impacts by the proposed masterplan community and potential fair share contribution to regional traffic improvements.

If you have any questions, please contact Ken Tatsuguchi, Engineering Program Manager, Highways Division, Planning Branch at (808) 587-1830. Please reference file review number PS 2018-127.

Sincerely,

JADE T. BUTAY
Director of Transportation

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

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Associate

Mr. Jade T. Butay, Director
State of Hawai‘i
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Mr. Butay,

On behalf of Work Force Developers, LLC, thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (dated January 28, 2019, Reference code: DIR 1399 HWY-PS 2.9278). In response to your comments, we offer the following responses:

A Traffic Impact Assessment Report (TIAR) has been prepared for Nakahili by a Professional Engineer with a State license and traffic expertise, to be included in the Draft EA. The TIAR will address the intersections specified in your letter and include a phasing plan, transportation improvements for each phase, an evaluation of regional traffic impacts from Nakahili, and any potential fair share contribution to regional traffic improvements.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawai‘i Office of Housing and Community Development

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STATE OF HAWAII

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DTS201901091408NA

January 10, 2019

Mr. Tom Schnell, AICP
Principal
PBR HAWAII & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Schnell,

Subject: Pre-Assessment Consultation for An Environmental Assessment for Nakahili
TMK: (3) 6-8-002: 005, 006, 028, 029, and 030
Waikoloa, South Kohala, Hawaii

Thank you for the opportunity to comment on the Pre-Assessment Consultation for a Draft Environmental Assessment (Draft EA) for Nakahili. Work Force Developers LLC is proposing to create a workforce family agricultural community on 1,550 acres near the intersection of Mamalahoa Highway and Waikoloa Road. The proposed Nakahili community will consist of 700 one-acre agricultural lots surrounded by 150 larger agricultural lots ranging in size from two to five acres. Approximately 15 acres of the project site is proposed for a neighborhood commercial district ("village") with multi-family apartments, retail, and limited light industrial use. A community green for community activities and events, and a 29-acre regional park is also planned.

Community infrastructure will be provided on-site, with areas for new water wells, water tanks, a small wastewater treatment facility serving the commercial area, and several large detention basins. Wastewater service for the agricultural lots and homes will be provided by individual wastewater systems located on each lot. Approvals for the project will be processed under HRS, Chapter 201H. More than 50 percent of the total number of for-sale agricultural dwellings and lots and village rental apartments will be priced in accordance with the County of Hawaii's Office of Housing and Community Development's Affordable Housing Guidelines.

The Nakahili project site is entirely within the State Agricultural District. The project is situated on lands classified "D" by the Land Study Bureau.

The Office of Planning (OP) has the following comments:

1. Non-permitted Uses in the State Agricultural District

Multi-family apartments, retail, and light industrial uses are not permissible uses in the State Agricultural District. Provided the proposed neighborhood commercial district remains at 15 acres or less in size, the Draft EA should disclose the applicant's intention to seek a district boundary amendment from the Agricultural to the Urban District or a special permit to

accommodate the non-permissible uses from the County of Hawaii. Should the proposed commercial district exceed 15 acres, then the applicant must request a State Land Use District Boundary Amendment from the State Land Use Commission.

2. The Hawaii State Planning Act

Hawaii Administrative Rules (HAR) § 11-200-10(4) requires an Environmental Assessment to provide a general description of the action's technical, economic, social, and environmental characteristics.

The Draft EA should provide a discussion of the project and its ability to meet State goals and priorities as detailed in Hawaii Revised Statutes (HRS) Chapter 226. The analysis on the Hawaii State Planning Act should examine the project's consistency with all three parts of HRS Chapter 226 or clarify where the project conflicts with them. If any of these statutes are not applicable to the project, the analysis should affirmatively state such determination, along with discussion paragraphs.

3. Hawaii Coastal Zone Management Program

The Coastal Zone Management (CZM) area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (HRS § 205A-1). The proposed action should conform with all the objectives and supporting policies of the Hawaii CZM program, as listed in HRS § 205A-2.

Pursuant to HRS § 205A-4, in implementing the objectives of the CZM program, agencies shall give full consideration to ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. As this project may require the approval of government agencies, the Draft EA should contain analysis on the project's consistency with HRS § 205A-2.

4. Affordable Rental Housing

Pursuant to Act 127, Session Laws of Hawaii 2016, a Special Action Team on affordable housing was established to make recommendations on actions to promote affordable rental housing statement. A key goal of Act 127 is to achieve 22,500 affordable rental housing units by December 31, 2026. According to the pre-consultation review material, affordable rental units will be made available for this project and will be priced in accordance with the County of Hawaii's Office of Housing and Community Development's Affordable Housing Guidelines.

The Draft EA should indicate the quantity of affordable rental units that will be made available to the residents of South Kohala, so that the total number of affordable rental units can be applied to the goals of Act 127.

5. Drainage / Stormwater Runoff Mitigation / Erosion Control
Pursuant to HAR § 11-200-10(6) – identification and summary of impacts and alternatives considered; in order to ensure that the water and marine resources of the South Kohala area of Hawaii Island remain protected, the negative effects of stormwater inundation to the project area and its surroundings should be evaluated in the Draft EA.

Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, open spaces, streams and wetlands, and soil absorption characteristics. These items, as well as the marine water quality classification, should be considered when developing mitigation measures for the protection of surface water resources and coastal ecosystem, pursuant to HAR § 11-200-10(7).

According to the transmitted review material, this project involves not only light industrial uses, commercial activities, and housing development (which is typical of urban areas), it also involves agricultural operations. Therefore, the Draft EA should consider mitigation strategies to limit stormwater runoff. To assist in the development of stormwater runoff strategies, OP has developed guidance documents on this subject. We recommend consulting these evaluative tools for polluted runoff reduction. They offer useful techniques to keep land-based pollutants and sediment in place, while considering the management practices best suited for the topography of the area and the types of contaminants potentially affecting nearby water resources. The evaluative tools include:

- Hawaii Watershed Guidance provides direction on mitigation strategies for agricultural production activities, as well as actions that are typical in urban areas, that will safeguard watersheds and implement watershed plans. http://files.hawaii.gov/dbedt/op/czm/initiative/nonpoint/HI Watershed Guidance Final.pdf; and

- Stormwater Impact Assessments can be used to identify and analyze information on hydrology, sensitivity of coastal and riparian resources, and management measures to control runoff, as well as consider secondary and cumulative impacts to the area. http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_ stormwater_impact_assessments_guidance.

If you have any questions about this comment letter, please contact Aaron Setogawa of our Land Use Division at (808) 587-2883 or Joshua Hekekia of our CZM Program at (808) 587-2845.

Sincerely,

Leo R. Asuncion
Planning Program Administrator II

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

Mr. Leo R. Asuncion
Planning Program Administrator II
State of Hawai‘i
Office of Planning
P.O. Box 2359
Honolulu, HI 96804

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Mr. Asuncion,

On behalf of Work Force Developers, LLC (Applicant), thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (dated January 10, 2019, Reference code: DTS201901091408NA). In response to your comments, we offer the following responses:

1. We acknowledge your comment regarding the non-permitted uses on the Property due to its location within the State Agricultural District. Approvals for Nakahili are proposed be processed under Chapter 201H, Hawai‘i Revised Statues (HRS). In addition, the commercial district will not exceed 15 acres in size and the Draft EA will address compliance with State Land Use boundary amendments.

2. The Draft EA will include a discussion of Nakahili’s compliance with all three parts of the Hawai‘i State Planning Act, Chapter 226, Hawai‘i Revised Statutes (HRS).

3. The Draft EA will include a discussion of Nakahili’s compliance with the Hawai‘i Coastal Zone Management Plan, Chapter 205A, HRS.

4. We acknowledge the information provided on Affordable Housing initiatives pursuant to Act 127 and the statewide housing unit goal in place for 2026. With its 300 apartments, of which at least 50% are planned to be made available for rent at affordable rates by 2023, Nakahili would represent a substantial achievement with respect to the State goal for development of 22,500 new affordable rental housing units by December 31, 2026, as expressed in Act 127, Session Laws of Hawai‘i. The Draft EA will discuss the total proposed housing units and a breakdown of how these will be priced in accordance with the County of Hawai‘i’s OHCD Affordable Housing Guidelines.

5. We acknowledge your comments and information provided regarding drainage, stormwater runoff mitigation, and erosion control. The Draft EA will discuss these topics and proposed mitigation. We also acknowledge your recommendation to consult evaluative tools to reduce polluted runoff from the Property and will review these resources at the appropriate time.

THOMAS S. WITTEN, FASLA
Chairman / Principal

R. STAN DUNCAN, ASLA
President / Principal

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We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawaiʻi Office of Housing and Community Development

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Harry Kim
Mayor

Wilfred M. Okabe
Managing Director

William A. Kucharski
Director

Diane A. Noda
Deputy Director

County of Hawai'i
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720
Ph: (808) 961-8083 · Fax: (808) 961-8086
Email: cohdem@hawaiicounty.gov

December 18, 2018

Mr. Tom Schnell, AICP
PBR Hawai'i & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813-3484

Re: Pre-Assessment Consultation for an Environmental Assessment for Nakahili, Located in Waikōloa, South Kohala, Hawai'i
Tax Map Key Nos. (3) 6-8-002:005, 006, 028, 029, 030

Dear Mr. Schnell:

The Department of Environmental Management's Solid Waste Division and Wastewater Division have reviewed your December 11, 2018, letter inviting input on the proposed Nakahili project.

The Solid Waste Division (SWD) strongly recommends that the project include waste diversion as part of the project specifications. The SWD can work with the architect/engineer and/or contractor at the appropriate time.

Thank you for the opportunity to provide input.

Sincerely,

William A. Kucharski
Director

WK:mef
cc: Gregory Goodale, SWD
Gene Quiamas, SWD

County of Hawai'i is an Equal Opportunity Provider and Employer

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

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President / Principal

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Associate

BRIAN WOLF, ASLA, LEED® AP
Associate

Mr. William A. Kucharski, Director
County of Hawai‘i
Department of Environmental Management
345 Kekuanao‘a Street, Suite 41
Hilo, HI 96720

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Mr. Kucharski,

On behalf of Work Force Developers, LLC, we thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (dated December 18, 2018, Reference: WK:mef). In response to your comments, we offer the following responses:

We acknowledge the recommendation by the Solid Waste Division (SWD) to incorporate solid waste diversion as part of the specifications for the project. Work Force Developers will coordinate with SWD for opportunities to include solid waste diversion as Nakahili moves into the design phase. The Draft EA will also include a discussion of recycling stations and other available waste diversion options available in the region.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawai‘i Office of Housing and Community Development

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Harry Kim
Mayor

Diane L. Ley
Director

Ron Whitmore
Deputy Director

County of Hawai'i

DEPARTMENT OF RESEARCH AND DEVELOPMENT

25 Aupuni Street, Room 1301 • Hilo, Hawai'i 96720-4252
(808) 961-8366 • Fax (808) 935-1205
E-mail: chresdev@hawaiicounty.gov

January 11, 2019

PBR Hawai'i & Associates, Inc.
Attn: Tom Schnell, AICP
1001 Bishop Street, Suite 650
Honolulu, HI 96813-3483

SUBJECT: Pre-Assessment Consultation for an Environmental Assessment (EA) for Nakahili, Located in Waikōloa, South Kohala

Dear Mr. Schnell:

We are writing in response to your December 11, 2018 notice of pre-assessment consultation for an Environmental Assessment (EA) for Nakahili, located in Waikōloa, South Kohala. Thank you for the opportunity to comment.

Though we appreciate efforts to address the affordable housing challenge facing Hawai'i County, we believe that it is important to at the same time advance smart growth. The EA should specifically address the area's agricultural land use designations and how appropriate it is for urban development.

At the same time, given the dry, rugged landscape, the opportunities for viable agriculture are limited in the area. Therefore, the EA should specifically address the viability of agricultural activity in the development, especially on small lots. Likewise, the EA should address the need for supporting infrastructure necessary for successful agricultural business development and subsistence food production, like storage, certified kitchens, and processing facilities.

If the development is permitted, at a minimum, the following should be addressed:

- Appropriate improvements at the intersection of Waikōloa Road and Highway 190
- Consideration of access via Waikōloa Road
- Infrastructure standards (without exemptions) that are appropriate for the proposed uses, including paving of agricultural lot roads and transit amenities
- Xeriscape landscaping and other green infrastructure that is appropriate for the area's microclimate
- The re-use of treated waste water for irrigation.

Again, thank you for the opportunity to comment. Please notify us when the Draft Environmental Assessment is available for review. In the interim, please contact Deputy Director Ron Whitmore if you have any questions.

Sincerely,

Diane L. Ley
Director

RW:nc

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

THOMAS S. WITTEN, FASLA
Chairman / Principal

R. STAN DUNCAN, ASLA
President / Principal

RUSSELL Y. J. CHUNG, FASLA, LEED® AP BD+C
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TOM SCHNELL, AICP
Principal

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CATIE CULLISON, AICP
Senior Associate

MARC SHIMATSU, ASLA
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DACHENG DONG, LEED® AP
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MICAH McMILLEN, ASLA, LEED® AP
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NATHALIE RAZO
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GRACE ZHENG, ASLA, LEED® GA, SITES® AP
Associate

BRIAN WOLF, ASLA, LEED® AP
Associate

Ms. Diane L. Ley, Director
County of Hawai‘i
Department of Research and Development
25 Aupuni Street, Room 1301
Hilo, HI 96720

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Ms. Ley,

On behalf of Work Force Developers, LLC, thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (dated January 11, 2019, Reference: RW:nc). In response to your comments, we offer the following responses:

1. The Draft EA will address the area's agricultural land use designations the appropriateness of the portion the project proposed for a small neighborhood commercial "village" area with apartments and limited retail uses to serve the agricultural community. The neighborhood commercial "village" area will generally conform to the development standards set forth under Hawai‘i County Code (HHC) Chapter 25 (Zoning) for Neighborhood Commercial Districts, which apply to strategically located commercial centers that supply goods and services to a residential or working population on a frequent need or convenience basis.

2. The Draft EA will include a section on the the agricultural feasibility of Nakahili's proposed agricultural lot sizes. This section will also include information regarding how the agricultural lots could have greater agricultural value when managed by multiple owners who are knowledgeable and capable of cultivating the land for agricultural pursuits, such as through the creation an association or cooperative among multiple lot owners to increase profitably of agricultural production through shared knowledge and support.

3. The Draft EA will include information on traffic impacts, mitigation measures (including proposed access and recommended intersection improvements), and internal roadway standards appropriate for the agricultural community.

4. Climate-adaptive native plants (and other species considered low-risk of becoming invasive) will be considered for roadway landscaping, parks, and other common areas. In addition, Low Impact Development (LID) drainage features such as vegetated buffers/filter strips, grass swales, and infiltration basins will be considered.

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5. We acknowledge your recommendation to re-use treated waste water for irrigation and will address this option within the Draft EA.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawai'i Office of Housing and Community Development

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

January 10, 2019

Mr. Tom Schnell, AICP
PBR Hawaii & Associates, Inc.
1001 Bishop Street
ASB Tower, Suite 650
Honolulu, HI 96813-3484

Dear Mr. Schnell:

Subject: **Pre-Environmental Assessment Consultation for Nakahili**
Applicant – Work Force Developers LLC
Tax Map Key 6-8-002:005, 006, 028, 029, 030

This is in response to your Pre-Environmental Assessment Consultation request dated December 11, 2018.

Please be informed that the nearest water system in the area is privately owned and operated. We recommend that you contact the Hawai'i Water Service to determine any impacts the subject project will have on their water system.

For your information, pursuant to Section 23-84 of the Hawai'i County Code regulating subdivisions, the following minimum requirements must be complied with for any subdivision approval:

1. Provide a water system designed to deliver water at adequate pressure and volume under peak-flow conditions in accordance with the Water System Standards, State of Hawai'i, and the Rules and Regulations of the Department of Water Supply. The water system shall include, but not be limited to, the installation of the necessary distribution pipeline, fire hydrants, and service laterals.

2. Submit construction plans for our review and approval.

3. Pay a fee of four-tenths of one percent of the estimated cost for the construction of the water system, but not less than $50.00, to cover the cost for plan review, testing, and inspection.

Should there be any questions, please contact Mr. Ryan Quitoriano of our Water Resources and Planning Branch at 961-8070, extension 256.

Sincerely yours,

Keith K. Okamoto, P.E.
Manager-Chief Engineer

RQ:dfg

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

Mr. Keith K. Okamoto, P.E., Manager-Chief Engineer
County of Hawai‘i
Department of Water Supply
345 Kekūanaō‘a Street, Suite 20
Hilo, HI 96720

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Mr. Okamoto,

On behalf of Work Force Developers, LLC, we thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (dated January 10, 2019, Reference: RQ:dfg). In response to your comments, we are offering the following responses:

We acknowledge the recommendation by the Department of Water Supply (DWS) to consult Hawai‘i Water System regarding any potential impacts to their private water system. Work Force Developers has consulted with Hawai‘i Water System and expects continued coordination as the planning for Nakahili progresses.

Work Force Developers will comply with the requirements included under Section 23-84 of the Hawai‘i County Code regarding subdivisions, including the following:

1. Provide a water delivery system that is in accordance with the Water System Standards, State of Hawai‘i, and the Rules and Regulations of the Department of Water Supply, as well as includes necessary distribution pipelines, fire hydrants, and service laterals. The Draft EA will include preliminary information regarding Nakahili’s water system.

2. Construction plans will be provided to the DWS for review and approval at the appropriate time in the development process.

3. As applicable, Work Force Developers will pay a fee for plan review, testing, and inspection to the DWS, to be determined by the estimated construction cost of the water system.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawai‘i Office of Housing and Community Development

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Chairman / Principal

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President / Principal

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Executive Vice-President / Principal

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KIMI MIKAMI YUEN, LEED® AP BD+C
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W. FRANK BRANDT, FASLA
Chairman Emeritus

ANN MIKIKO BOUSLOG, PhD
Project Director

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Cultural Sustainability Planner

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From: Tom Schnell
To: "Brenda.Carreira@hawaiicounty.gov"
Cc: Brittany Wheatman
Subject: RE: Pre-assessment Consultation for an Environmental Assessment Located in Waikoloa
Date: Tuesday, January 8, 2019 4:14:54 AM

Brenda,

Thank you for your email regarding the Nakahili EA pre-assessment consultation. I understand that your department has no comments at this time. We will send you a copy of the draft EA when it is available.

Tom Schnell, AICP
Principal

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Land Planning | Landscape Architecture
Environmental Planning | Land Use Entitlements
1001 Bishop Street Suite 650
Honolulu, HI 96813
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www.pbrhawaii.com

From: sysadmin <sysadmin@pbrhawaii.com>
Sent: Monday, January 7, 2019 2:35 PM
To: Tom Schnell <tschnell@pbrhawaii.com>
Subject: FW: Pre-assessment Consultation for an Environmental Assessment Located in Waikoloa

---

From: Carreira, Brenda <Brenda.Carreira@hawaiicounty.gov>
Sent: Monday, January 7, 2019 12:50 PM
To: sysadmin <sysadmin@pbrhawaii.com>
Subject: Pre-assessment Consultation for an Environmental Assessment Located in Waikoloa

Hi Mr. Schnell,

Thank you for asking us to provide input on this pre-assessment. We have no comments at this time. Best wishes on your workforce family agricultural community.

Brenda L. Carreira
Mass Transit Administrator
25 Aupuni Street
Hilo, Hawaii 96720

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

THOMAS S. WITTEN, FASLA
Chairman / Principal

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President / Principal

RUSSELL Y. J. CHUNG, FASLA, LEED® AP BD+C
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Associate

BRIAN WOLF, ASLA, LEED® AP
Associate

Ms. Brenda Carreira, Administrator
County of Hawai‘i
Mass Transit Agency
25 Aupuni Street
Hilo, HI 96720

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Ms. Carreira,

On behalf of Work Force Developers, LLC (Applicant), thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (email received January 7, 2019). We acknowledge that your department has no comments at this time.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawai‘i Office of Housing and Community Development

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Mayor

Wil Okabe
Managing Director

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County of Hawai'i
PLANNING DEPARTMENT

Michael Yee
Director

Duane Kanuha
Deputy Director

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

January 17, 2019

PBR HAWAII & Associates, Inc.
Attn: Tom Schnell, AICP
1001 Bishop Street, Suite 650
Honolulu, HI 96813-3484

Dear Mr. Schnell,

Subject: **Request for Comments per a Pre-Draft Environmental Assessment (DEA) Consultation.**
Project: Nakahili, Located In Waikolōa, South Kohala, Hawai'i (Tax Map Key 3-6-8-002:005, 006, 028, 029, 030)

This is to acknowledge receipt of your letter dated December 11, 2019 (COR-18-122126) requesting comments from the Planning Department regarding a Pre-DEA consultation for Nakahili, a proposed "workforce family agricultural community" in South Kohala, Hawai'i on the TMK parcels listed above and referred here to as the "project area." Situated on approximately 1,550 acres, this project proposes to develop approximately 700 one-acre agricultural lots surrounded by larger agricultural lots (approximately 150) ranging from approximately two to five acres in size. This project also proposes that a 15-acre portion located near the north-eastern part of the project area be more densely developed as a small neighborhood commercial village consisting of approximately 300 apartments with additional spaces for light industrial uses, such as self-storage facilities, contractor or supply warehouses, and offices. At the western edge of the property a 29-acre regional park is proposed with a possible future expansion planned contiguous but outside of the current project area.

From your request letter and your joint consultation meeting held with the County Planning Department and Office of Housing and Community Development on January 4, 2019, you indicated the infrastructural needs of this project and how the development proposes to meet them. The primary entrance to the development is proposed to be from the mauka boundary of the property along Mamalahoa Highway and planned as part of the 15-acre village area. Water wells are proposed to be drilled and water holding tanks constructed; both located within the project area. This project also proposes to construct its own on-site wastewater treatment facility that would serve the 15-acre village area, while the one acre and two to five-acre agricultural lots would require individual wastewater systems located on each lot.

The following comments relate to County regional land use planning, as well as zoning and permitting issues. Comments related public trust and health concerns will be subsequent. The final section of this letter will recommend topics we would like to see addressed in the Environmental Assessment (EA) and future project plans. While your letter (COR-18-122126) informs us that this project may be seeking certain statute, ordinance and/or charter exemptions under Hawai'i Revised Statutes (HRS) 201H-38, the following comments will reflect our department's concerns for your earnest consideration.

Hawai'i County Land Use Plans and Zoning:

- General Plan (GP)
- South Kohala Community Development Plan (SKCDP)
- Hawai'i County Code (HCC)

> The land use element sets forth goals, policies, and standards to guide the location and density, and building intensities of land uses in particular areas. Regional and/or Community Development Plans are intended to implement the broad goals within the General Plan on a regional basis.
>
> The land use element is intended to be used as a policy guide for the coordinated growth and development of the County. It seeks to accommodate growth without congestion; to designate and preserve the lands needed for residential use, commercial and visitor services, industry, agriculture, and open space; and coordinate these uses with the County's service and circulation systems.
> (Hawai'i County General Plan 14-1)

The Planning Department has the responsibility to make sure that growth on the island is consistent with overall land use direction for the County as presented in the General Plan and more specifically within the Community Development Plans. The laws and rules regarding 201H projects also reflect that these projects shall consider consistency with these plans, and if they stray from them, to state the reasons why they are going against these plans. These include:

> HRS 201H-33(a)(3)(c): The corporation shall adopt, pursuant to chapter 91, rules on health, safety, building, planning, zoning, and land use that relate to the development, subdivision, and construction of dwelling units in housing projects in which the State, through the corporation, shall participate. The rules shall not contravene any safety standards or tariffs approved by the public utilities commission and shall follow existing law as closely as is consistent with the production of lower cost housing with standards that meet minimum requirements of good design, pleasant amenities, health, safety, and coordinated development.
>
> HAR 15-307-26 (Project Proposal; Minimum Requirements) (a)(14): Applicable provisions of existing state and county general plans, development plans, community development plans, and other comparable plans developed or adopted by the state or county government in which the proposed project is situated, county zoning of the area and other applicable land use requirements, and if known, any substantial difference in

> the proposed project from the respective county general plan or development, or community development plan, or other county plans and zoning and other land use requirements, and the reasons for varying from the respective county requirements.

In reviewing the materials and discussions provided at the Pre-DEA consultation meeting, the apparent conflict between the proposed project and Hawai'i County land use policies lay in the fact that the project is not congruent with the County's land use planning, zoning, and subsequent intentions of planned growth. Per the map packet you provided at the January 4th meeting, there is acknowledgment that this proposed project is on lands designated "Agriculture" by the State Land Use District (SLUD) and that these lands have an ALISH classification of "Other" meaning that this land "is of state-wide or local importance for the production of food, feed, fiber and forage crops"[1]. The Hawai'i County GP Land Use Pattern Allocation Guide (LUPAG) map designates these lands as "Important Agricultural Lands". Furthermore, in Section 5.2 of the SKCDP your project area is not represented in the Waikoloa Village Conceptual Plan as an area considered for future growth. As for density, Hawaii County Zoning classifies these lands as A-20a (lot size/ minimum building site area of 20 acres) HCC 25-5-71. This project proposes to create 700 1acre lots comparable to FA-1a zoning. FA-1a zoning, according to HCC 25-5-60 states,

> this district is intended to be primarily comprised of agricultural lands less than five acres in area, which are not classified as A or B lands under the land study bureau's master productivity rating, or classified as prime, unique, or other important agricultural lands. Provided, that this district may include lands so classified if the lands are situated within an urban expansion or other urban designation under the general plan land use pattern allocation guide (LUPAG) map. (1996, ord 96-160, sec 2; ratified April 6, 1999.) [emphasis added]

In contradiction to HCC 25-5-60 the project area is on lands that are designated as other important agricultural lands, and not situated on any type of LUPAG urban designation. While the Planning Department appreciates the project's attempt to develop affordable housing units, we cannot overlook the locational discrepancy this project poses and the administrative, environmental, and public trust and safety issues that this misplacement will cause. Therefore, the Planning Department requests that you address the following.

1. **Inconsistency with the General Plan LUPAG IAL Designation**. This project consists of urban type zoning (commercial and RM) as well as FA-1a zoning, which is not consistent with the current IAL GP designation for the area.

    a. Zoning is SLU Ag and County A-20a. There will need to be many requests for exemptions under the 201H resolution including exemptions to allow multiple zonings (FA, RM or CV, ML and/or MG). an exemption from the GP LUPAG Map designation, exemptions from the SKCDP, and exemptions from all the other agency requirements that the applicant is seeking

[1] Link to ALISH metadata - http://files.hawaii.gov/dbedt/op/gis/data/alish.pdf

2. **Inconsistency with the South Kohala CDP.** The proposed project basically creates another town with an urban core outside of the Waikoloa urban core identified in the South Kohala CDP. There is nothing in the CDP that identified this type of large project in this area. Regarding workforce housing in this area, the CDP identifies it occurring within the Waikoloa urban core - the County project identified as Kamakoa, which still needs to be completed. Efforts should be focused on the completion of the Kamakoa project before initiating another large project for work force housing.

3. **Lack of infrastructure.** There is currently no water, no sewer, limited utilities and insufficient roads for a project of this size in this area. There are proposals for these utilities, but they are not finalized. There is concern about the limited access and the increase of traffic this project will generate to the upper road and possibly Waikoloa Road (if the applicant acquires an access to Waikoloa Road).

4. **Due Diligence and Processes**

    a. **(Environmental, Cultural, Traffic Impact Studies)** Our understanding is that the applicant is proposing a wastewater treatment facility, which will require at least an EA. The entire project will need to be detailed within the EA, as well as impacts and mitigation of those impacts. All the plans will need to be done as part of the EA including the mitigation details. For example, The TIAR may show the need for channelization of the intersection.

    b. **(Other Permitting)** It is our understanding that the wastewater treatment facility will be in the SLU Ag district, which will require a Special Permit. We are not sure if the County or the Land Use Commission (LUC) can exempt the requirement of a Special Permit through the 201H exemption process.

    c. **(Act of Council Legislation)** There will need to be a 201H resolution passed by Council, which will need a large number of exemptions, including zoning, the general plan, the CDP, and many infrastructure requirements, and other agency requirements. If a particular exemption(s) is not approved or identified, the developer will have to comply with current standards for those requirements.

    d. **(State Land Use Amendment)** As advised by the LUC staff on recent HRS 201H projects 15 acres or less in size, the applicant will either need to submit a State Land Use Boundary Amendment (SLUBA) 201-H exemption through the Land Use Commission or submit a State Land Use Boundary Amendment (SLUBA) application to the Planning Commission and County Council for approval. Previously, the developer requested 90 acres for urban core village area and to come in with phasing. In the recent meeting, the village core area has been downsized to approximately 15 acres. However, in regard to phasing, the entire project will need to be detailed within the EA.

Public Trust: (FUDS, Fire Hazard, Water and Health)

1. **(Formerly Used Defense Sites)** Per the County Office of Housing and Community Development, HUD may not accept the US Corp of Army Engineer's clearance of Unexploded Ordnance for the project area (referenced in joint meeting by Annie Bailey of OHCD).

2. **(Fire Hazard)** The proposed project area is located in an area that is historically prone to wildfires. For this reason, other proposed subdivision applications in near proximity to the proposed project area (sharing the same environmental conditions) were required to submit Fire Management Plans. The precedence for requesting Fire management plans is exemplified in (COR-10-060152) for subdivision applications SUB-07-000571, SUB-07-000581, and SUB-07-000588 and their corresponding TMKs: 6-8-002:112, 113, and 007 – TMK: 6-8-002: 007 being adjacent to the proposed project area.

   For Subdivision application (SUB-08-000745) corresponding to TMKs: 6-8-002: 010, and 011, the Planning Department in addition to requiring a Fire Management Plan, questioned anticipated water planning saying "Some of these planned subdivisions are contemplating a private water system, but will these systems be able to meet fire flow requirements" (Laserfiche Doc# 05-19-08PPMDEF), and required the applicant to consult with the Fire Department and DLNR in the creation of their Fire Management Plan.

3. **(Water Requirements, Aquifer Sustainability, and Wastewater)**

   a. HRS 174C mandates the preparation and adoption of a water use and development plan by each County for incorporation into the Hawai'i water plan. According to the State DLNR aquifer GIS map this project is situated on the West Mauna Kea Aquifer. Speaking of this aquifer the *Hawaii County Water Use and Development Plan Update (2010)* states,

      > Full build-out water demands associated with the maximum density of LUPAG land uses are not sustainable. If agricultural demands are not included, the LUPAG full build-out water demand requires over twice the sustainable yield (SY) of the West Mauna Kea Aquifer Sector Area (ASEA), and nearly eight times the SY if worst case agricultural demands are included. The existing zoning is legally developable and requires nearly 60 percent of the existing sustainable yield if agricultural demands are not included, and over six times the SY if worst case agricultural demands are included.

      Because the proposed project is not located within the planned growth designation of the LUPAG, its potential water demands need to be estimated and reserved to factor in its impact on the aquifer in relation to County planned growth and land use. Estimated water demands should include residential, agricultural, fire hazard

management, landscaping and any other types of water use. Since water and aquifer health is a matter of Public Trust under Article XI-1 of the Hawai'i State Constitution, we recommend that the development of proposed on-site wells follow the processes and procedures of HRS 174C and especially 174C-41 relating to Designation of Water Management Areas. Also refer to the Zoning Code HCC 25-2-46(m) for County zoning and standards.

b. Since this project proposes to have fresh water sourced from ground water wells and its Wastewater Treatment plant both located on site (as well as individual waste water systems for approximately 850 lots), we request that the EA report on the Wastewater Management Plan, and how cross contamination between freshwater and wastewater will be avoided, prevented, and nullified. As a matter of Public Trust and human health concerns, we request that your EA thoroughly address this issue.

Thank you for your requesting the Planning Department's comments on this proposed project and for addressing our comments in your future plan submittals and Environmental Assessment. Please provide our department with a copy of the Draft Environmental Assessment for our review and comment.

Sincerely,

MICHAEL YEE
Planning Director

PBR HAWAII
& ASSOCIATES, INC.

February 12, 2019

THOMAS S. WITTEN, FASLA
Chairman / Principal

R. STAN DUNCAN, ASLA
President / Principal

RUSSELL Y. J. CHUNG, FASLA, LEED® AP BD+C
Executive Vice-President / Principal

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Vice-President / Principal

TOM SCHNELL, AICP
Principal

KIMI MIKAMI YUEN, LEED® AP BD+C
Principal

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NATHALIE RAZO
Associate

GRACE ZHENG, ASLA, LEED® GA, SITES® AP
Associate

BRIAN WOLF, ASLA, LEED® AP
Associate

Mr. Michael Yee, Director
County of Hawai‘i
Planning Department
Aupuni Center
101 Pauahi Street, Suite 3
Hilo, HI 96720

SUBJECT: PRE-ASSESSMENT CONSULTATION FOR THE NAKAHILI DRAFT ENVIRONMENTAL ASSESSMENT (EA), LOCATED IN WAIKOLOA, SOUTH KOHALA, HAWAI‘I (TAX MAP KEY 3-6-8-002:005, 006, 028, 029, 030)

Dear Mr. Yee,

On behalf of Work Force Developers, LLC, thank you for responding as part of the pre-assessment consultation process for the Nakahili Draft Environmental Assessment (EA) (dated January 17, 2019). In response to your comments, we offer the following responses (numbered to correspond with your comments):

1. **Inconsistency with the General Plan LUPAG IAL Designation.** The Draft EA will discuss the inconsistency with the General Plan's Land Use Pattern Allocation Guide (LUPAG) Map designation of the Property as Important Agricultural Lands. The Draft EA will also include discussion of the State Land Use Agricultural District and County of Hawai‘i A-20a zoning of the Property.

2. **Inconsistency with South Kohala CDP.** The Draft EA will include discussion of the South Kohala Community Development Plan (CDP).

3. **Lack of infrastructure.** The Draft EA will include discussion of infrastructure necessary for Nakahili and include a complete Preliminary Engineering Report as an appendix. The Draft EA will also include: 1) discussion of existing traffic conditions and projections of future traffic growth in the area (without and with Nakahili) in accordance with Section 25-2-46, Hawai‘i County Code (HCC); and 2) a complete Traffic Impact Analysis Report as an appendix.

4. **Due Diligence and Processes**

    a. **Environmental, Cultural, Traffic Impact Studies.** The Draft EA will include discussion of environmental, cultural, and traffic issues in relation to the entire Nakahili area (TMKs (3) 6-8-002:005, 06, 028, 029, 030). The Draft EA will also contain the following studies as appendices: Biological Survey, Archaeological Inventory Survey, Cultural Impact Assessment, and Preliminary Engineering Report.

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b. Other Permitting. Since last meeting with the Planning Department and the Office of Housing Community Development (OHCD) on January 4, 2019, we have revised the Nakahili plan to include the small wastewater treatment plant (WWTP) within the neighborhood commercial "village" area to service: 1) the multifamily rental apartments and commercial and light industrial uses; and 2) single-family farm dwellings within 1,000 feet of the initial well site. The neighborhood commercial "village" is proposed to be within the State Urban District, and thus a Special Permit will not be required for the WWTP. At some point in the future if a larger WWTP may be needed in an area outside of the State Urban District, Work Force Developers will apply for any required permits and approvals, which may include a Special Permit.

c. Act of Council Legislation. Approvals for Nakahili are proposed be processed under Section 201H-38, Hawai'i Revised Statues (HRS), which was enacted to encourage the development of affordable housing. Section 201H-38, HRS (titled "Housing development; exemption from statutes, ordinances, charter provisions, and rules"), provides that the various County Council's shall authorize the development of housing projects that "shall be exempt from all statutes, ordinances, charter provisions, and rules of any government agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of dwelling units thereon" as long as: the project meets minimum requirements of health and safety; the project does not contravene any safety standards, tariffs, or rates and fees approved by the Public Utilities Commission for public utilities or of the Board of Water Supply; and the County Council approves the project by resolution.

To develop Nakahili as a workforce family agricultural community, Work Force Developers will request exemptions from certain provisions of Hawai'i Revised Statutes, the Hawai'i County Code and County Charter, and County rules and regulations. Exemptions are needed to achieve and maintain Nakahili's financial feasibility as a workforce family agricultural community. At this stage, Work Force Developers' exemptions are conceptual but are expected to include exemptions to:

- The County of Hawai'i General Plan Land Use Pattern Allocation Guide map
- The County of Hawai'i South Kohala Community Development Plan
- The County of Hawai'i Zoning Code
- The County of Hawai'i Subdivision Code
- Other State and County statutes, ordinances codes, rules, and regulations, rules, and fees as may be determined.

Although it is premature to identify specific exemptions that will be requested for Nakahili, the Draft EA will include information regarding the scope of, and rational for, the exemptions that may be requested and it is expected that Work Force Developers will consult with applicable agencies and gather related information during the Environmental Assessment process. After completion of the EA process, Work Force Developers will

prepare a 201H Application that will include a list of requested exemptions and submit it to OHCD for review.

d. State Land Use Amendment. Work Force Developers will comply with all requirements necessary to allow the uses proposed within the neighborhood commercial "village" area, which will be 15 acres in size or less. The Draft EA will address the entire Nakahili area (TMKs (3) 6-8-002:005, 06, 028, 029, 030).

Public Trust:

1. **Formerly Used Defense Sites.** The Draft EA will include a section on the Waikoloa Maneuver Area (WMA), including discussion of Formerly Used Defense Sites (FUDS) and unexploded ordnance (UXO).

   We understand that U.S. Department of Housing and Urban Development (HUD) may not accept the U.S. Corp of Army Engineer's (USACE) clearance of UXO of the Property and we have consulted with the Hawai'i Department of Health (DOH) regarding the process going forward. The identification and cleanup process for FUDS sites is regulated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Property is within the Area I Munitions Response Site of the WMA FUDS. The Area I Munitions Response Site is in the Investigation phase of the CERCLA process which consists of three phases: Inventory, Investigation, and Cleanup. DOH confirmed that completion of the CERCLA process will first require completion of the Investigation and Cleanup phases, including a Remedial Investigation/Feasibility Study and Remedial Design/Remedial Action. A process by which DOH can formally assess risk on FUDS, based on information provided by the USACE, is in development.

   Work Force Developers will follow all applicable State and County laws to ensure that health and safety remain a priority throughout planning, construction, and long-term use of Nakahili.

   The Draft EA will include the information above, along with additional information.

2. **Fire Hazard.** We acknowledge your comments regarding fire hazards, and we are aware of the high fire risks for the Property and the region, which will be discussed in the Draft EA.

   To mitigate risks posed by wild-land fires the Nakahili plan designates a 150-foot wide firebreak around the entire Nakahili perimeter and an additional 150-foot wide firebreak through the middle of the property. This will be noted in the Draft EA and shown on the Conceptual Site Plan included in the Draft EA.

The Draft EA will also include information on Nakahili's water system, including fire flow requirements water storage tank capacities. The Preliminary Engineering Report, which provides more details, will also be included as an appendix to the Draft EA.

Pre-consultation letters for Nakahili where sent to the County Fire Department as well as the Hawai'i Wildfire Management Organization. While neither of these organizations responded to the pre-consultation letter, Work Force Developers will coordinate with both as the planning for Nakahili progresses. In addition, the Draft EA will be sent to both as part of the Draft EA comment period.

If required as part of the subdivision process, a fire management plan will be prepared for Nakahili.

3. Water Requirements, Aquifer Sustainability, and Wastewater

The Draft EA will include information on the sustainable yield of the West Mauna Kea Sector, Waimea Aquifer System (80301), over which the Property is located. According to the current to Hawai'i Water Plan Water Resource Protection Plan (WRPP) (Commission on Water Resource Management (CWRM) 2008), the West Mauna Kea Sector, Waimea Aquifer System (80301), has a sustainable yield of approximately 24 million gallons per day (mgd) and use of 9.173 mgd (as of 2005). At full build-out Nakahili's daily water demand is expected to average 1.39 mgd (including water for residential use, fire flow standard, and irrigation) and thus the aquifer has adequate capacity to accommodate Nakahili's water demand without impacting the aquifer's sustainable yield.

We are aware that the CWRM staff is in the process of updating the WRPP and released the WRPP 2019 Update Public Review Draft in October 2018. The 2019 Update Public Review Draft estimates the sustainable yield of West Mauna Kea Sector, Waimea Aquifer System (80301) at approximately 16 mgd and quantifies that current use has reached 13.83 mgd, or approximately 86.4 percent of the sustainable yield.

Public hearings on the 2019 Update Public Review Draft are scheduled in February of 2019. Barring any significant and substantive revisions, CWRM staff plan to submit the WRPP 2019 Update to the CWRM for adoption in April or May of 2019. If significant and substantive revisions are required, CWRM staff will hold additional public hearings statewide. In that case, adoption of WRPP 2019 Update may occur in the fall of 2019. Due to the pending WRPP 2019 Update and proposed estimates regarding sustainable yield, Work Force Developers will monitor the update process. The Draft EA will include this information

Work Force Developers is aware that Well Construction/Pump Installation Permits from the CWRM will be required for the new Nakahili wells, along with other requirements that

necessary in compliance with the State Water Code (Chapter 174C, HRS). Should the West Mauna Kea Sector, Waimea Aquifer System (80301) be designated as a water management area pursuant to Section 174C-41, HRS, Work Force Developers and its hydrologist will proceed appropriately, and the full build-out of Nakahili may not be realized.

Regarding Nakahili's wells and waterwater systems Nakahili will include a small wastewater treatment plant (WWTP) within the neighborhood commercial "village" area to service: 1) the multifamily rental apartments and commercial and light industrial uses; and 2) single-family farm dwellings within 1,000 feet of the initial well site. Wastewater from agricultural lot farm dwellings not within 1,000 feet of a well will be serviced by individual wastewater systems on each agricultural lot. At some point in the future, a larger WWTP may be needed to serve additional any single-family farm dwellings within 1,000 feet of the second well site and other uses that may not suitable for individual wastewater systems. This information will be included in the Draft EA. The Draft EA will also include a section on phasing and a phasing plan, which will include information on the phasing of infrastructure.

Nakahili's wastewater systems will be in compliance with all DOH requirements as provided under HAR Title 11, Chapter 62, Wastewater Systems (Wastewater System Rules). The purpose of these rules is, in part, to ensure that the disposal of wastewater from wastewater systems does not: "…contaminate or pollute any drinking water or potential drinking water supply, or the waters of any beaches, shores, ponds, lakes, streams, groundwater, or shellfish growing waters…" (see Section 11-62-02, HAR). In addition, the Wastewater System Rules state, in part: "The department of health seeks to ensure that the use and disposal of wastewater and wastewater sludge does not contaminate or pollute any valuable water resource…" and "Individual wastewater systems may be utilized in remote areas and in areas of low population density." (see Section 11-62-01, HAR). See Section 4.8.2 for more information on Nakahili's wastewater systems. This information will be included in the Draft EA.

Work Force Developers understand that pursuant to Article IX, Section 1 of the Hawai'i State Constitution, all public natural resources are held in trust by the State for the benefit of the people. Such natural resources include land, water, minerals and energy resources.

Based upon the analyses that will be contained and referenced in the Draft EA, approval of Nakahili will be consistent with the public trust doctrine. No adverse impact on surface waters is anticipated. The uses within Nakahili will be designed and constructed with a minimum of grading to preserve the existing drainage patterns. The onsite drainage system will be designed to retain and manage the increase in runoff due to development so that post development runoff from the Property will not exceed existing conditions (pre-development). Ground water resources will be developed in compliance with the State Water Code (Chapter 174C, HRS), County of Hawai'i requirements, and State Department

of Health requirements. Wastewater systems will be designed and operated in compliance with the DOH Wastewater System Rules (Title 11, Chapter 62, HAR). With Nakahili, land and resources of the property and the surrounding area will be put to reasonable and beneficial uses which are consistent with public trust principles. Nakahili will not compromise the public's future use of resources.

We appreciate your participation in the environmental review process. Your comments will be reproduced in the forthcoming Draft EA.

Sincerely,

PBR HAWAII & Associates, Inc.

Tom Schnell, AICP
Principal

cc: Work Force Developers, LLC
County of Hawaiʻi Office of Housing and Community Development

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